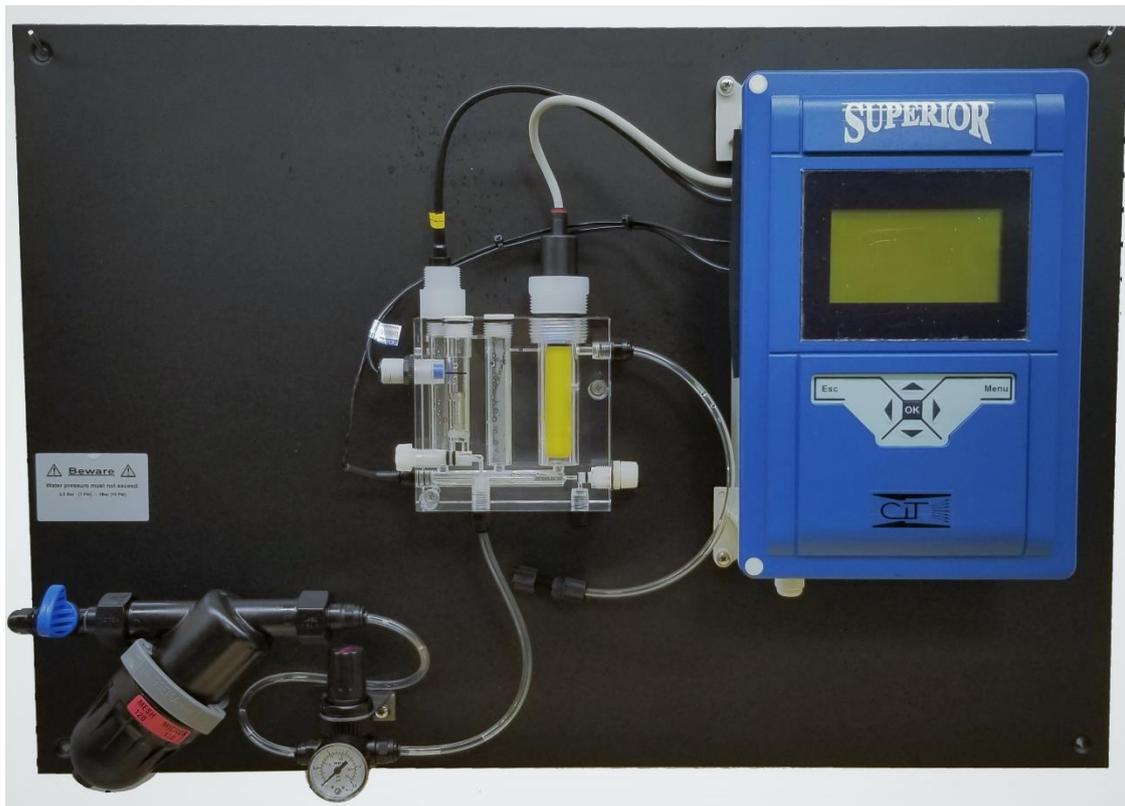




WATERGUARD WG-602

FREE CHLORINE ANALYZER

User Manual



V5.15US January 2018



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1 General Safety Precautions



This section presents important information intended to ensure safe and effective use of this product.

Read the following carefully before handling the product. These warnings and cautions must be followed carefully to avoid injury to yourself or damage to equipment.

Warning: Only properly trained and licensed electricians should attempt to wire or service the electronic components of the analyzer/controller.

There is an Electrical Shock Hazard when servicing this system.

Always verify that all electrical power source(s) are off before opening the analyzer/controller unit or attempting to service electronic components or wiring.

Caution: Extreme caution should be used when installing, operating, and maintaining the WATERGUARD® Analyzer. Only properly trained technicians are authorized to install and maintain the analyzer/controller.

Always follow local health and safety regulations when performing any service on the analyzer/controller unit or when changing chemical dosing settings.

Each relay connection is limited to 8 amps, to prevent overheating. The relays may show a higher rating but do not connect equipment exceeding 8 amps.

All electrical connections should comply with National Electrical Code (NEC) and all local regulations.

Caution: Do not use chemicals that reduce the surface tension. When using hydrochloric acid, observe all safety regulations.

Electrodes:

Warning: Do not swallow the electrolyte. Avoid electrolyte contact with skin or eyes. In case of accidental contact, wash with cold water! In case of eye inflammation, contact a doctor immediately. Wear safety glasses and gloves when working with the electrolyte solution.

