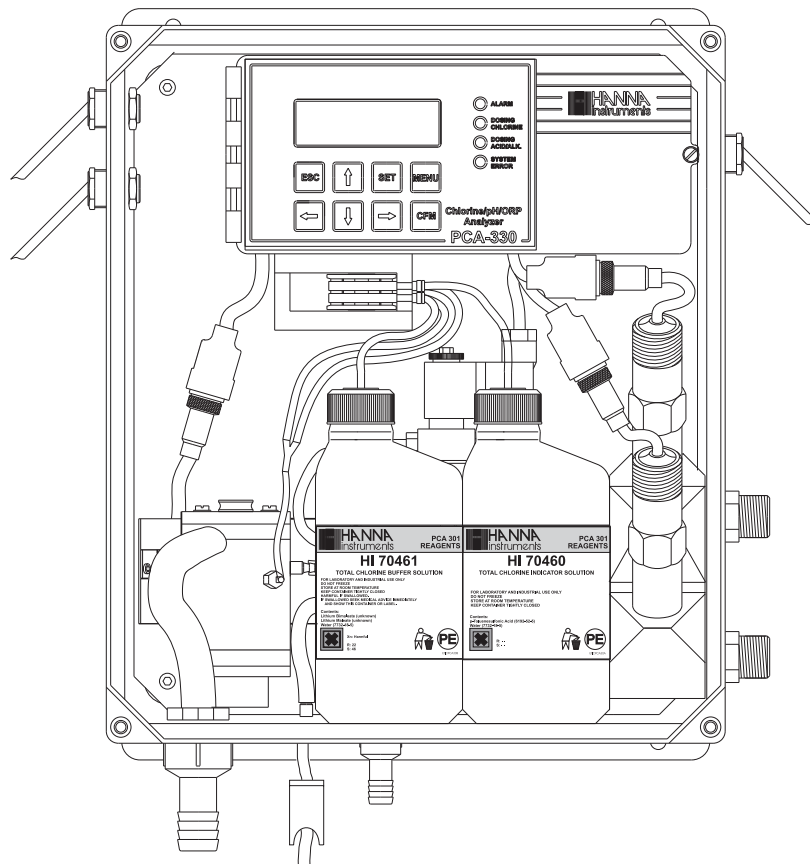


Instruction Manual

PCA 310, PCA 320, PCA 330 Chlorine, pH, Temperature, ORP Analyzers



Dear Customer,

Thank you for choosing a Hanna Product.

This instruction manual has been written for the following:

PCA 330 – Chlorine, pH, temperature, ORP analyzer.

PCA 320 – Chlorine, pH, temperature analyzer.

PCA 310 – Chlorine analyzer.

The analyzers have features such as: automatic chlorine measurement, pH, temperature and ORP measurement, chlorine and pH dosing regulator, selectable sampling periods, alarm system, data link through GSM network, user friendly interface, serial communication through RS485, recorder output, 4-20mA dosing output, Nema 4X enclosure.

The ordering code for chlorine analyzers is:

PCA 3a0-b

a = 1 - Chlorine analyzer
2 - Chlorine, pH and Temperature analyzer
3 - Chlorine, pH, Temperature and ORP analyzer

b = 1 - 115Vac 50-60Hz
2 - 220Vac 50-60Hz

Note: If the instrument is set for free chlorine analysis, the software will report at startup Free chlorine and if it is set for total chlorine, the software will report at startup Total chlorine.

Please read this instruction manual carefully before using the instrument. It will provide you the necessary information for the correct use of the instrument, as well as a more precise idea of its versatility.

Hanna Instruments reserves the right to modify the design, construction and appearance of its products without advance notice.
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PRELIMINARY EXAMINATION

Remove the analyzer from the packing material and examine it carefully to make sure that no damage has occurred during shipping. If there is any noticeable damage, notify your dealer immediately.

Each analyzer is supplied complete with:

- 2 reagent bottles (1 indicator and 1 buffer solution)
- 2 reagent bottle caps
- 1 DPD compound powder
- tubing

Note: Save all packing materials until you are sure that the instrument functions correctly. Any damaged or defective items must be returned in their original packing materials together with the supplied accessories.

WARNING: The PCA 310 - PCA 330 series of Chlorine, pH and ORP Analyzers are not designed for use with samples that are inflammable or explosive in nature. If any sample solution other than water is used with these products, test the sample/product compatibility to assure user safety and proper product performance.

Safety Precautions: Please take the time to read the safety precautions carefully wherever they appear in this manual. They are provided to prevent personal injury and damage to the instrument. This safety information applies to the operators and service personnel and the following two captions are used:

CAUTION: identifies conditions or practices that could result in damage to the instrument or persons;

Warning: identifies conditions or practices that could result in personal injury or loss of life.

Note: Because of the inherent dangers in handling chemical samples, standards and reagents, HANNA Instruments strongly recommends the users of this product to review the [Material Safety Data Sheets](#) and become familiar with safe handling procedures and proper usage prior to handling any chemicals.

GENERAL DESCRIPTION

The Hanna PCA 310, PCA 320 and PCA 330 series of chlorine, pH, ORP and temperature analyzers are microprocessor controlled, process analyzers which continuously monitor a sample stream for chlorine content, pH, ORP and temperature values.

The PCA 310-330 monitor the free chlorine or total chlorine in the 0 to 5 mg/L range depending on the factory settings and used reagents.

In the DPD Colorimetric method, N, N-Diethyl-p-phenylenediamine indicator and a buffer are mixed with the sample.

The resulting chemical reaction causes a magenta color to form. The color intensity is proportional to the concentration of chlorine. The color intensity is measured photometrically (with a light beam and a photodetector) and converted to chlorine concentration, in mg/L, which is displayed on the front panel.

Indicator and buffer reagent bottles are placed directly into the instrument case. With a sampling period of 5 minutes, reagents need to be replenished about once a month. The reagent bottles are easily visible through the transparent window allowing the operator to check the reagent levels.

PCA 320 and PCA 330 analyzers HI 1005 probe to continuously measure the pH of the sample stream in the range of 0 to 14 pH. The sample temperature is measured in the 5 to 75°C range. pH and temperature are displayed on the front panel. pH value is corrected with temperature.

pH	6.02	08:11
Cl	0.15 mg/L	
T	15.0 °C	
ORP	184 mV	

PCA 330 analyzer use HI 2008 platinum ORP electrode to continuously measure the sample ORP value.

The pH/temperature combined sensor and the ORP sensor are placed inside the case, directly in the sample stream.

The case of PCA 310-330 analyzers meet NEMA 4X, 12 and

13 standards. Molded fiberglass polyester has outstanding chemical and temperature resistance.

The case provides wall mounting capability and door gasket assures a watertight and dust-tight seal.

The electrical and hydraulic connections are made through the side of the enclosure.

The front cover is secured with two lockable latches.

Four chlorine level setpoints can be adjusted by the operator: a proportional dosing setpoint, two alarm setpoints and a minimum level for dosing.

The proportional dosing factor ($1/\delta$) is user selectable with a delta between 0.1 and 5 mg/L (ppm). Chlorine dosing system controls a SPST relay.

Each chlorine alarm can be enabled or disabled.

Three pH level setpoints can be adjusted by the operator: a dosing setpoint and two alarm setpoints. The pH control mode is user selectable: on/off or proportional dosing.

The proportional dosing factor ($1/\delta$) is user selectable with a delta between 0.1 and 2 pH. The on/off dosing hysteresis is user selectable between 0.05 and 2.00 pH. pH dosing system controls a SPST relay.

Each pH alarm can be enabled or disabled.

For temperature and ORP, two alarm levels can be set by the user.

Each temperature or ORP alarm can be enabled or disabled.

Alarm condition controls a SPDT relay.

A system error feature provides relay activation to signals need for operator intervention.

System error condition controls a SPST relay.

Two current outputs of 4-20 or 0-20 mA are available to drive external devices such as chart recorders.

The analyzer can drive two dosing pumps through the 4-20 mA outputs for chloride and for acid/alkali dosing.

The analog output is fully programmable and could be proportional with chlorine concentration, pH, ORP or temperature value. The limits of the analog output is selectable for each parameter.

The analyzer can store up to 3500 readings (at least 7 days at 3 minutes sampling interval), that are available for consulting or downloading.

The PCA 310-330 analyzers can be monitored or controlled through RS485 or GSM network connection.

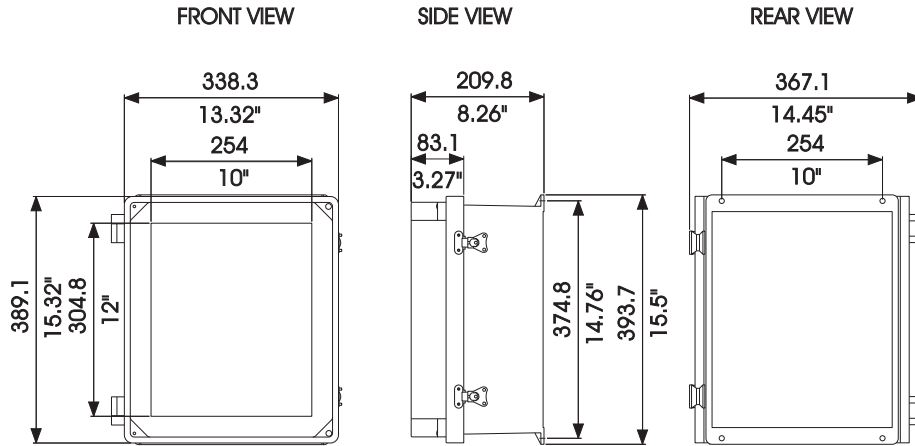
Errors, alarms and warnings are sent through SMS (using GSM module HI 504900).

The analyzer state can be interrogated by a simple call using GSM phone.

Time is displayed on the main panel and a time related warning system for "Old calibration" "Reagent expired" and "SIM expired" is available.

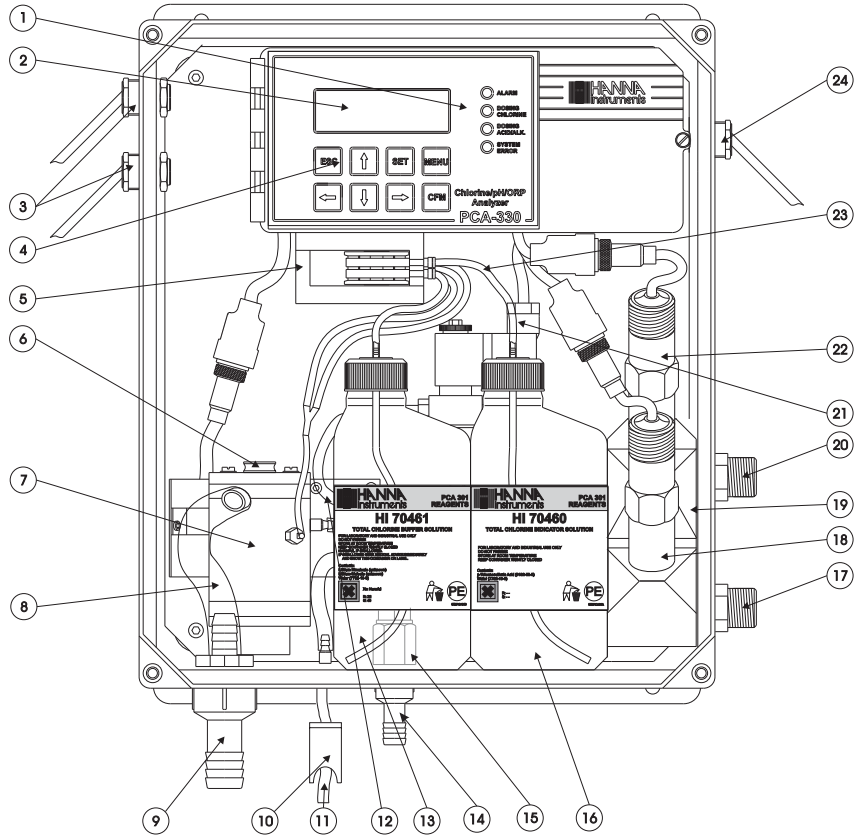
The language for user interface can be easily changed without restarting the analyzer.

MECHANICAL DIMENSIONS



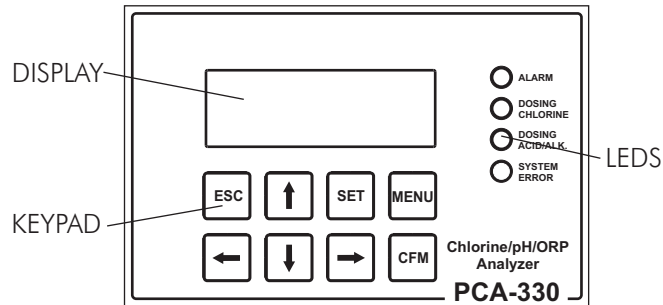
Case dimensions in mm & inches

FUNCTIONAL DESCRIPTION



- | | |
|---------------------------------------|------------------------------------|
| 1. Alarms, dosing, system error LED's | 13. Buffer Bottle |
| 2. Character Display | 14. Pressure Regulator Output Port |
| 3. Cable glands | 15. Incoming Pressure Regulator |
| 4. Keypad | 16. Indicator Bottle |
| 5. Peristaltic Pump | 17. Sample Inlet Port |
| 6. Access Point to Cell | 18. pH Electrode (not included) |
| 7. Measuring Cell | 19. Electrodes Holder |
| 8. Drain Tube | 20. Sample Output Port |
| 9. Output Port | 21. Electrovalve |
| 10. Drain Port Valve | 22. ORP Electrode (not included) |
| 11. Drain Port of Measuring Cell | 23. Reagent Tubing |
| 12. Sample Tubing | 24. Line Input |

DISPLAY, LEDS AND KEYBOARD

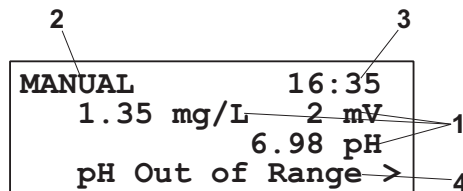


DISPLAY

The display contains 4 lines with 20 characters on one line. The information and error messages are clearly displayed in plain language, without error codes.

The display has back light for better visibility.

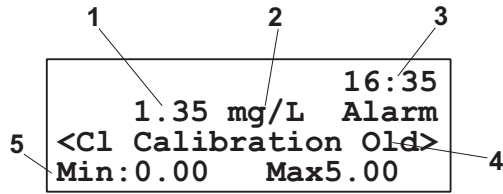
The analyzer is in main panels mode when displays a panel that contains the measured values. Several main panels could be selected by pressing the up and down arrow keys. The PCA 310 do not have the main mode for the display.



- 1 - measured values
- 2 - controller status
- 3 - current time and date
- 4 - message line

The display is in chlorine, pH, ORP or temperature measuring panels mode when displays one of those values and secondary information related to it. Several panels with different secondary information could be selected by pressing the up or down arrow keys.

When the display is in one of the above modes, the measuring units, the current time and the alarm or error status are also displayed. PCA 310 is always in chlorine measuring panels.



- 1 - measured value (chlorine, pH, ORP or temperature)
- 2 - measurement units (mg/L, pH, mV, °C or °F)
- 3 - current time in format HH:MM
- 4 - warnings, alarms and errors, displayed one at a time
- 5 - secondary information.

LEDs

- ALARM
- DOSING CHLORINE
- DOSING ACID/ALK.
- SYSTEM ERROR

Three or four LEDs are present on the front panel:

ALARM LED (red), signals the presence of at least one alarm and the closing of the Alarm relay. When the alarm is present, the LED blinks. When the analyzer is in MANUAL mode, the LED is on but not blinking.

DOSING CHLORINE LED (green), signals the closing of the chlorine dosing relay. When dosing stops, the LED is turned off.

DOSING ACID/ALK. LED (green), signals the closing of the acid/alkali dosing relay. When dosing stops, the LED is turned off (PCA 320 and PCA 330 only).

- ALARM
- DOSING CHLORINE
- SYSTEM ERROR

SYSTEM ERROR LED (red), signals the presence of an error and the closing of the System error relay. When the error is present, the LED blinks. When in STANDBY mode, the led is on but not blinking.

For PCA 310 the system error LED is moved in the dosing ACID/ALK. LED position.

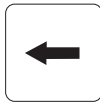
KEYPAD

The keypad has 8 keys with the following signification:



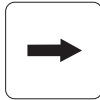
UP and DOWN ARROWS

- select the main display appearance,
- select the menu,
- select an item from a list
- edit values.



LEFT and RIGHT ARROWS

- select an error message,
- select an item to edit or
- select the current digit for editing.



MENU enter in menu mode.



CFM confirm the selected menu and edited values.



SET starts editing the selected item.



ESC

- return to the previous menu,
- exit from operation without saving.

SPECIFICATIONS

CHLORINE MEASUREMENT AND DOSING (All models)

Range	0.00 to 5.00 mg/L
Resolution	0.01 mg/L
Accuracy	± 8% or ± 0.05 mg/L whichever is greater
Typical EMC deviation	± 0.05 mg/L
Calibration	1 point
Minimum detectable level	0.05 mg/L
Sampling rate	3 to 90 minutes
Dosage	Proportional relay or 4-20mA output
Delta	selectable 0.1 to 5 mg/L

pH MEASUREMENT AND DOSING (PCA 320 and PCA 330)

Range	0.00 to 14.00 pH
Resolution	0.01 pH
Accuracy	± 0.05 pH
Typical EMC deviation	± 0.2 pH
Calibration	1; 2 points or in line calibration
Dosing rate	3 to 120 seconds
Dosage	On/Off or proportional, relay or 4-20mA output
Delta	selectable 0.1 to 2 pH
Hysteresis	selectable 0.05 to 2 pH

ORP MEASUREMENT (PCA 330)

Range	0 to 2000 mV
Resolution	1 mV
Accuracy	± 1 mV
Typical EMC deviation	± 10 mV

TEMPERATURE MEASUREMENT (PCA 320 and PCA 330)

Range	5.0 to 75.0 °C (41 to 167 °F)
Resolution	0.1 °C
Accuracy	± 0.5 °C
Typical EMC deviation	± 0.5 °C

OTHERS (All models)

Recorder output	4-20mA, 0-20mA
Serial communication	RS485, galvanic separated
Baud rate	1200; 2400; 4800; 9600 bps
Display	character LCD 4 lines x 20 characters
Languages	English, Italian, Spanish, French
Log	3500 log records
GSM alarm	2 numbers, alarm SMS, info SMS, warning SMS
Alarm relay	SPDT 5A 230V
Dosing relays	SPST 5A 230V
System error relay	SPST 5A 230V
Sample inlet pressure	0.07 to 4 bar
Sample flow rate	100 to 300 mL/min
Sample temperature	5 to 40 °C
Sample inlet	12mm (1/2") male NPT fitting
Sample outlet	12mm (1/2") male NPT fitting
Drain connection	10mm (3/8") barb
Process pH/temp probe	HI 1005
Process ORP probe	HI 2008
Power requirements	20 VA
Case	NEMA-4X

OPERATING DESCRIPTION

CHLORINE MEASUREMENT

Referring to the drawing on page 10 and the Fluidic Diagram on page 17, the Sample Line is connected to the instrument at the Sample Port (#17); an internal Regulator (#15) reduces the inlet pressure from a maximum of 4 bar (57.2 psi) down to 1 bar (14.3 psi); from the Regulator a nylon tube is connected to the input of the Electrovalve (#21). The output of the valve goes to the Drain Port (#11) and then to the Measuring Cell (#7). An optional Filter can be installed to the sample port if the stream is excessively turbid.

The sample coming from the line normally flows through the Measuring Cell (#7). It goes out from the Measuring Cell through the Drain Tube (#8) and the Output Port (#9).

The Measuring Cell is accessible from the port placed on the top (#6) for speedy cleaning and maintenance.

During the 100 seconds preceding the sampling, the analyzer solenoid input valve is open to allow sample flow to flush the colorimeter cell. Every 3 to 90 minutes (user selectable), the electrovalve closes stopping the sample flow and leaving the sample cell full of fresh sample. Cell volume is controlled by an overflow gateway.

As the sample inlet electrovalve closes, a series of measurements (with LED on and off) of the unreacted sample is taken to determine an average blank level prior to reagent addition.

The measurement of sample blank signal permits compensation for any turbidity or natural color, and provides the zero reference point for the measurement.

The two channel Peristaltic Pump (#5) starts rotating causing a precise quantity of buffer and indicator (#13 and #16) to enter the colorimeter sample cell. Here a magnetically coupled stirrer mixes the reagents with the sample.

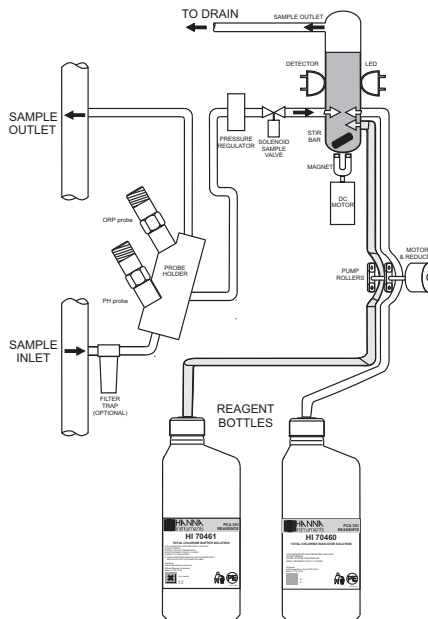
After a delay for the color development, a series of measurements (with LED on and off) are taken (sample level) to determine an average chlorine concentration measurement. The reacted sample signal is then measured and displayed.

This sequence is repeated every 3 to 90 minutes (user-selectable).

METHOD OF ANALYSIS

Free available chlorine oxidizes the DPD indicator reagent at a pH between 5.5 and 6.0 to form a magenta-colored compound. The intensity of the resulting color is proportional to the concentration of chlorine in the sample. The purpose of the buffer solution is to maintain the proper pH.

To measure total residual chlorine (free available chlorine plus combined chlorine) the PCA adds potassium iodide. The chloramines in the sample cause iodide ions to become iodine which then act with free chlorine to oxidize the DPD indicator. After the chemical reaction is complete, the optical signal at 555 nm is compared to the signal measured through the sample (before the reagents were added). From these measurements chlorine concentration is calculated.



pH AND TEMPERATURE MEASUREMENT

The **HI 1005** pH/temperature probe provides at the out port a potential proportional with the pH. The temperature is measured with PT100 platinum sensor.

For increased accuracy the pH is corrected with temperature and with the calibration coefficients. Up to 2 buffers can be used for calibration.

The temperature can be displayed in °C or °F.

The probe can withstand pressure up to 6 bar (87 psi).

ORP MEASUREMENT

The **HI 2008** probe provides at the out port a potential proportional with the ORP value. The value is directly displayed in mV. The probe can withstand pressure up to 6 bar (87 psi).

INITIAL PREPARATION AND INSTALLATION

INSTALLATION PERSONNEL

Installation of the PCA 310-330 Chlorine, pH, ORP and temperature analyzers should be undertaken by persons with technical knowledge of the dangers associated with chemical exposure and electrical shock.

Hanna Instruments assumes that persons performing the installation tasks are aware of the appropriate safety procedures.

CAUTION: Review the Material Safety Data Sheets (MSDS) before handling the supplied chemical reagents.

LOCATION OF THE INSTRUMENT

Analyzer Location

Locate the analyzer as close as is reasonably possible to the point where the sample is withdrawn from the product stream (referred to as the sampling point).

The instrument should be mounted indoors, out of direct sunlight. Instrument operating temperature is 5 to 40°C (41 to 104°F).

Sampling Point Location

Locate the sampling point to obtain a truly representative sample from the product stream. For example, be sure the sampling point is well downstream from a Chlorine and acid / alkali feed. This assures that adequate mixing and reaction of the Chlorine and acid / alkali before a sample is extracted.

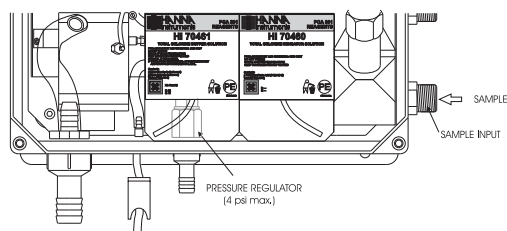
HYDRAULIC CONNECTIONS

Note: Hydraulic connections should be installed only by qualified personnel to assure conformity to applicable plumbing codes.

Sample Line Installation

Direct routing of sample lines is recommended.

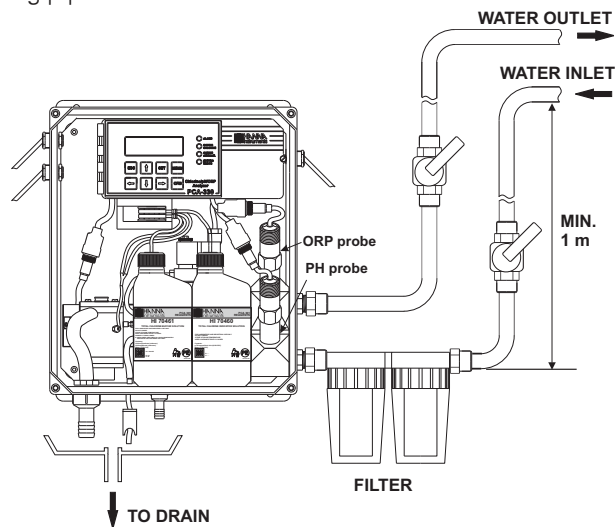
If the large process pipes are horizontal, taps should be inserted vertically in the middle of the pipe to avoid pulling sediment from the bottom or air bubbles from the top of the pipe into the sample line.



A 1/2 BSP sample input fitting allows direct connection to the optional input filter.

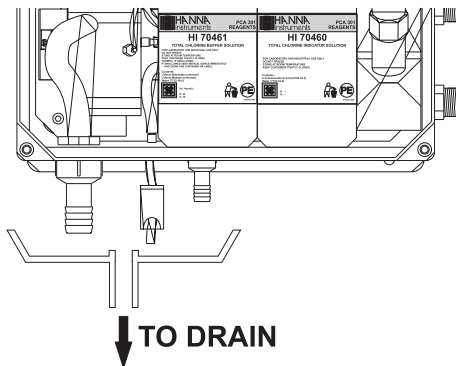
Sample line pressure should be between 0.07 and 4 bar (1 and 57.2 psi) with an ideal pressure of 0.7 bar (10 psi).

It is recommended to assure that the water inlet come at 1 m above the instrument sample input pitting. For maintenance issues is also recommended to install valves on both sampling pipes.



Drain Line Installation

The drain hose fitting is a 20 mm (3/4") hose barb on the bottom of the instrument enclosure. An air gap between the end of the drain hose and the drain is recommended to prevent any back flow into the instrument in the event of drain blockage.



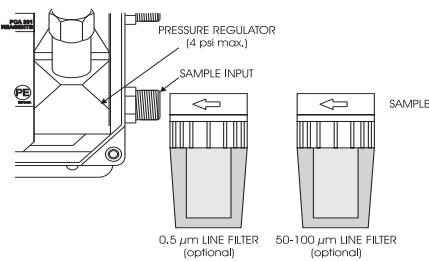
Return Line Installation

The return hose fitting is a 12 mm (1/2") hose barb on the bottom of the regulator output port and should always be connected even when pressure is below 1 bar.

INSTALLING THE INPUT FILTER

In order to ensure maximum accuracy of measurements, it is recommended to have always clear sample, with suspended particles smaller than $0.5 \mu\text{m}$. This can be achieved by installing two filters before the sample input.

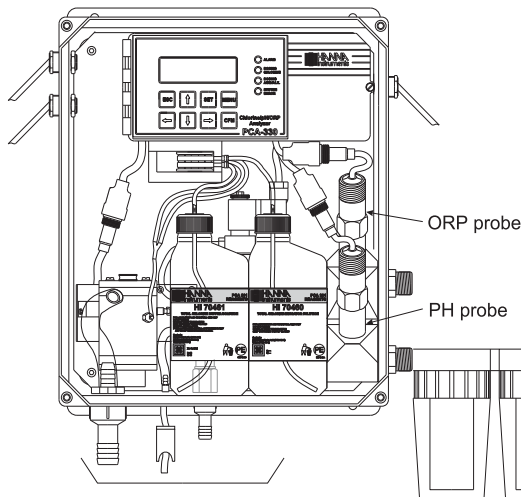
The type of filters depends on the quality of the water: the first filter should have 50-100 μm pore size, whereas in any case the second filter, the one closer to the analyzer, has to be $0.5 \mu\text{m}$.