Caution: Do not touch or damage the electrodes. The electrolyte is sensitive to oxidation: Always keep the electrolyte bottle closed after use. Do not transfer the electrolyte to other containers. The electrolyte should not be stored for more than one year and should be clear (not yellow) in appearance (for use by date, see label). Avoid forming air bubbles when pouring the electrolyte into the measuring chamber.

Caution: WATERGUARD's controller unit should not be opened except for initial installation and troubleshooting, and should only be opened by a trained and approved technician.

2 Preface

The WaterGuard WG-602 Free chlorine (FCL) is an amperometric chlorine analyzer that measures free chlorine in water applications.

2.1 Intended Use

This manual is for qualified and trained service technicians who will install and service the WaterGuard WG-602 Chlorine Analyzer. It provides instructions on how to install the WaterGuard system, as well as how to calibrate, operate, and maintain the system.

2.2 Safety Precautions



WARNING

Only properly trained and licensed electricians should attempt to wire or service the electronic components of the analyzer. There is an Electrical Shock Hazard when servicing this system. Always verify that all electrical power source(s) are off before opening the analyzer unit or attempting to service electronic components or wiring.

CAUTION

Extreme caution should be used when installing, operating, and maintaining the WaterGuard WG-602 Water Quality Analyzer and Controller. Only properly trained technicians are authorized to install and maintain the analyzer. Only properly trained and licensed electricians should attempt any change to the system's electrical components. Only properly trained and licensed operators should attempt to make any changes to chemical dosing levels.

NOTE

Always follow local health and safety regulations when performing any service on the WaterGuard unit or changing chemical dosing settings.



3 Overview

3.1 Features

The WaterGuard WG602 Free chlorine (FCL) is an amperometric chlorine analyzer that measures free chlorine in water applications. The analyzer includes a free chlorine electrode, pH and temperature sensors.

The WG602 FCL analyzer includes 2 built-in 4/20 mA analog outputs, and can support additional 4 analog outputs (total of 6 analog outputs) when required.

The WG602 FCL analyzer includes RS485 digital output that support MODBUS communication protocol OR BLUE I communication protocol for remote communication options. For more information about remote communication and WATERGUARD ON-LINE remote management tools please contact your local distributor or representative.

The WG602 FCL analyzer supports connection of external conductivity and turbidity sensors, fully displayed. For more information about conductivity and turbidity measurements options please contact your local distributor or representative.

3.2 System Components

The WG602 FCL analyzer is a board mounted analyzer and includes all required components for installation.

The system includes the following components:

1. Controller – includes the display and keyboard panel. Includes 3 electronic cards: Control panel card, I/O card and electrodes card.
2. Acrylic flow cell – includes free chlorine electrode, pH electrode, Temperature sensor, flow switch (proximity flow switch), water inlet and outlet ports, and sampling port.
3. Pre-filter (washable disc filter) – the filter is a 120 micron disc filter and it's goal is to remove large particles from getting in to the acrylic flow cell.
4. Pressure regulator – the pressure regulator maintains a constant pressure and flow in the acrylic flow cell, to allow stable readings of the chlorine electrode.