For correct installing procedure and maintenance, see the instructions of filters.

INSTALLING THE pH AND ORP PROBES

To mount the pH and ORP probes, first turn off the analyzer. Unscrew the closing caps from the electrode holder and remove

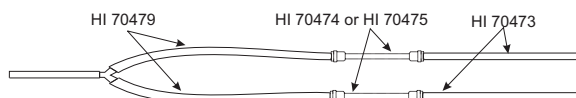


the protective cap from electrodes and electrodes connectors. Screw the pH probe (**HI 1005**) in the lower position and the ORP probe (**HI 2008**) in the higher position and assure that no leakage occurs. Only after the probe is in final position connect the probe to the dedicated connector. Lock the connector with the built in nut.

 **Warning:** Never connect or disconnect the probes when the analyzer is powered on.

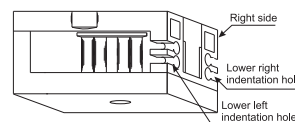
INSTALLING THE PUMP TUBES

Locate the analyzer reagent tubes in the accessory kit. Each tube is composed of three sections. The sections are joined together by plastic connectors with plastic collars at the ends of the center section.

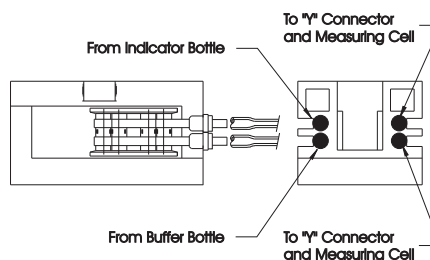


Locate the peristaltic pump.

Feed one tube from the shorter end section behind the pump rollers from the right side of the pump. Seat the plastic collar at the right end of the center section of tubing into the lower right indentation hole of the pump face.

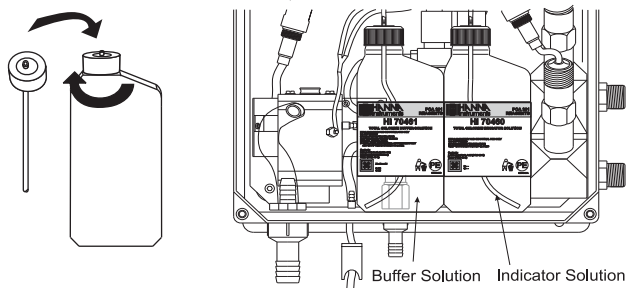


Grasp the other plastic collar and pull, stretching the center section, and place the grommet in the lower left indentation hole.



Repeat this process with the second pump tube, placing it in the upper indentation holes.

Separate reagent caps are provided in the accessory kit. Put the supplied caps onto each reagent bottle prior to installing

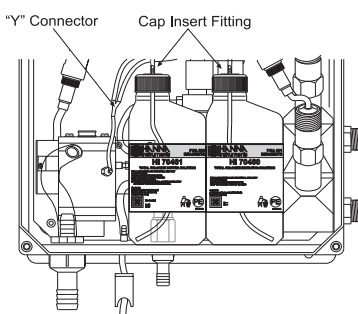


them. Place the indicator bottle (HI 70450 for free chlorine and HI 70460 for total chlorine) on the right and the buffer bottle (HI 70451 for free chlorine and HI 70461 for total chlorine) on the left.

Note: Add the content of 5 HI70452 sachets, DPD Compound, to the Indicator Solution prior to installing it.

Connect the longer tube ends on the left side of the pump to the reagent bottle cap insert fitting.

Connect the short ends in the right side of the pump to the measuring cell reagent input port through the "Y" connector.



ELECTRICAL CONNECTIONS



Warning Electrical connections should be installed only by qualified personnel to assure conformity to applicable electrical codes. Unplug the meter before any electrical connection.

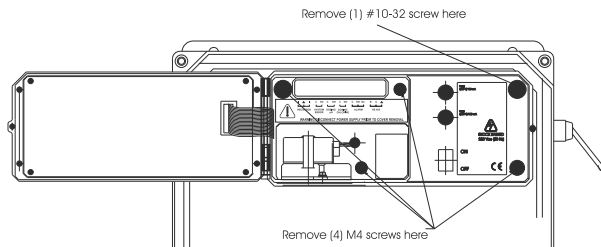
Power Connection

Power connections are made at a terminal block located in the center of the electrical compartment to the right of the fuses.

Hard wiring with 13 mm (1/2") conduit is recommended and usually required by most municipal electrical codes.

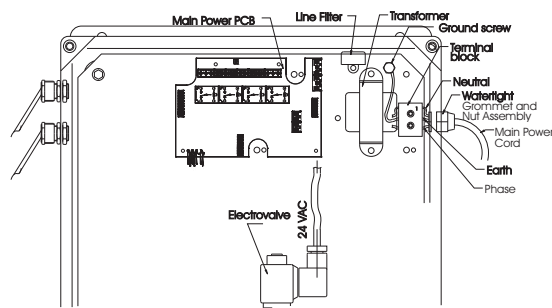
Warning Before connecting the instrument to the line:

- 1) Check the label near the fuses for proper voltage.
- 2) Be sure the power cord is not connected to the line.



- 3) Open front panel.
- 4) Remove the cover screws (Allen head).
- 5) Do not remove peristaltic pump or motor.
- 6) Unplug all alarms and recorder jacks.

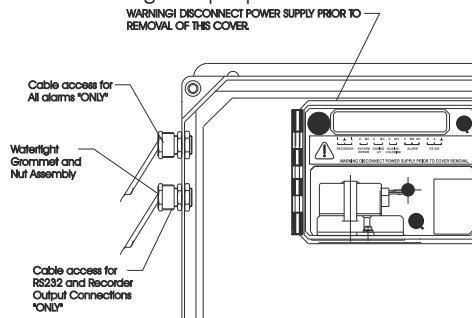
Feed the power cord through the watertight grommet and tighten the grommet nut. See the picture below for proper wire connections.



Recorder Output and Relay Access

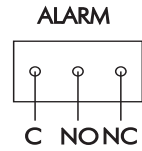
Hard wiring for alarms and relays recorder outputs and serial communication can be accomplished through four watertight connectors on the left side of the enclosure, by passing wires through the rubber grommet and tightening the nut as described earlier.

Refer to the drawings for proper wire connections.



Alarm Relay

A system alarm feature provides relay activation to signal that the measuring value exceed the alarm setpoints. The alarm relay is closed (Common connect to Normal Close) if the value is lower than alarm low setpoint or higher than alarm high setpoint.

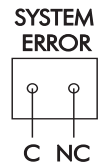


The ALARM LED blinks when alarm is active.

Note: The Alarm relay is power-fail safe and is closed when the analyzer is not powered.

System Error Relay

A system error feature provides relay activation to signal the need for operator intervention through an external device, such as a buzzer, a light or any other electrical equipment. When errors appears, the relay is closed (Common connect to Normal Close).



The SYSERR LED blinks when a system error occurred.

If the situation persists for more than a few samples, the operator should notify maintenance personnel for investigation of the problem.

Note: When the meter is in alarm mode or in system error mode, the user could directly view the alarm or error description on the display.

If GSM transmitter is installed and GSM mode is selected, the alarms and errors are sent as SMS message.

The System error relay is power-fail safe and is closed when the analyzer is not powered.

Chlorine Dosing Relay

The chlorine dosing relay is activated (Common connected to Normal Open) when chlorine concentration is under the dosing setpoint. The chlorine dosing use a proportional algorithm that depends on both, setpoint and delta.

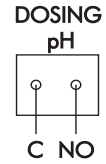


The DOSING CHLORINE LED is turned on when the dosing relay is closed.

Note: The chlorine dosing is stopped when the concentration is over Alarm high setpoint or when a System error related to chlorine measurement occurs.

Acid/alkali Dosing Relay

Acid/alk dosing relay is activated (Common connected to Normal Open) depending on the setpoint and selected delta. If the analyzer is set to dose acid, the relay is active when the pH value is over the setpoint. If alkaline is dosed, the relay is activated when the pH value is under the setpoint.

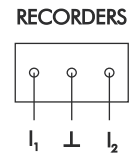


The DOSING ACID/ALK. LED is turned on when the dosing relay is closed.

Note: The acid/alk dosing is stopped when system error related to pH occurs.

Recorder Outputs

The recommended recorder hookup uses a twisted pair shielded cable. The shield should be connected to the terminal at the instrument end and left open at the recorder end.



To operate with this hookup, the following conditions are required at the recorder end:

- The input to the recorder must be isolated from the chassis ground (earth) of the recorder;
- If the recorder has more than one input, they must be differential inputs.

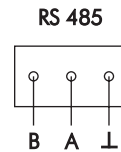
Two types of outputs are available: 0-20 mA or 4-20 mA for each output. The recorder outputs could be assigned to Cl, pH, Temperature or ORP.

Proportional dosing pump

Two proportional dosing pumps could be connected to the 4-20 mA outputs. The pump could be used to dose chlorine and acid/alk as selected by the user. When the output is 4 mA, the pump must be stopped and when the output is 20 mA, the pump must provide the maximum output.

RS485

The analyzer has RS485 serial communication with selectable baud rate between 1200 and 9600 Bps. The GSM module HI 504900 is also connected using the RS485 port.

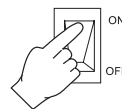


Note: The RS485 could use also the ground wire to prevent common mode voltages.

STARTUP

To power up the analyzer open the electronic box door and turn on the main switch.

When the analyzer is powered up, the display backlight is turned on and the initialization take place. In this phase, the integrity of the stored data is checked and the information regarding the language is loaded.



The display will show HANNA INSTRUMENTS, the name of the instrument and the software version.

```
HANNA INSTRUMENTS
PCA 320 Ver. 1.3a
Free Chlorine
Loading language..
```

or

```
HANNA INSTRUMENTS
PCA 320 Ver. 1.3a
Total Chlorine
Loading language..
```

Note: If the instrument is set for free chlorine analysis, the software will report at startup Free Chlorine and if it is set for total chlorine, the software will report at startup Total Chlorine.

After initialization, the analyzer will show the main panel (or chlorine measuring panel for PCA 310). The measured value are displayed. The chlorine concentration will be updated only after a full measuring cycle. The first reading is 0.00 mg/L and the dosing relay is not active.

After the first chlorine concentration is measured and displayed, the chlorine dosing relay is activated if necessary.

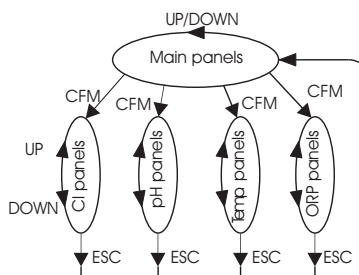
Note: If the SMS feature is selected and correctly configured, the analyzer will send a SMS at each power up sequence.

USER INTERFACE

PANELS ORGANIZATION

The PCA 310 – 330 analyzers provide a friendly interface that display all important parameters of the analyzer. The appearance of the display could be selected by the user.

The panels are organized in circular loops. PCA 330 has a main loop where panels with all measurements are displayed, chlorine measurement loop, pH measurement loop, temperature measurement loop and ORP measurement loop where only information related to the parameter is displayed.



PCA 320 has the same structure but without the ORP measurement panels.

PCA 310 has only the chlorine measurement panels.

Pressing “UP” and “DOWN” keys will move inside loop in a circular way (after last panel, the first panel is displayed). Pressing “CFM” to move from main panels to measurement panels. Pressing “ESC” to move from measurement panels to main panels.

MAIN PANELS

At startup the display shows one of the main panels. This panel contains the chlorine, pH, ORP

pH	5.94	08:10
Cl	0.15 mg/L	Error
T	17.3 °C	
ORP	187 mV	

and temperature values and the related measuring units. The panel contains also the current time and the alarm / error status.

Other panels are available by pressing “UP” or “DOWN” keys. On each of this panels one measurement is displayed on the left side and the others on the right side.

One row with messages is also displayed.

When the display show one of this panels, pressing "CFM", will enter in the panels related to the parameter displayed in the left side.

	6.29 pH	08:10
<	Low ORP	Error >
Min:4.18	Max:7.00	

Example: When pH is displayed on the left side and the chlorine, ORP and temperature on the right side, pressing "CFM" will go in one of the pH measure panels.

MEASURE PANELS

For each parameter, several measure panels are available.

One panel contains large digits for better visibility.

The measure panels contains:

1	2	3	
5	STANDBY	16:35	4
	1.35 mg/L	Alarm	
7	<Cl Calibration Old>	6	
	Min:0.00	Max5.00	

1 = the measured value (chlorine, pH, ORP or temperature)

2 = the measurement units (mg/L, pH, mV, °C or °F)

3 = the current time in format HH:MM

4 = error or alarm indicator

5 = information about the operating mode.

6 = warnings, alarms and errors, displayed one at a time

7 = the last row displays less important information:

- Maximum and minimum value
- Sampling time
- Reagent doses left
- Alarm High and Alarm Low
- Regulator Setpoint and Delta or Hysteresis
- Analog output maximum and minimum
- Cl measuring phase

The display go in large digits panel if no key is pressed for about 4 minutes. If key is pressed, the display returns in the panel where it was before.



Pressing "ESC" when in one of those panels will return in main panels mode.

MESSAGES

When warnings, alarms or errors appears, the message line is displayed. The meanings of each message is explained in chapter ERRORS, ALARMS AND WARNINGS.

If many messages are present, the "<" and ">" signs are displayed on the left and/or the right side.

Pressing "LEFT" or "RIGHT" arrow keys the messages are scrolled. If is no message in the left or right side, the corresponding sign "<" or ">" disappears.

When at least one alarm is active, the "Alarm" appears in the right side of the display. The ALARM LED will start to blink.

When errors or both, errors and alarms are active, "Error" appears in the right side of the display. The SYSTEM ERROR LED will blink.

The "MANUAL" or "STANDBY" information is displayed on the first line of the LCD.

MENU MODE

By pressing "MENU" key, the analyzer will enter in menu mode. In this mode, the analyzer settings can be consulted or modified. The settings are organized in menus and grouped by functions. The menu is password protected.

PASSWORD PROCEDURE

When the "MENU" key is pressed, the analyzer ask for the password.

If the password is set to "0000" (default value) the analyzer will not ask for password.



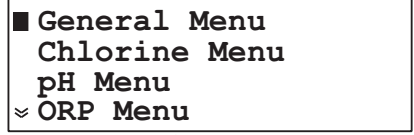
If correct password is entered and confirmed, the analyzer will go in menu mode.

If wrong password is entered, the analyzer displays "Password incorrect. Settings are not allowed!", and the user could only view the analyzer parameters.

NAVIGATING THROUGH MENU

The menu is organized as a list of options. Each line of this list:

- could contain a sub-menu;
- could display an analyzer parameter or
- could start a function.



■ General Menu
Chlorine Menu
pH Menu
≈ ORP Menu
Temperature Menu

To select a menu line, press "UP" or "DOWN" arrows.

The selected line is signaled by a black square in the left side of the display.

If the menu continues outside the viewing area, a double up or down arrow is displayed on the first or last line of the display.

As a general rule, the "CFM" key will descend into menu and "ESC" key will return to a higher level.

Pressing "CFM" will make the following actions:

- descend into the sub-menu for sub-menu line.
- no action for parameter line.
- start the function for function line.

Pressing ESC will make the following actions

- Return in measure mode when in the main menu
- Return in the previous menu when in submenu
- Return from function before the normal ending when function is executing
- Exit from edit mode without saving.

MODIFY A PARAMETER

To modify a parameter, press "SET" key when a line that displays a parameter is selected.

The cursor will go to the first digit or letter of the parameter.

Note: If wrong password is entered, editing is not allowed.

The editing sequence depend upon the parameter type.

For list type parameter

In this case the cursor will blink and first letter alternates with a black square. To modify the value press "UP" or "DOWN" arrow key until the correct value appears.

```
Setpoint :2.50 mg/L
■ Delta  :0.1 mg/L
Low Point:0.02 mg/L
Low Point:Inactive
```

Press "CFM" to save the value or press "ESC" to end the editing without saving the value.

For single numeric values

In this case the cursor will blink by alternating the first digit and a black square.

Press "RIGHT" or "LEFT" arrow key to focus on the digit that has to be edited.

To edit the current digit press "UP" or "DOWN" arrow keys.

Press "CFM" to save the value or press "ESC" to end the editing without saving the value.

For many numeric values on a row

In this case the cursor will go to the first digit of the first parameter. The cursor will blink but no black square will be displayed.

Select the parameter to be edited by pressing "RIGHT" or "LEFT" arrows.

```
Set Time: 10:31
■ Set Date:2004/01/01
```

To edit the parameter press "SET" key again and the black square alternating with the first character appears, signaling that the parameter could be edited.

Depend on the parameter type, the edit procedure is as described for list type or single numeric value.

Press "CFM" to save the value or press "ESC" to end the editing without saving the value. The cursor will prompt the edited parameter.

Pressing "RIGHT" or "LEFT" arrow keys, another parameter can be set.

Pressing "ESC" key will return to menu.

Note: If the edited value is outside the allowed range, a warning panel appears when "CFM" is pressed. This panel contains the parameter limits. Pressing again "CFM" or "ESC" will return to the edit mode.

PROGRAMMING THE ANALYZER

To set the parameters press "MENU" while in the measure mode. The main Menu is displayed.

```
■ General Menu
  Chlorine Menu
  pH Menu
  ≡ ORP Menu
```

Temperature Menu

Select the appropriate entry as described in next pages.

SETTING RESTORE

The settings are stored in a nonvolatile EEPROM memory. If a power failure appears the settings are restored after power on.

When power is first time applied to PCA 310-330 analyzers, the settings are set to factory default values.

At startup the EEPROM content is analyzed and, if some settings are corrupted, a restore procedure is started. The instrument displays the following screen:

```
EEP1 Errors found!
Press:
CFM -to try restore
SET -set to default
```

Press "CFM" to restore the settings that are out of range. In this case, the corrupted settings are set to default. In this case all settings should be checked in to see the values.

Press "SET" to restore to default of all settings.

In extreme situation when the LCD is blank at startup, is possible to reset the instrument by keeping the keys "UP" + "SET" + "MENU" pressed while the instrument is powered on.

GENERAL SETTINGS

The analyzer settings, common for all measurements, are grouped in "General Menu".

```
■ System Log
  Analog Output
  SMS Settings
  ≈ Serial & GSM Comm.
  Time and Date
  System Functions
  Language Change
```

CHANGING THE PASSWORD

The password is a numeric value with 4 digits.

To change the password, enter in "General Menu" - "System Functions" and edit the "Change Pass" line. Press "CFM" to save.

After new value is confirmed, the displayed password is set to 0000 for protection against unauthorized reading.

SETTING THE LANGUAGE

The PCA 310-330 analyzers has 4 languages stored inside. The user could easily change the language without restarting the analyzer.

To select a new language, enter in "General Menu" - "Language Change" and select the new language. After pressing "CFM" key, the new language is loaded.

ANALYZER SERIAL NUMBER AND SOFTWARE VERSION

The unique serial number can be viewed by selecting the "General Menu" - "System Functions" - "Serial Nr."

Serial number is not editable.

The software version is displayed each time the analyzer is turned on and lasts during the initialization phase.

TIME AND DATE

The PCA 310-330 analyzers have a built in real time clock. When the analyzer is in normal mode, the current time is displayed on the right side of the display in HH:MM format.

To set the time and date, select the "General Menu" - "Time and Date". Set the time and the date as described in the User interface chapter.

```
Set Time: 10:31
■ Set Date: 2004/01/01
```

WORKING MODE

Three working modes could be selected for the analyzer. The selection is available in "General Menu" - "System Functions" - "Manual Commands" - "Work Mode".

The work mode could be set as AUTOMATIC, STANDBY or MANUAL.

```
■ Work Mode : AUTOMATIC
Read On Demand
Alarm Relay : ON
Dose Cl Rel : ON
```

```
Dose pH Rel : ON
Sys. Err. Rel : OFF
Stirrer : OFF
Valve : OFF
Cell Led : OFF
Reagent Pump : OFF
```

AUTOMATIC MODE

In this mode the analyzer performs the measurements continuously accordingly with the settings.

STANDBY MODE

When in standby, the sampling electrovalve is closed, the measurements are stopped and the peristaltic pump is activated for 2 seconds each 100 minutes to preserve the elasticity of the tubes.

The display will show "STANDBY" on the first line when in the measurement mode. The chlorine, pH, ORP, and temperature displayed values will be all time the last measured ones. The SYSTEM ERROR LED is always on (no blinking).

Note: When the analyzer exit from STANDBY, the relays and corresponding LED's are activated only after a new value is read.

MANUAL MODE

For testing, maintenances and setup purposes, the analyzer has the possibility to use direct manual commands.

In this operating mode, by setting the "Alarm Relay", "Dose Cl Rel.", "Dose pH Rel.", "Sys. Err. Rel", "Stirrer", "Valve", "Cell Led" and "Reagent Pump" as "ON" or "OFF" will turn on or off the corresponding device.

The display will show "MANUAL" on the first line when in the measurement panels. The displayed values will be the last measured ones and the measuring sequence is stopped.

When in manual mode the ALARM LED is always on (no blinking).

READ ON DEMAND

When this function is selected, ("General Menu" - "System Functions" - "Manual commands" - "Read On Demand") a new chlorine measuring cycle is immediately started.

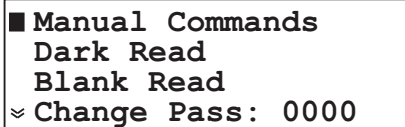
This command is useful when calibrate or whenever an immediate result is needed.

Note: The read on demand function is active only when the analyzer is in automatic mode.

DIRECT READ

For rapid diagnostics of the measuring cell, the converter readings for dark (cell LED off) and blank (cell LED on) could be consulted.

To display the dark reading activate the "General Menu" - "System Functions" - "Dark Read" function. After confirmation the dark value is displayed.



```
■ Manual Commands
  Dark Read
  Blank Read
  ≅ Change Pass: 0000
```

To display the blank reading activate the "General Menu" - "System Functions" - "Blank Read" function. After confirmation the blank value is displayed.

If the cell work correctly, the values must be between -20000 and 20000 with a minimum difference blank – dark of 20000 converter points.

SYSTEM ERROR RELAY

The PCA 320-330 controller has a single system error relay for all measured parameters.

To allow chlorine errors to activate the relay, set "Chlorine Menu" - "Alarm&Err Chlorine" - "Err.Relay" to Active.

For pH errors set the item "pH Menu" - "Alarms&Err pH" - "Err. Relay" to Active.

For ORP errors set the item "ORP Menu" - "Alarms&Err ORP" - "Err. Relay" to Active.

For temperature errors set the item "Temperature Menu" - "Alarms&Err Temp." - "Err. Relay" to Active.

CHLORINE SETTINGS

The settings related to chlorine measurement are grouped in "Chlorine Menu". The following options are available:

■ Reagent Change
Measure Settings
Dosing Control Cl
≈ Alarms&Err Chlorine
Analog Output Cl
Cal. Measuring Cell
Measure Info

REAGENT CHANGING

One set of reagents is enough for at least 16000 samples.

The remaining doses of reagent are displayed on one chlorine measuring panel.

■ Used Doses : 0003
Remaining : 15997
Reset Reag. Counter
Prime Reag. Circuit

When the reagent is changed, several actions must be performed:

Prepare the reagent and install the new bottles as described in initial preparation and installation chapter.

Prime the reagent pump if needed or simply reset the reagent counter.

The used reagent doses and the remaining reagent doses could be viewed on the first two lines when enter in "Chlorine Menu" - "Reagent change".

If "Chlorine Menu" - "Reagent change" - "Reset Reag. Counter" function is selected and confirmed, the used doses become 0 and the remaining doses become 16000. This command does not perform a priming of the reagent pump.

If "Chlorine Menu" - "Reagent change" - "Prime Reag. Circuit" function is selected and confirmed, the dosing

Priming in progress
... 168s

pump is turned on for 180 seconds. The remaining time is displayed on the right-down corner of the display.

The process could be terminated by pressing "ESC" at any moment.

MEASURE SETTINGS

Select "Chlorine Menu" - "Measure Settings" and set the "Period" between 3 and 90 minutes.

Period (sampling rate) is the elapsed time between two consecutive chlorine measurements. The sampling rate is also important when the analyzer is used for chlorine dosing. For larger pools, the period must be longer, and for smaller pools, the period must be shorter.

The sampling rate can be quickly consulted on one chlorine measuring panel.

MEASURE INFO

The analyzer calculates the maximum and minimum concentration value since the first measurement.

The maximum and minimum can be quickly consulted on chlorine measuring panel.

To see information about these values, select "Chlorine Menu" - "Measure Info". The time stamp when maximum and minimum appears are also displayed in this menu.

To reset the maximum or minimum values, select the functions "Chlorine Menu" - "Measure Info" - "Clear Max. Value" or "Chlorine Menu" - "Measure Info" - "Clear Min. Value".

■ Max. Value: 0.25 mg/L Date: 04/01/16 22:45 Min. Value: 0.00 mg/L ≈ Date: 04/01/03 00:16 Clear Max. Value Clear Min. Value
--

The maximum or minimum value will be set to the current read value.

ANALOG OUTPUT

The type of analog output can be set as described in "Analog output" chapter. The analog output span for chlorine could be set in "Chlorine Menu" - "Analog Output Cl".

"Min. Rec" will set the recorder lower limit and "Max. Rec" will set the recorder higher limit. The Max. Rec. value must be greater than Min. Rec. value.

■ Max. Rec: 5.00 mg/L Min. Rec: 0.00 mg/L
--

The output will be proportional with chlorine if the read value is between those limits.

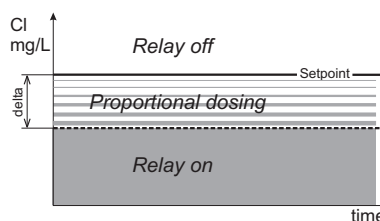
Example: if the 0.0 to 20.0 mA recorder output has been selected, the operator can select 0.0 mA to correspond to a concentration of 3.00 mg/L (Min. Rec. setting) and 20.0 mA to correspond to a concentration of 4.50 mg/L (Max. Rec. setting).

The full scale span of the recorder would then be 1.5 mg/L, yielding a magnified view of the 3.00 to 4.50 mg/L concentration range on the recorder.

The analog output limits can be quickly consulted in one of the chlorine measuring panels.

CHLORINE DOSING

The PCA 310-330 analyzers contain a simple proportional dosing algorithm. Proportional dosing establishes and maintains a controlled and consistent concentration level.



The analyzer has a relay for chlorine dosing and also the 4-20 mA outputs could be configured as dosing outputs.

The equation for determining the time for relay on is:

dosing time = (set value - measured value)*Period/Delta

The analog output will have the value:

analog output [mA] = 4 + 16 * dosing time/Period [mA]

Note: If the measured concentration is lower than setpoint minus delta, the dosing will be continuous until the next measurement is taken (one period).

Example: For setpoint 3.00 mg/L, delta=0.5, sample rate 5 minutes and measured value 2.80 mg/L, the proportional dosing will be active for the initial 2 minutes and will stop for the remaining 3 minutes.

In fact: Time = (3-2.8)*5/0.5 = 2 minutes

Analog output = 4 + 16*2/5 = 10.4 mA

To modify the dosing setpoint, enter the "Chlorine Menu" - "Dosing control Cl" and edit the "Setpoint" line. The value must be between 0.10 and 4.90 mg/L.

■	Setpoint	: 2.50 mg/L
	Delta	: 0.1 mg/L
	Low Point	: 0.01 mg/L
≈	Low Point	: Inactive
	Max. ON	: 060 min

To modify the Delta, edit the "Delta" line. The available values are 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1, 1.5, 2, 3, 4, 5.

Note: The speed of the analyzer could be modified by changing the sampling rate. A new decision regarding the chlorine regulator is taken only after a new measurement.

The Setpoint and Delta could be quickly consulted on one chlorine measuring panel.

LOW READING PROTECTION

To prevent excessive chlorine dosing if the detector is not working properly or the reagent bottle is empty, a "Detector Error" is generated if the measured chlorine value is under the low point value. This error is generated only if the low point feature is set active.

The chlorine dosing is stopped and the SYSTEM ERROR LED starts blinking.