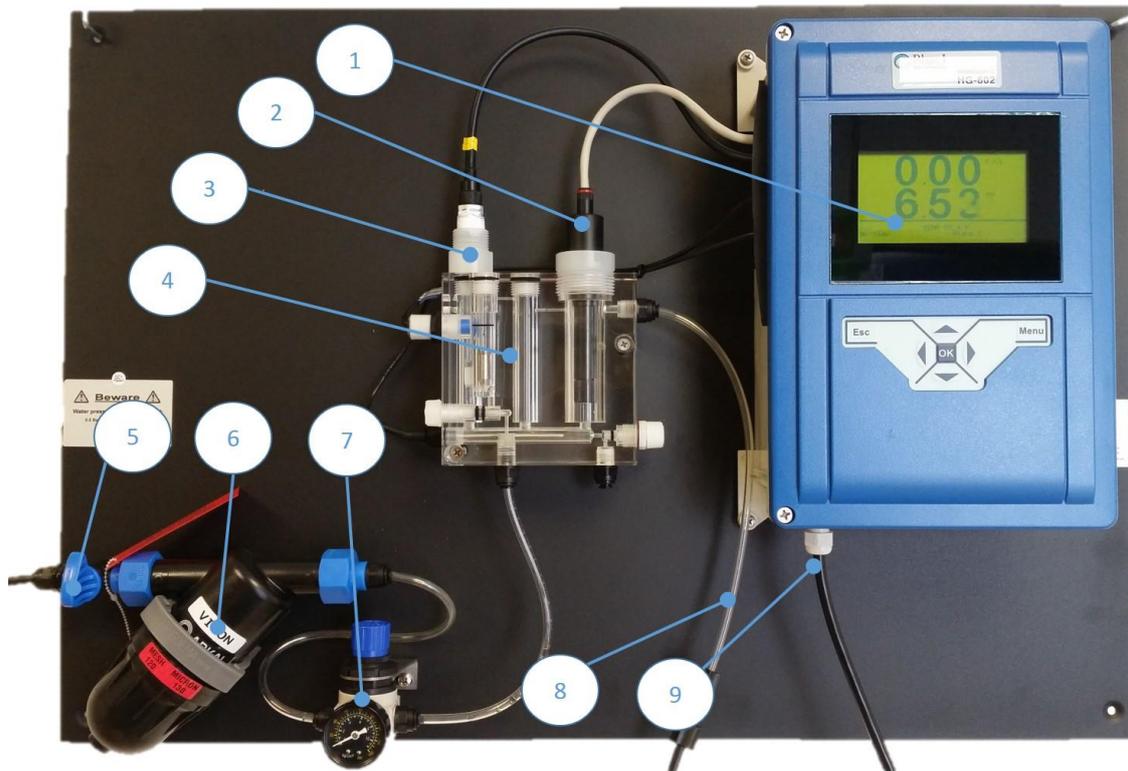


Figure 1: WG602 FCL Analyzer - General overview

-
1. Controller

 2. Free chlorine electrode

 3. pH electrode

 4. Acrylic flow cell

 5. Water inlet (on/off ball valve)

 6. Pre-filter (washable disc filter)

 7. Pressure regulator

 8. Water drain

 9. Power connection

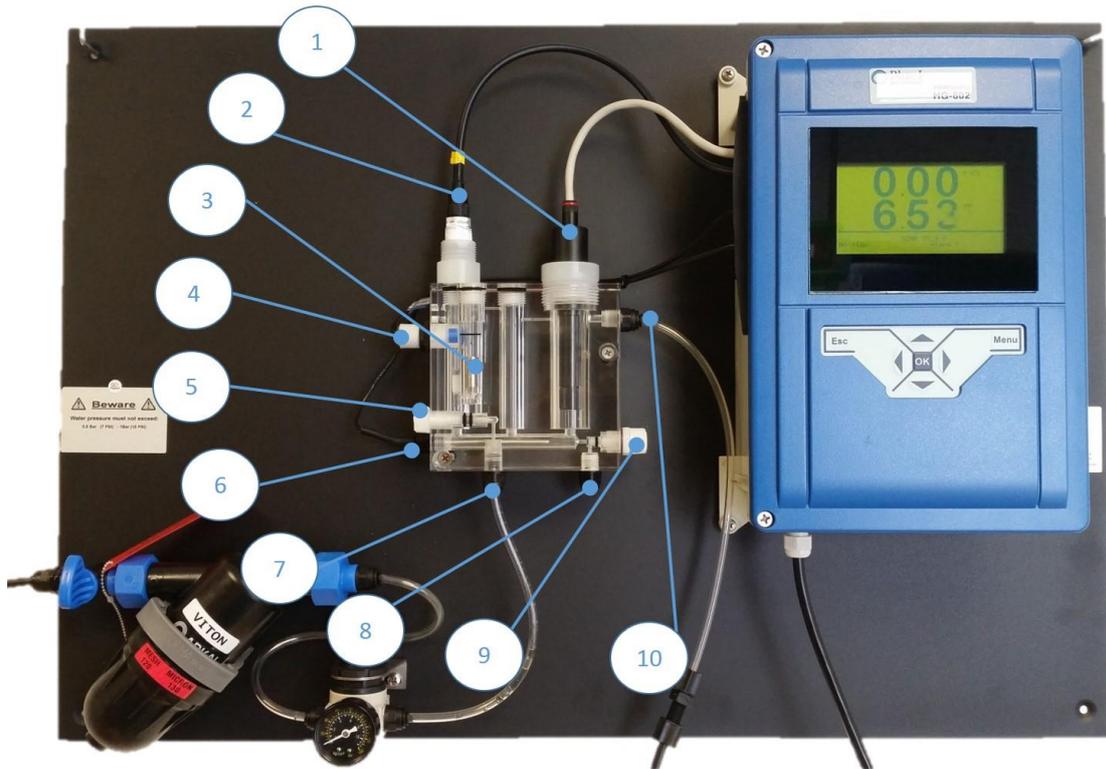
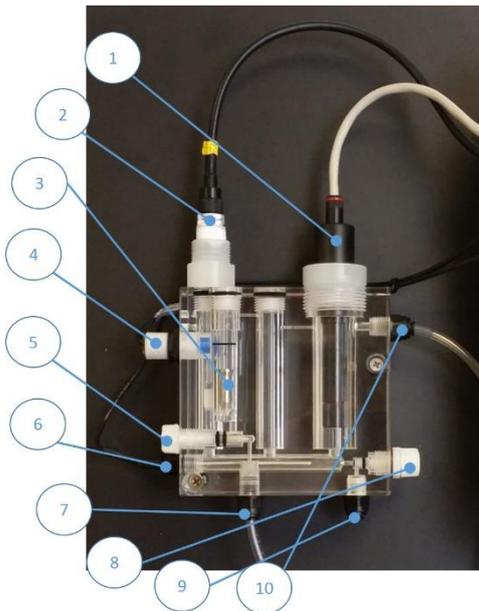