To enable this feature, edit "Chlorine Menu" - "Dosing control Cl" - "Low Point" value and set the "Low Point" status as "Active". The allowed value is 0.00 to 1.00 mg/L.

OVERDOSING PROTECTION

To prevent overdosing a "Detector Error" is generated if the dosing command is on for the Max. ON time and the read value is changing less than 0.05 mg/L.

The chlorine dosing is stopped and the SYSTEM ERROR LED starts blinking. The dosing could be resumed only by restarting the controller.

To modify this protection, edit "Chlorine Menu" - "Dosing control Cl" - "Max. ON" value. The allowed range is between 30 and 720 minutes.

ALARMS

Two alarm setpoints are available for chlorine: Alarm high and Alarm low.

The ALARM LED and alarm relay are activated when the chlorine concentration is higher than Alarm high or lower than Alarm low.

To modify the alarm setpoints, enter the "Chlorine Menu" - "Alarms Chlorine" and edit "Alarm Hi" or "Alarm Lo" value.

```
■ Alarm Hi : 2.34mg/l
  Alarm Hi : Inactive
  Alarm Lo : 00.00mg/l
  Alarm Lo : Inactive
  Err. Relay: Active
```

The alarms could be separately activated or inactivated.

To modify the alarms status, enter the "Chlorine Menu" - "Alarms Chlorine" menu and edit "Alarm Hi" or "Alarm Lo" status. When the status is set to "Inactive", the alarm is ignored.

Note: The Alarm high must be greater than Alarm low value. The analyzer display a warning if the settings are incorrect.

The Alarm high setpoint and Alarm low setpoint could be quickly consulted on one chlorine measuring panel. When an alarm is disabled, the —.— is displayed instead of alarm value.

CALIBRATE THE MEASURING CELL

The PCA 310-330 analyzers have the possibility to calibrate the measuring cell.

When a new calibration is performed, calibration factor is recalculated and all measurements are multiplied with it.

CALIBRATION DATE AND FACTOR

The last calibration date can be found in the "Chlorine menu" - "Cal. Measuring Cell" - "Cal. Date". Calibration date is in the YY/MM/DD format.

■ Cal. Value: 0.14 mg/L
Factor : 0.954
Cal. Date: 04/01/20
≈ Reset Cal. Factor

Calibration Blank

A warning "Cl Calibration Old" is displayed if one month elapsed from the last calibration.

The calibrated date is updated after a new calibration is done.

The calibration factor is displayed in "Chlorine menu" - "Cal. Measuring Cell" - "Factor".

The default calibration factor is 1.000. Each measurement result is multiplied with calibration factor.

The calibration factor could be reset to 1.000 by activating the "Chlorine menu" - "Cal. Measuring Cell" - "Reset Cal. Factor" function.

CALIBRATION PROCEDURE

To calibrate the measuring cell, follow the steps:

- Withdraw a sample of the measured liquid directly from the drain port of the measuring cell (#11) by opening its valve (#10) - see figure on page 10.

Note: Withdraw the sample just before the electrovalve stops the liquid flow to the measuring cell.

- With a calibrated meter take a measure of the sample. This is the calibration value.
- Wait for the PCA to display the new reading.
- Go in "Chlorine menu" - "Cal. Measuring Cell" and edit "Cal. Value" field.
- Enter the calibration value and save with "CFM".
- The calibration coefficient and the calibration date will be updated.
- Press repeatedly "ESC" to exit from menu mode. The displayed chlorine concentration will be equal with the calibration value.

Note: It is not recommended to calibrate the analyzer at values below 2 mg/L in order to maintain enough accuracy in the whole range. Calibration below 2 mg/L does not guarantee declared accuracy outside an interval of $\pm 50\%$ from the calibration value.

pH SETTINGS (PCA 320, PCA 330)

Settings related to pH measurement are grouped in "pH Menu". The following options are available:

```
Dosing Control pH
Alarm&Err pH
Analog Output pH
≈ Cal. pH Probe
```

Measure Info

MEASURE INFO

The analyzer calculates the maximum and minimum pH value since the first measurement.

The maximum and minimum can be quickly consulted on one pH measuring panel.

For more detailed information select "pH Menu" - "Measure Info" The "Max. Value" and "Min. Value". The time stamp when maximum and minimum occurs are also displayed in this menu.

To reset the maximum or minimum values, select the functions "pH Menu" - "Measure Info" - "Clear Max. Value" or "pH Menu" - "Measure Info" - "Clear Min. Value".

```
■ Max. Value: 14.00 pH
Date: 03/01/01 14:39
Min. Value: 00.00 pH
≈ Date: 04/01/01 00:03
```

Clear Max. Value
Clear Min. Value

The maximum or minimum value is set to the current read value.

ANALOG OUTPUT

The type of analog output could be set as described in “Analog output” chapter. The analog output span for pH could be set in “pH Menu” - “Analog Output pH”.

“Min. Rec” will set the recorder low limit and “Max. Rec” will set the recorder high limit. The Max. Rec. value must be greater than Min. Rec. value.

The output will be proportional with pH value if the read value is between those limits.

The analog output limits could be quickly consulted in one of the pH measuring panel.

pH DOSING

The PCA 320 and PCA 330 can use ON/OFF or proportional dosing algorithm to stabilize the pH .

The analyzer has a relay for acid or alkali dosing and also the 4-20 mA output could be configured as a dosing output.

To select the type of pH dosing edit the “pH Menu” - “Dosing Control pH” - “pH Control” line. The available options are Proportional and ON/OFF.

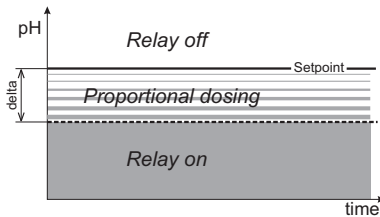
```

■ pH Control:On/Off
  Dosing Type:Acid
  Period      :003 sec
  ≈ Setpoint  :07.00 pH
  Delta       :0.1
  Hysteresis  :1.00 pH
  Max. ON     :060 min
    
```

The acid or alkali dosing is set in the “pH Menu” - “Dosing Control pH” - “Dosing Type”. When “Acid” is selected, the analyzer will dose when the pH value is higher than the setpoint and when “Alk” is selected, the analyzer will dose when the pH value is lower than the setpoint.

PROPORTIONAL DOSING

The proportional dosing algorithm turns on the dosing relay proportionally with the difference between the setpoint and measured value.



The equation for determining the time for relay on is:

$$\text{dosing time} = (\text{set value} - \text{measured value}) * \text{Period} / \text{Delta}$$

The analog output will have the value:

$$\text{analog output [mA]} = 4 + 16 * \text{dosing time/Period [mA]}$$

Note: If the measured pH is lower (or higher for acid dosing) than setpoint minus (plus) delta, the dosing will be continuous until the pH period elapsed.

To modify the dosing setpoint, enter the "pH Menu" - "Dosing Control pH" edit the "Setpoint" line. The value must be between 2.00 and 12.00 pH.

To modify the Delta, edit the "Delta" line. The available values are 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1, 1.5, 2.

To modify the dosing time edit the "Period" line. The allowed values are between 3 and 120 seconds.

Note: The period is related only to the dosing process. The pH measurement take place with a higher rate.

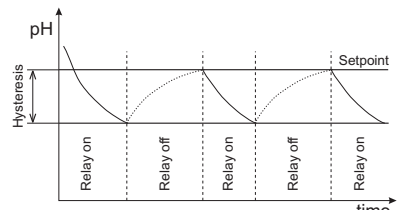
Note: The speed of the analyzer could be modified by changing the regulator period. A new decision regarding the pH dosing is taken only after one period elapsed.

The Setpoint and Delta could be quickly consulted on one pH measuring panel.

ON/OFF DOSING

If this mode is selected the Period and Delta has no effect. The algorithm will use only Setpoint and Hysteresis.

For alkaline dosing, the relay will stay on until the pH increases to the setpoint plus hysteresis value, then the relay stays off until the pH decreases to a value equal to setpoint.



For acid dosing, the relay will stay on until the pH decreases to the setpoint minus hysteresis value, then the relay stays off until the pH increases to a value equal to setpoint.

To set the hysteresis edit the "pH Menu" - "Dosing Control pH" - "Hysteresis" line. The hysteresis value must be between 0.05 and 2.00 pH.

OVERDOSING PROTECTION

To prevent overdosing a "Detector Error" is generated if the dosing command is on for the Max. ON time and the read value is changing less than 0.1 pH.

The acid/alkali dosing is stopped and the SYSTEM ERROR LED starts blinking. The dosing could be resumed only by restarting the controller.

To modify this protection, edit "pH Menu" - "Dosing control pH" - "Max. ON" value. The allowed range is between 30 and 720 minutes.

ALARMS

Two alarm setpoints are available for pH: Alarm high and Alarm low.

The ALARM LED and relay are activated when the pH value is higher than Alarm high or lower than Alarm low.

To modify the alarms setpoints, enter the "Alarms pH" menu and edit "Alarm Hi" value or "Alarm Lo" value.

The alarms can be separately activated or inactivated.

To modify the alarms status, enter the "pH Menu" - "Alarms pH" menu and edit "Alarm Hi" status or "Alarm Lo" status. When the status is set to "Inactive", the alarm is ignored.

Note: The Alarm high value must be greater than Alarm low value. The analyzer display a warning if the settings are incorrect.

The Alarm high Setpoint and Alarm low setpoint could be quickly consulted on one pH measuring panel. When an alarm is disabled, the —.— is displayed instead of alarm value.

pH CALIBRATION (PCA 320, PCA 330)

It is recommended to perform pH calibration when the probe is replaced and after any cleaning action.

The analyzer can perform 2 points calibration, 1 point calibration or process pH calibration.

To perform any pH calibration enter in "pH Menu" - "Cal. pH Probe".

<p>Set Default pH Cal. Process pH Cal. ■ Buffer pH Cal. Cal. Date :01/01/01</p>

In this menu the last calibration date is displayed on the "Cal. Date" line. If the probe calibration is older than 1 month, a warning is displayed.

Initial Preparation

Pour small quantities of pH 7.01 (HI 7007) and pH 4.01 (HI 7004) or 10.01 (HI 7010) solutions into individual beakers. If possible, use plastic beakers to minimize any EMC interference. Also NIST buffers of 6.86 or 9.18 could be used.

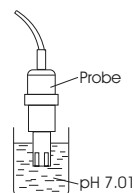
For accurate calibration use two different beakers for each buffer solution, the first one for rinsing the probe and the second one for calibration. By doing this, contamination between buffers is minimized.

Unscrew the probe from its position. Take care to stop the sample flow before removing the probe. If necessary, disconnect the probe from analyzer to prevent the damage of the probe cable.

ONE POINT CALIBRATION

Immerse the pH probe into the buffer solution (e.g. pH 7.01) until the metal ring is immersed, then stir gently.

Select the "pH Menu" - "Cal. pH Probe" - "Buffer pH Cal."



- The analyzer will prompt to select the first buffer. Select the buffer (e.g. pH 7.01) using "UP" or "DOWN" arrow keys and confirm.
- The analyzer checks for readings stability. During this period, the "Wait for stabilize" message is displayed.

Buffer 1 pH:	7.01
Measured pH:	7.02
Temp. [°C]:	25.1
Wait for stabilize	

Note: If the read value, calculated with the default offset and slope, is different from the expected value with more than 1.15 pH (i.e. offset > 68mV), the "Wrong calib. values" message is displayed.

The message "Wrong calib. values" appears also if the pH probe is defective or not connected. The problem could be identified if the buffer set value is compared with the actual read value (first and second line of the display).

If the probe is inserted in the appropriate buffer, the measuring cycle is restarted automatically and message "Wait for stabilize" is displayed again.

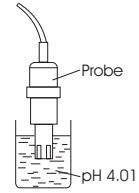
- If the temperature reading is wrong, the value is set to 25 °C and a blinking "*" is displayed near it, indicating that is not the real temperature value. The calibration procedure is not interrupted.
- When the reading become stable, the analyzer displays "Stable... press CFM".

- The analyzer prompts for the second buffer selection, and displays the message “Select buffer pH... or press SET for one point cal.”.

Pressing “SET” key will end the one point calibration procedure.

TWO-POINTS CALIBRATION

- To perform a two-points pH calibration follow the steps described at one-point calibration until the analyzer displays the message: “Select buffer pH... or press SET for one point cal.”.
- Immerse the pH electrode into the second buffer solution (e.g. pH 4.01) until the metal ring is immersed, then stir gently.
- Press “UP” or “DOWN” arrow keys to select the second buffer from the list to continue the calibration and confirm with “CFM”.



Note: The difference between the first and second buffer must be more than 1 pH in order to assure the calibration accuracy. Calibration using 7.01 and 6.86 pH or 10.01 and 9.18 pH is not allowed.

- The analyzer checks for readings stability. During this period, the “Wait for stabilize” message is displayed.
- When the reading becomes stable, the instrument checks if the calculated slope is between 47.3 and 68 mV/pH. If the value is not within this range, the message “Wrong calib. values” is displayed. In this case it is necessary to perform a cleaning procedure (see “Electrode conditioning and maintenance” section) or to replace the probe.
- If the value is accepted, the analyzer displays “Stable... press CFM”.

Pressing CFM, the two point calibration is completed.

PROCESS pH CALIBRATION

The PCA 320 and PCA 330 has the possibility to calibrate the pH probe without using buffers and without dismount the probe. For doing this calibration, a reference pH-meter must be used. To complete the process calibration, follow the steps:

- Pour a quantity of sample in a beaker. Use the sample of the measured liquid directly from the drain port of the measuring cell (#11) by opening it’s valve (#10) to do this as described in the Calibration Procedure chapter.
- Place the pH probe of the reference meter in the beaker and stir gently.

- Wait for readings to stabilize.
- Enter in "pH Menu" - "Cal. pH Probe" - "Process pH Cal." and enter in the "Cal. Value" field the reading from the reference pH meter.
- Press "CFM" key when the analyzer prompt for "Over-write pH cal. ?".
- The analyzer checks for readings stability (see One-point calibration) and when the value is stable the message "Stable... press CFM" is displayed.
- Pressing "CFM" key will complete the process pH calibration.

■ Cal. Value: 06.84 pH

Note: The calibration could be terminated at any time by pressing "ESC". In this case the new calibration is not saved and the old one remains effective.

SET DEFAULT CALIBRATION

When a new probe is connected or for any reason the current calibration is wrong and new calibration can't be performed, the default calibration values could be set. In this case the slope is set to 59.16 mV/pH and the offset is set to 0 mV.

To accomplish that, select "pH Menu" - "Cal. pH Probe" - "Set Default pH Cal."

The analyzer will ask "Reset the pH cal. to default ?" and if "CFM" key is pressed will replace the existing calibration coefficients with the default values.

TEMPERATURE SETTINGS (PCA 320, PCA 330)

Settings related to temperature measurement are grouped in "Temperature Menu". The following options are available:

```
■ Units      : Fahrenheit
Alarms&Err Temp.
Analog Output Temp.
Measure Info
```

UNITS

The analyzer could display the Temperature using Celsius or Fahrenheit temperature units.

To select the temperature units, edit the "Temperature Menu" - "Units" line. Select Celsius or Fahrenheit and confirm.

Note: The temperature values sent via SMS are always the Celsius values.

MEASURE INFO

The analyzer calculates the maximum and minimum temperature value since the first measurement.

The maximum and minimum can be quickly consulted on one temperature measuring panel.

For more detailed information select "Temperature Menu" - "Measure Info". The "Max. Value" and "Min. Value" are displayed and also time stamp when maximum and minimum occurs are displayed in this menu.

```
Max. Value: 167.0 °F
Date: 04/01/18 00:00
Min. Value: 41.0 °F
≈ Date: 04/05/22 18:57
```

```
Clear Max. Value
Clear Min. Value
```

To reset the maximum or minimum values, select the functions "Temperature Menu" - "Measure Info" - "Clear Max. value" or "Temperature Menu" - "Measure Info" - "Clear Min. value"

The maximum or minimum value is set to the current read value.

ANALOG OUTPUT

The type of analog output could be set as described in "Analog output" chapter. The analog output span for temperature could be set in the "Temperature Menu" - "Analog Output Temp."

“Min. Rec” will set the recorder lower limit and “Max. Rec” will set the recorder higher limit. The Max. Rec. value must be greater than Min. Rec. value.

```
■ Max. Rec.:167.0 °F
  Min. Rec.:041.0 °F
```

The output will be proportional with temperature value if the read value is between those limits.

The analog output limits could be quickly consulted in one of the Temperature measuring panel.

ALARMS

Two alarm setpoints are available for temperature: Alarm high and Alarm low.

The ALARM LED and relay are activated when the temperature value is higher than Alarm high or lower than Alarm low.

To modify the alarms setpoints, enter the “Temperature Menu” - “Alarms Temperature” and edit “Alarm Hi” or “Alarm Lo” value.

```
■ Alarm Hi :086.0 °F
  Alarm Hi :Active
  Alarm Lo :068.0 °F
  ≅ Alarm Lo :Active
  Err.Relay:Active
```

The alarms could be separately activated or inactivated.

To modify the alarms status, enter the “Temperature Menu” - “Alarms Temperature” menu and edit “Alarm Hi” or “Alarm Lo” status.

Note: The Alarm high value must be greater than Alarm low value. The analyzer display a warning if the settings are incorrect.

The Alarm high setpoint and Alarm low setpoint could be quickly consulted on one temperature measuring panel. When an alarm is disabled, the —.— is displayed instead of alarm value.

ORP SETTINGS (PCA 330)

Settings related to ORP measurement are grouped in "ORP Menu". The following options are available:

```
■ Alarms ORP
  Analog Output ORP
  Measure Info
```

MEASURE INFO

The analyzer calculates the maximum and minimum ORP value since the first measurement.

The maximum and minimum can be quickly consulted on one ORP measuring panel.

For more detailed information select "ORP Menu" - "Measure Info" The "Max.

Value" and "Min. Value" are displayed and also time stamps when maximum and minimum occurs are displayed in this menu.

```
■ Max.Value:2000 mV
  Date:04/01/14 14:51
  Min.Value: 0 mV
  ≅ Date:03/01/01 18:29
```

```
Clear max. value
Clear min. value
```

To reset the maximum or minimum values, select the functions "ORP Menu" - "Measure Info" - "Clear Max. Value" or "ORP Menu" - "Measure Info" - "Clear Min. Value"

The maximum or minimum value is set to the current read value.

ANALOG OUTPUT

The type of analog output could be set as described in "Analog output" chapter. The analog output span for ORP could be set in the "ORP Menu" - "Analog output ORP".

"Min. Rec" will set the recorder lower limit and "Max. Rec" will set the recorder higher limit. The Max. Rec. value must be greater than Min. Rec. value.

The output will be proportional with ORP value if the reading is between those limits.

The analog output limits could be quickly consulted in one of the ORP measuring panel.

ALARMS

Two alarm setpoints are available for ORP: Alarm high and Alarm low.

The ALARM LED and relay are activated when the ORP value is higher than Alarm high or lower than Alarm low.

To modify the alarms setpoints, enter the "ORP Menu"- "Alarms ORP" menu and edit Alarm Hi value or Alarm Lo value.

```
■ Alarm Hi :1000 mV
  Alarm Hi :Active
  Alarm Lo :0200 mV
  ≍ Alarm Lo :Active
  Err.Relay:Active
```

The alarms could be separately activated or inactivated.

To modify the alarms status, enter "ORP Menu" - "Alarms ORP" menu and edit "Alarm Hi" status or "Alarm Lo" status. When the status is set to "Inactive", the alarm is ignored.

Note: The Alarm high value must be greater than Alarm low value. The analyzer display a warning if the settings are incorrect.

The Alarm high setpoint and Alarm low setpoint could be quickly consulted on one ORP measuring panel. When an alarm is disabled, the — is displayed instead of alarm value.

ANALOG OUTPUTS

The PCA 310-330 analyzers has two current analog outputs. Each one can be configured as 0-20 mA, 4-20 mA or dosing type. Also they can be assigned to one of the measurement parameters: Cl, pH, Orp, Temp.

SELECT THE ANALOG OUTPUT TYPE

To select the analog output type enter in "General Menu" - "Analog Output1" or "Analog Output2".

The analog output could be assigned to one of the four measured parameters.

To define this assignment, edit the "Out Param." field. "Chlorine", "pH", "ORP" and "Temper." options are available.

■	Out Param.:	Chlorine
	Type	:Dosing
	Cal.Analog Out Max.	
≈	Cal.Analog Out Min.	
	Output Middle Range	

To select the analog output type edit the "Type" line. The available options are: 0-20 mA , 4-20 mA current outputs.

DOSING THROUGH 4-20 mA OUTPUT

Select "General Menu" - "Analog Output1" or "Analog Output2" - "Type" as Dosing to activate this feature. The output become 4-20 mA current type, proportional with pH or chlorine regulator output.

The 4 mA correspond with pump stop and 20 mA correspond to pump operating at full speed.

This mode should be selected when a proportional pump is attached to the analyzer.

Note: In this mode calibration is not allowed. If calibration menu is entered, the following message appears: "Analog output value cannot be changed when analog output type is dosing".

CALIBRATE THE ANALOG OUTPUTS

The analog output is factory calibrated. Recalibration is not needed when the output type is changed.

If, for any reason, a new calibration has to be performed, each output type could be easily calibrated.

To calibrate the current type analog outputs, follow the steps:

- Connect an ammeter to the pin 1 and 2 / pin 3 and 2 of the output connector.

- Enter in menu mode and select "General Menu" - "Analog Output" sub-menu.

- Select the analog output type to one current type 0-20mA or 4-20 mA.

- Select "Cal. Analog Out Max" and press "Up" and "Down" keys until the read value is equal with 20 mA.

- Save the new coefficients by pressing "CFM" key.

- Select "Cal. Analog Out Min" and press "Up" and "Down" keys until the read value is equal with 0mA or 4 mA.

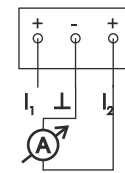
The analog output source current and when calibrating 0mA, a positive value must be set for current (0.1 mA for example) and then the current must be slowly decreased to 0mA.

- Save the new coefficients by pressing "CFM" key.

Note: The analog output calibration is not allowed if the analog output type is set to "Dosing".

Pressing for longer time the arrow keys will increase the variation speed of the analog output.

RECORDERS



OUTPUT MIDDLE RANGE

To easily adjust a recorder offset, the analog output could be set to middle range. In this case the output is set to 12 mA or 10 mA for 4-20 mA or 0-20 mA output.

To activate this option select "General Menu" - "Analog Output1" or "Analog Output2" - "Output Middle Range" function and press "CFM" key. The analyzer will display "Recorder output is set to middle value". Press "ESC" to exit from this function.

SYSTEM LOG

The PCA 310-330 analyzers have a permanent logging function. Up to 3500 records could be stored. At a sampling interval of 3 minutes the log covers more than 7 days.

If the logging memory is full, the oldest record is lost when a new record is stored.

The record contains the date and time, the chlorine, pH, ORP and temperature value and the status of errors and alarms.

SET LOG

The data are stored after the chlorine measuring cycle is completed. The log could be performed only after several chlorine cycle. The number of cycles between two logs are set in "General Menu" - "System Log" - "Log CI cycles".

The allowed range is between 1 and 10 chlorine measuring cycles.

Example: If the sampling period for chlorine is set to 3 minutes and the log CI cycles is set to 5, a new record is stored at each 15 minutes (3 x 5).

CLEAR SYSTEM LOG

To erase the system log activate the function "General Menu" - "System Log" - "Clear System Log".

VIEW LOG

To consult the log, select "General Menu" - "System Log".

The searching criteria for viewing the log could be set by editing the "Search" field. The following options are available:

- "All" all records will be displayed.
- "Alarms" only the records that contains alarms are displayed.
- "Errors" only the records that contain errors are displayed.
- "Err&Alr" both errors and alarms are displayed.

The records from one day are displayed. To set the searching date, edit the "Day", "Month" and "Year" fields.

The default searching date is the current date.

To display the log contents select the "View Records" function. The analyzer will find all records from specified date that match the searching criteria.

```
■ View Records
  Search :All
  Day :28 Month :10
  ≈ Year :2004
  Log Cl cycles:01
  Clear System Log
```

When the searching is in work, the message "Searching Records" is displayed.

The search result could be:

- "No records found" meaning that no records were found with specified criteria.
- "No records stored" meaning that there is no record in log.
- Display the log.

The records will have the following structure:

14:38	1.00	5.86		
■ 14:33	1.05	5.63	A	
14:27	1.20	4.99	E	
14:22	1.17	5.11	AE	

- 1 - Time of the record
- 2 - Chlorine value
- 3 - pH value (only for PCA 320 and PCA 330)
- 4 - Alarm field (empty if no alarms)
- 5 - Errors field (empty if no errors)

The double arrow sign is present on the bottom line if the log continues outside the display.

Pressing "UP" or "DOWN" arrow key, scroll the log with one record up or down. Pressing longer time one of those keys will scroll with one page at a time (4 records).

Pressing "CFM" when a record is highlighted, the record content will be displayed in details.

The display contains:

2004/01/19	06:13
0.33 mg/L	5.85 pH
205 mV	5.0 °C
Temp. Out of Range>	

- 1 - The log day
- 2 - The log hour and minute
- 3 - The chlorine concentration and units (mg/l)
- 4 - The pH value and units (pH)
- 5 - The ORP value and units (mV)

6 – The Temperature value and units (°C or °F)

7 – The Errors and Alarms

If many errors or alarms are present, the “<” and “>” signs are displayed on the left or right side of the display. Selecting another message could be done by pressing “LEFT” or “RIGHT” arrow keys.

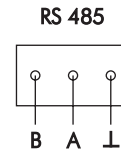
Pressing three time “ESC” will return in the main menu.

SERIAL COMMUNICATION

The PCA 310-330 have one RS485 serial communication port. The serial communication is galvanically isolated from other analyzer parts.

The connector configuration for RS485 is shown in the figure aside.

Two mode of working are available for the serial communication: STANDARD and GSM.



STANDARD MODE

The analyzer could be connected to PC using RS485 to RS232 converter. With the HI 92500 software the analyzer data could be downloaded to the PC and also the analyzer parameters could be set from PC.

To set communication as PC type, select “General Menu” - “Serial & GSM Comm.” and set the “Type” to STANDARD.

To establish connection with the PC the baud rate, the RS485 address and the password must be matched between the application and PCA 310-330 analyzer.

The baud rate is set in the “General Menu” - “Serial & GSM Comm.” - “Baud Rate” menu. Available values are 1200, 2400, 4800, 9600 bps.

Analyzer address is set in the “Address” line and could be between 0 and 32.

Note: If many analyzers are connected in a RS485 network, each analyzer must have a unique address.

Note: While one parameter is edited by the user the PC software is unable to modify it. Any other parameter could be modified by the PC software.

GSM

GSM MODE

If the "Type" is set to GSM, the analyzer will work with HI 504900 GSM module. This connection enables the analyzer to send SMSs to one (or two) cellular phone(s) and through this feature the device can be monitored. Moreover if an error occurs on the PCA 3x0, a SMS is sent to the cellular phone(s) signaling immediately the user about the problem.

When the SMS feature is active, three type of SMS messages are sent to the selected cellular phone(s).

Alarm SMS which contains the Error, Alarm and Warning messages that are active on the analyzer, separated by ';'. The events that generate the alarm SMS are user selectable from "General Menu" - "SMS Settings".

Info SMS which contains the Chlorine, pH, ORP and Temperature readings. Analyzer's error status and settings are also included as selected by the user from "General Menu" - "SMS Settings".

Warning SMS which contains information about the SIM card credit. The settings related to GSM are grouped in "General Menu" - "Serial & GSM Comm.".

SETTING THE GSM FEATURE

To use the SMS feature, a SIM card able to make voice calls must be used.

It is necessary to enter the PIN code of the SIM card inserted in the GSM module. To do this, set the "General Menu" - "Serial & GSM Comm" - "PIN No.".

Note: The PIN number is not visible after editing for protection reasons. The field will always show 0000.

```
■ Type : STANDARD
  Baud Rate: 9600
  Address: 01
  ≡ Send SMS : Inactive
  PIN No. : 0000
  Phone 1 : Inactive
  No1: -----
  Phone 2 : Inactive
  No2: -----
  Charge Inf: Inactive
  Exp. Date: 2010/01/01
  Remaining: 0000
  RepeatNo: 2
  Delay : 05 min
  Remote : Active
```

One or two phone numbers associated with the service - to which the messages will be sent – must be set. The number has to be entered in the fields named “No1” and “No2”. The space reserved for a phone number is 15 digits.

The phone numbers have to be inserted using the international format excluding the starting + character and without any space inside the number.

Example: if the cellular number is +39123456789 (+39 is the country code), the number to be stored in the PCA 310-330 is 39123456789.

The numbers could be activated or inactivated. The SMS is sent only to active numbers. If both numbers are inactive, no SMS is sent even if both numbers are correctly entered. To activate the phone numbers, set “Active” in the “Phone1” and “Phone2” fields.

The SMS sending has to be activated by selecting “Active” in the “Send SMS” field. If “Send SMS” is set to “Inactive” then no SMS will be sent even if the phone numbers are active.

The number of repeated alarm SMSs could be set in the field “RepeatNo”. The range is between 0 and 5. If RepeatNo is set to 0 than only one SMS is sent.

The delay between two repeated SMSs is set in the “Delay” item. The range is between 5 and 60 minutes. If the “RepeatNo” is 0, this parameter has no effect.

GSM CONNECTION

After the correct settings are done, the SMS feature can be enabled by set “General Menu” - “Serial & GSM Comm.” - “Type” to GSM.

Note: Power the GSM module before first attempt to connect the analyzer to GSM network.

If the PIN number is wrong, then it is not possible to make the cellular module connection. The “GSM Wrong PIN Code” message is displayed.

Note: If the first attempt to initialize GSM engine fails because of a wrong PIN, then no other attempt will be allowed (prevention of sending three wrong PINs).

To make another attempt, a new PIN has to be entered and the analyzer has to be restarted. The analyzer attempt to initialize the GSM module at startup.

If a wrong PIN was entered three times, the user has to extract the SIM card and manually enter the PUK number using his own cellular phone to unlock the SIM card.

Note: There is no need to modify the default baud rate (1200) of the serial link when enable the GSM feature. It will be switched to 9600 automatically.

SETTING SMS FEATURE

In order to avoid the frequent sending of the SMSs or rapid consuming of the GSM credit when one measuring channel not work correctly, the SMS sending could be customized.

The options are available in the "General Menu" - "SMS Settings".

To select the events that generate alarm SMS, set the "Cl Events", "pH Events", "ORP Events" or "Temp. Event" as Active or Inactive. When one of them is active the corresponding alarms and errors will generate an alarm SMS. When alarm SMS is sent, all current alarms and errors are sent, even if are not the ones that initiate the SMS.

```
■  --Alarms SMS--  
Cl Events :Inactive  
pH Events :Inactive  
≈ ORP Events:Inactive  
Temp.Event:Inactive  
  --Info SMS --  
Set      :Inactive  
Errors   :Inactive
```

To customize the info SMS, two options are available:

- "Errors" - when active will include in the info SMS all alarms and errors currently active on the analyzer.
- "Set" - when active will include in the info SMS alarm and dosing setpoints.

Alarm SMS

When errors or alarms appears, alarm SMS is sent to the active phone numbers. Alarm SMS is sent without special request. The events that generate alarm SMS could be selected as described in Setting SMS Feature paragraph. Alarm SMS is sent once per chlorine cycle.

At each sending of alarm SMS, after 30 seconds, a phone call is made by the analyzer to the programmed number(s). This is done because the SMS can be received with a considerable delay due to network overload, while the phone call takes place immediately and has a long ring which is more likely to be heard.

The phone call advises the user that something happened on the PCA analyzer and SMS is going to be received. It is not necessary to answer the phone call and it is suggested to close it without any answer.

A confirmation of the alarm message reception is waited by the analyzer. The confirmation can be done by simply calling the PCA analyzer phone number (number of the GSM module). The analyzer will hang up without answering and will send Info SMS (this confirmation is managed as an information request; see further on for details). Info SMS don't need confirmation.

If "RepeatNo" is more than 0, the instrument sends repeated (1 to 5 times) alarm messages if confirmation is not received. This feature prevents losing of the message due for example to overload of the telephone network. The "0" is associated with no repetition: only one message will be sent and no confirmation waited.

The delay (5 to 60 minutes) between two subsequent repeated messages could be set on the "Delay" line.

Note: A remote connection will cancel the confirmation waiting. Also, the analyzer events occurred during a remote connection will not generate any alarm SMS, even after the remote connection ends.

Example of alarm SMS: "Temp Err;L Ph;H Temp;Pwr rst;" (see Errors, Alarms and Warnings chapter for details).

Info SMS

When the instrument receives a phone call (coming from one of the programmed cellular numbers), it interprets the calling as an information request and reacts hanging up and sending an info SMS.

The maximum number of characters for an SMS is 160, so, if the message text is longer, many messages will be sent. In this case a message header is added with informations about the message type and the current / total number of SMSs (for example INF1/2:).

It is possible to ask the PCA 310-330 for Info SMS from a cellular phone different from the one(s) set in the analyzer. This is accomplished by sending to the instrument the SMS: "PxxxAWE", where xxx is the analyzer's password (the one used for settings).

The instrument will recognize the command and reply sending the Info SMS.

Note: If the analyzer is waiting for confirmation after sending an alarm SMS, the received SMS will be just stored on the SIM until the confirmation is coming or all the repeated alarm SMSs are sent.

The info SMS will always contain the Chlorine, pH, ORP and Temperature readings and the Settings and Errors if enabled. Also, the remaining SMSs number will be added if "Chk. Charge" is active.

Example of info SMS:

"Temp Err;L Ph;H Temp; READINGS:
ReagRem=8413;Cl=2.05;
pH=7.02;Orp=700;Temp=25.2;"

Example of info SMS (splitted):

"INF1/2: Temp Err;L Cl;L Ph;H Temp;Cl Cal;SET: Cl(SP=2.00;
AIH=2.70;AIL=150);pH(SP=7.00;AIH=8.00;AIL=6.00);ORP
(AIH=800;AIL=200);Temp(AIH=30.0;AIL=20.0);"
"INF2/2: READINGS: ReagRem=8413;Cl=1.35;pH=5.02;
ORP=280; Temp=75.0; Remaining SMS=321;"

Warning SMS

The information about SIM charge and expiration date are not saved in the SIM card but are managed by the network operator; the analyzer can not get directly the information.

To prevent an unnoticed discharge of the SIM card, the user has to configure manually (accordingly with the credit stored on the SIM card), the maximum number of SMSs that can be sent. The item is "Remaining" (SMS) in the "General Menu" - "Serial & GSM com." menu.

If the "General Menu" - "Serial & GSM com." - "Charge Inf" is set "Active", every time an SMS is submitted, the "Remaining" item is updated and will always indicate the remaining number of messages that the analyzer can send.

With "Chk.Charge" set "Active", the number of remaining SMS is checked and when is going to reach zero, a warning SMS containing the text "Maximum number of SMS reached. Please check the cellular SIM card charge level" is sent.

Charge Inf:Active Exp.Date:2010/01/01 Remaining:0000 RepeatNo:2
--

This particular situation is managed as an error occurrence and a confirmation of the SMS reception is waited. After that, a "GSM no credit" warning appears on the display signaling that no other SMS can be sent.

In this case the user is supposed to extract the SIM card from the cellular module as soon as possible and check the remaining credit (using its own cellular phone and calling the network operator).

Every time a recharge of the cellular module SIM card is performed, the corresponding expiration date has to be manually updated – item "Exp.Date" in the "General Menu" - "Serial & GSM com."

If the "Chk.Charge" item is set "Active", a check is performed daily between the current date and the expiration date. Two weeks before the expiration date, the warning SMS "The cellular SIM card will expire on: DD-MM-YYYY. Please recharge or substitute it" is sent to the programmed phone number(s). The same message will be sent again also one week before, and the day before the expiration date.

Note: This particular warning message does not need confirmation. In this case the user has to recharge or substitute the SIM card. The sending of the repeated warning messages will be reset when the expiration date is changed. If the expiration date is reached without any updating of the expired date, then the message "GSM Card expired" appears on the display and no more SMSs will be sent by the analyzer until the error is deactivated.

To deactivate this error it is necessary to update the SIM expiration date.

If the user has unlimited credit on the SIM card, the "Chk.Charge" must be set "Inactive". In this case the value of remaining messages will not be decremented and no check will be performed on the SIM card expiration date. Moreover, in the info SMS will not be present the remaining-messages information.

Note: If a problem related to GSM feature occurs during the normal functioning of the analyzer, the "GSM Not Respond", "GSM Init failed" or "GSM Network Error" will be displayed and the analyzer will try repeatedly to initialize the cellular engine. The error will be deactivated only after a successful initialization.

MODEM CONNECTION

Modem connection can be established between PCA 310-330 and a remote computer. The connection allows the user to interrogate the analyzer, from remote position, about its status and measurements and to change analyzer parameters. Also the log could be downloaded through remote connection.

A SIM card able to receive data calls must be used in HI 504900 GSM module.

To enable the answer to data request, the item "Remote" from "General Menu" - "Serial & GSM com." must be set "Active".

⋈	Remaining:0000
	RepeatNo:2
	Delay :05 min
■	Remote :Active

To make the data transfer between PCA 310-330 and remote PC, HI 92500 software must be installed on the PC, and modem must be connected between PC and phone line.

The baud rate, the password and the RS485 address must be the same on PCA and on PC application.

Note: If the PC stops the communication for 4 minutes, the GSM call is interrupted by the analyzer to free the line.

MAINTENANCE

The PCA 310, PCA 320 and PCA 330 analyzers incorporate several technologies to minimize the maintenance.

Also, if the GSM module is connected, the warnings, alarms and errors are sent to the operator, making the maintenance even simpler.

The analyzer status could be sent via SMS messages after a call from operator.

Calibration of the chlorine measuring circuits is not normally required. The DPD technique for measuring chlorine concentration is well established and consistent. Also, by measuring the sample blank absorbency to establish the zero reference with each measurement, the accuracy of the analyzer is assured.

If, for any reason, the Chlorine measurements are inaccurate proceed with the calibration procedure.

A visual check of the hydraulic compartment can detect leaks, pump tubing fatigue or breakage. These periodic checks help ensure reliable analyzer performance.

PCA 310-330 analyzers warning the user when the reagents level reaches approximately 20% with the "Low reagent" message.

Working at maximum capacity (3 minutes sampling rate), the analyzers can operate for 1.5 more days.

The alarm system is based on an internal counter that has to be reset every time the reagents are replaced.

The counter keeps track of the number of measurements taken and informs the user when it reaches the 16000th sample with the message "No reagent".

The pH, ORP and Temperature measurements are done with standard techniques that assure reliability and accuracy. However if a problem occurs on those measuring channels, an SMS is sent to the user.

Furthermore, if the relation between chlorine, pH and ORP is known for a certain application, one of those readings could be used to check the others, for example check the chlorine and pH by reading the ORP values.

ELECTRODE CONDITIONING AND MAINTENANCE

Preparation

Remove the probe protective cap.

DO NOT BE ALARMED IF ANY SALT DEPOSITS ARE PRESENT.

This is normal with probes and they will disappear when rinsed with water.

During transport tiny bubbles of air may have formed inside the glass bulb. The probe cannot function properly under these conditions. These bubbles can be removed by “shaking down” the probe as you would do with a glass thermometer.

If the bulb and/or junction are dry, soak the probe in HI 70300 Storage Solution for at least one hour.

If the probe does not respond to pH changes, electronics may be down and the electrode should be replaced.

Test measurement

Rinse the probe tip with distilled water.

Immerse the probe in the Hanna pH buffer 7.01 (HI 7007) until the solution is in contact with the metal ring and stir gently for 30 seconds. The reading must be near 7.01 pH

Repeat the operation for pH 4.01 solution (HI 7004). The difference from the previous reading must be near 3 pH.

Storage

To minimize clogging and assure a quick response time, the glass bulb and the junction should be kept moist and not allowed to dry out. This can be achieved by installing the input lines in such way that the probe holder is kept filled with sample.

When not in use, for longer time, dismount the probe and keep in the protective cap with a few drops of HI 70300 Storage Solution or, in its absence, HI 7082 (KCl 3.5 M Solution).

Follow the Preparation Procedure above before remount the probes.

Note: Never store the probe in distilled or deionized water.

Periodic maintenance

Inspect the probe and the cable. The cable used for the connection must be intact and there must be no points of broken insulation on the cable or cracks on the probe stem or bulb.

Cleaning procedure

<i>General</i>	Soak in Hanna HI 7061 General Cleaning Solution for approximately ½ hour.
Removal of films, dirt or deposits on the membrane/junction:	
<i>Protein</i>	Soak in Hanna HI 7073 Protein Cleaning Solution for 15 minutes.
<i>Inorganic</i>	Soak in Hanna HI 7074 Inorganic Cleaning Solution for 15 minutes.
<i>Oil/grease</i>	Rinse with Hanna HI 7077 Oil and Fat Cleaning Solution.

IMPORTANT: After performing any of the cleaning procedures rinse the probe thoroughly with distilled water and soak the electrode in HI 70300 Storage Solution for at least 1 hour before reinstalling it.

Troubleshooting

Evaluate your probe performance based on the following.

- Noise (Readings fluctuate up and down) could be due to clogged or dirty junction: refer to the Cleaning Procedure above.
- Dry Membrane/Junction: soak in Storage Solution HI 70300 for at least 1 hour. Check to make sure the installation is such as to create a well for the probe bulb to constantly remain moist.
- Drifting: soak the probe tip in warm Hanna Solution HI 7082 for one hour and rinse tip with distilled water.
- Low Slope: refer to the cleaning procedure above.
- No Slope:
 - Check the probe for cracks in glass stem or bulb (replace the probe if cracks are found).
 - Make sure cable and connections are not damaged.
- Slow Response/Excessive Drift: soak the tip in Hanna Solution HI 7061 for 30 minutes, rinse thoroughly in distilled water and then follow the Cleaning Procedure above.
- For ORP probe: polish the metal tip with a lightly abrasive paper (paying attention not to scratch the surface) and wash thoroughly with water.

CHANGING PERISTALTIC PUMP TUBING

It is recommended that the peristaltic pump tubes be changed on a regular basis depending on sampling period and operating time.

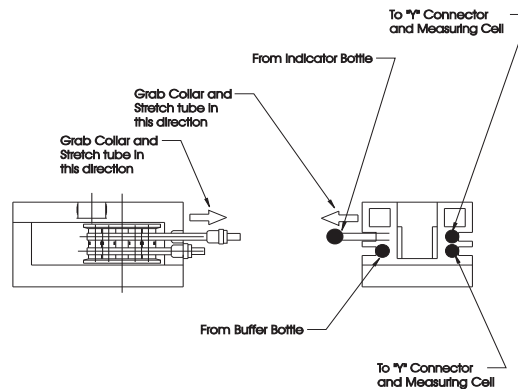
For a 5 minutes sample interval and continuous operation, changing of the tubes every month is recommended. For best results however, change the tubings every time the reagents are replaced.

Note: Rubber gloves and eye protection must be worn while handling reagent tubing to prevent contact with reagent chemicals. Read MSDS documents before proceeding.

Grasp the plastic collar of one pump tube and pull the fitting away from the pump toward the front of the case until it clears the retaining indentation.

Then move the fitting sideways away from the pump until the tube clears the slot.

Release the tube and fitting. The fitting on the other end of the pump tube may now be easily removed from the pump body.

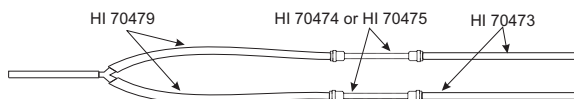


Remove the reagent tubing from one end of the pump tube fitting and pull the pump tube from behind the pump rollers.

Replace the pump tube with a new one and reassemble in reverse order. Repeat for the other pump tube.

TUBING REPLACEMENT

The remaining tubing in the analyzers should be replaced every two months.



When installing new tubing it is helpful to dip them in hot water before making the connections.

It is also recommended that one tube at a time is removed and replaced.

Note: DPD reagent tubing may darken before the scheduled replacement time, but this will not affect the instruments performance.

CLEANING MEASUREMENT CELL

In order to maintain the maximum reliability of measurements, it is recommended to periodically clean the measurement cell. In fact, the measurement cell could collect sediment or develop a film growth on the inside walls. When the automatic dirt compensation system detect the deposits presence, the analyzer will show "Dirty cell" message.

The measurement could continue but cleaning is recommended to avoid deposits that are harder to clean.

Thorough cleaning with a dilute acid solution and a cotton swab is recommended monthly. Depending on sample conditions at individual locations and absence of input filters, it may be necessary to clean the cell on a weekly basis. This can be determined by observing the cell condition when reagents are changed.

It is also highly recommended to clean the cell every time you turn the meter off. In such a way, scaling and molds growth are prevented. Otherwise, subsequent cleaning might become more difficult.

For cleaning procedure, remove the plastic cap placed on the top of the measuring cell.

Add a few drops of 19.2N Sulfuric Acid solution or alcohol to the cell.

Allow sulfuric acid to stand in the measuring cell for 15 minutes to dissolve any foreign materials adhering to the cell walls. Wipe the cell interior with a cotton-tipped swab. After wiping, open the drain port to empty the measuring cell from the cleaning solution.

CHANGING MEASUREMENT CELL

To change the measuring cell (#7 page 10) with a new one (**HI 70487**) in the PCA310 - 330 analyzers, follow the steps:

- Stop the analyser by turning off the main switch.
- Remove the reagent and buffer bottles to free space.
- Disconnect the reagent and buffer tubes from the cell body.
- Disconnect the sample inlet tube from the cell body. This tube is between electrovalve (#21 pag 10) and cell.
- Disconnect the drain tube (#8 on page 10) from the cell.
- Unplug the cell connector.
- Unscrew the cell from its support by using hexagonal wrench.
- Put the new cell in its place and screw it in position. Take care to position the electrical cable first.
- Reconnect the electrical wires and the pneumatic circuit as it was at the dismantled cell.
- Power on the PCA310 - 330 analyzer.
- Go to menu mode "Chlorine Menu" - "Cal measuring Cell" and start the "Calibration Blank" function.
- Confirm by pressing "CFM" when asked "Start the blank calibration?".
- Wait for the end of the procedure.
- If the message Press CFM appears, the procedure was successful and Pressing "CFM" will save the coefficients for the new cell.
- If the message "failed" appears, the cell is not working properly. Check the electrical cable connection and if the error persists call Hanna Service.
- Prime the reagent pump - see page 36 for details.
- Wait 3 cycles for the measurement to stabilize.
- Calibrate the measuring cell as described at page 40.

Note: Before start measuring assure that a stirring bar (**HI 70487**) is present in the cell.

ERRORS, ALARMS AND WARNINGS

The possible error, alarm and warning messages are described below with a short suggestion about the needed action to remove the error.

The pH and temperature related messages are present only on PCA 320 and PCA 330 and the ORP related messages are present only on PCA 330.

The warning messages appears on LCD and some of them on SMS. The measuring is not stopped on warnings.

Alarm conditions generate messages on the LCD, send SMS (if enabled), activate the alarm relay and the ALARM LED.

Error conditions generate messages on the LCD, send SMS (if enabled), activate the system error relay, the SYSTEM ERROR LED and block the dosing.

ERROR MESSAGES

“No Reagent” on LCD and **“No Reag.”** on SMS

The reagent counter reached 0.

At each measurement the reagent counter is decreased with one unit.

Change the reagent bottle and reset the reagent counter.

The reagent counter is reset also when the “prime reagent pump” command is executed.

“Hardware Error” on LCD and **“Hw Err”** on SMS

Error on the hardware. The writing in EEPROM failed or the analog to digital converter not working;

Call Hanna service.

“Detector Error” on LCD and **“Det Err”** on SMS

This error appear in the following situation:

The light do not reach the detector. The light source is broken or the cell inner wall is dirty.

The light that reach the detector with lamp off is too high.

The light source circuit or the detector circuit is broken.

The difference between the detector response with light on and light off is too small. The cell is dirty, the water is too turbid or the detector circuit is defective.

The chlorine reading is below “Low point”. This could be caused by absence of chlorine in water, low pressure in the water inlet, malfunction of the sample valve, missing of the stirrer bar, missing reagent, detector malfunction.

The chlorine value not increase at least with 0.05 ppm even if the chlorine dosing pump is running full time for "Max On time". In this particular case, the error is cleared only when the controller is restarted. This could be caused by absence of the chlorination agent, the malfunction of the dosing pump or malfunction of the detector.

Check the presence of the magnet barr, check the reagent level, check the reagent pump tubes, clean cell, observe if the sample flow in the cell, edit the "Low Point". Value, check the chlorine dosing pump, replace the cell.

"pH Out of Range" on LCD and **"pH Err"** on SMS

pH value is outside range (0.00 to 14.00 pH).

Verify the connections; Change the pH probe.

"ORP Out of Range" on LCD and **"ORP Err"** on SMS

ORP value is outside range (0 to 2000 mV).

Verify the sample ORP; verify ORP probe connections, Change the ORP probe.

"Temp. Out of Range" on LCD and **"Temp Err"** on SMS

Temperature value is outside range (0.0 °C to 75.0 °C).

Verify the sample temperature, verify the pH probe connector; change the pH probe.

"Conc. Out of Range" on LCD and **"Cl Err"** on SMS

Chlorine value is outside range (0.00 to 5.00 mg/L).

The chlorine concentration is too high.

ALARM MESSAGES

"High Chlorine" on LCD and **"H Cl"** on SMS

The concentration is over the Alarm High setpoint.

Change the setpoint; verify the chlorine dosing.

"Low Chlorine" on LCD and **"L Cl"** on SMS

The concentration is under the Alarm Low setpoint.

Change the setpoint, verify the chlorine dosing, wait for PCA to adjust the value.

"High pH" on LCD and **"H pH"** on SMS

The pH is over the Alarm High setpoint.

Change the setpoint; verify the pH dosing; verify if acid/base dosing is correctly set; wait for PCA to stabilize the value.

"Low pH" on LCD and **"L pH"** on SMS

The pH is under the Alarm Low setpoint.

Change the setpoint; verify the pH dosing; verify if acid/base dosing is correctly set; wait for PCA to adjust the value.

“High ORP” on LCD and **“H ORP”** on SMS

The ORP is over the Alarm High setpoint.

Change the setpoint, verify the ORP probe.

“Low ORP” on LCD and **“L ORP”** on SMS

The ORP is under the Alarm Low setpoint.

Change the setpoint, verify the ORP probe.

“High Temperature” on LCD and **“H Temp”** on SMS

The Temperature is over the Alarm High setpoint.

Change the setpoint, verify the pH probe.

“Low Temperature” on LCD and **“L Temp”** on SMS

The Temperature is under the Alarm Low setpoint.

Change the setpoint, verify the pH probe.

WARNING MESSAGES

“Dirty Cell” on LCD and **“Drt Cell”** on SMS

The light level is too low. The light source current is near the highest value. The cell is dirty or the water is too turbid.

Check the water quality; check the water flow; Clean the cell.

“Reagent Low Level” on LCD and **“L Reag”** on SMS

The reagent reach the 20% of the initial quantity. The reagent level is based on a “blind” counting of the completed measurements. A difference between reagent counter and real reagent level could appear.

Change the reagent or reset the reagent counter.

“CI Calibration Old” on LCD and **“CI Cal”** on SMS

Cell calibration is older than 1 months.

Calibrate the cell.

“Reagent Expired” on LCD and **“Reag Exp”** on SMS

Reagent is older than 3 month. The reagent expiration time is started when reagent counter is reset or “prime reagent pump command is executed.

Change the reagent and reset the reagent counter.

“GSM Wrong PIN Code”: appears on LCD

Wrong PIN code was entered.

Set the correct pin code and restart the analyzer.

“GSM Init failed”: appears on LCD

The GSM modem was not successfully initialized.

Wait for auto retry. Verify other messages related to GSM.

“GSM Card Expired”: appears on LCD

The SIM expiration date is reached.

Recharge the SIM card and change the expiration date or set the "Chk. Charge" Inactive.

"GSM No Credit": appears on LCD

The number of remaining SMS is 0.

Recharge the SIM card and change the "Remaining" SMS value, or set the "Chk.Charge" Inactive.

"GSM Not Respond": appears on LCD

The GSM modem not respond.

Check the data cable between GSM module and PCA, check the GSM module power supply and wait for auto retry.

"GSM Network Error": appears on LCD

The GSM network not respond.

Check the GSM module antenna and wait for auto retry.

"Pwr rst": appears on SMS

There was a reset on the analyzer.

Check the main power supply for the cause of dropout.

"pH calibration Old" on LCD and **"pH Cal"** on SMS

The pH calibration is older than 1 months.

Calibrate the pH probe.

"No pH Calibration" appears on LCD

The pH channel was not calibrated.

Appears after "Set Default pH Cal." or after EEPROM error. In the last case, call Hanna service.

"No ORP Calibration" on LCD and **"No ORP Cal"** on SMS

The ORP channel was not calibrated.

Appears after EEPROM error. Call Hanna service.

"No Temp. Cal" on LCD and **"No T Cal"** on SMS

The Temperature channel was not calibrated.

Appears after EEPROM error. Call Hanna service.

ACCESORIES

ChecktempC	Thermometer (-50.0 to 150.0 °C)
pHep5	pH meter (0.00 to 14.00pH)
ORP	ORP tester (+/-999 mV)
HI 1005	pH/temperature process probe
HI 2008	ORP process probe
HI 504900	GSM transmitter
HI 704731	Complete set of tubes from pressure regulator to drain PCA 310
HI 704732	Complete set of tubes from electrode holder to drain PCA 320-330
HI 70474	Peristaltic pump tube (6 pcs)

HI 70475	Peristaltic pump tube (2 pcs)
HI 70476	Reagent bottle inside tube (6 pcs)
HI 70477	Y strainer and the tube from Y strainer to cell (6 pcs)
HI 70478	Tube from bottle to pump (6 pcs)
HI 70479	Tube from pump to Y strainer (6 pcs)
HI 70480	Free Cl ₂ Reagent Pack (HI 70450, HI 70451, HI 70452)
HI 70481	Total Cl ₂ Reagent Pack (HI 70460, HI 70461, HI 70452)
HI 70482	0.5/50 micron filter system
HI 70483	Complete kit of reagent tubing spare kit (2 pcs)
HI 70484	Complete kit of reagent tubing spare kit (6 pcs)
HI 70485	Cuvet stirrer motor
HI 70486	Stirring bar (5 pcs)
HI 70487	Colorimetric cell
HI 70488	Electrovalve (24Vac/60Hz)
HI 70489	Electrovalve (24Vac/50Hz)
HI 70492	Electrode holder PCA 330
HI 70493	Closing cap for electrode holder
HI 70494	Calibration port tap
HI 70496	Replacement filter 0.45um (1 pcs)
HI 70497	Replacement filter 50um (1 pcs)

pH Solutions

HI 7004M or HI 7004L	pH 4.01 Buffer Solution, 230 or 500 mL bottle
HI 7006M or HI 7006L	pH 6.86 Buffer Solution, 230 or 500 mL bottle
HI 7007M or HI 7007L	pH 7.01 Buffer Solution, 230 or 500 mL bottle
HI 7009M or HI 7009L	pH 9.18 Buffer Solution, 230 or 500 mL bottle
HI 7010M or HI 7010L	pH 10.01 Buffer Solution, 230 or 500 mL bottle

ORP Solutions

HI 7020M or HI 7020L	200-275mV Buffer Solution, 230 or 500 mL bottle
HI 7091M or HI 7091L	Pretreatment Reducing Solution, 230 or 500 mL bottle
HI 7092M or HI 7092L	Pretreatment Oxidizing Solution, 230 or 500 mL bottle

Electrode Storage Solutions

HI 70300M or HI 70300L	Storage Solution, 230 or 500 mL bottle
HI 7082	3.5M KCl Electrolyte, 4x30 mL

Electrode Cleaning Solutions

HI 7061M or HI 7061L	General Cleaning Solution, 230 or 500 mL bottle
HI 7073M or HI 7073L	Protein Cleaning Solution, 230 or 500 mL bottle
HI 7074M or HI 7074L	Inorganic Cleaning Solution, 230 or 500 mL bottle
HI 7077M or HI 7077L	Oil & Fat Cleaning Solution, 230 or 500 mL bottle
HI 92500	Windows Compatible Application Software

Hanna Instruments reserves the right to modify the design, construction and appearance of its products without advance notice.
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