Figure 2: Acrylic flow cell overview



- | | |
|-----|-------------------------------|
| 1. | Free chlorine electrode |
| 2. | pH electrode |
| 3. | Float (proximity flow switch) |
| 4. | Proximity flow switch |
| 5. | Flow regulator |
| 6. | Temperature sensor |
| 7. | Flow cell water inlet |
| 8. | Sampling valve |
| 9. | Sampling connection |
| 10. | Flow cell water drain |

Figure 2a: Acrylic flow cell overview

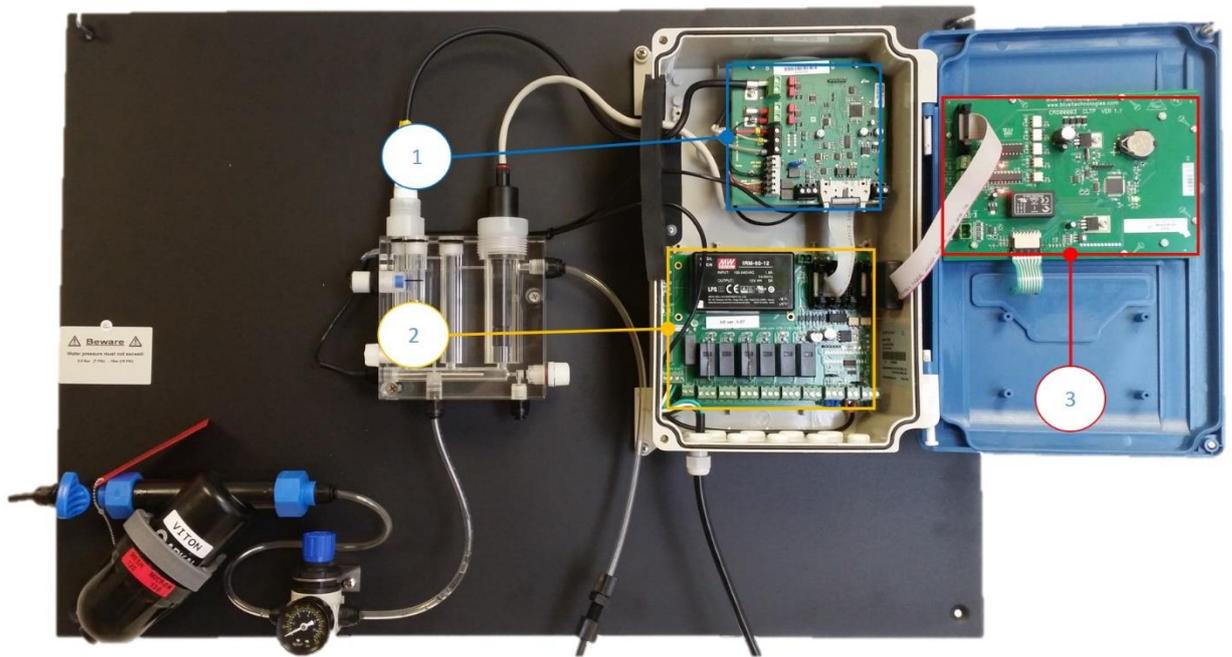


Figure 3: Controller overview

-
1. Electrodes card
 2. I/O card
 3. Control panel card
-

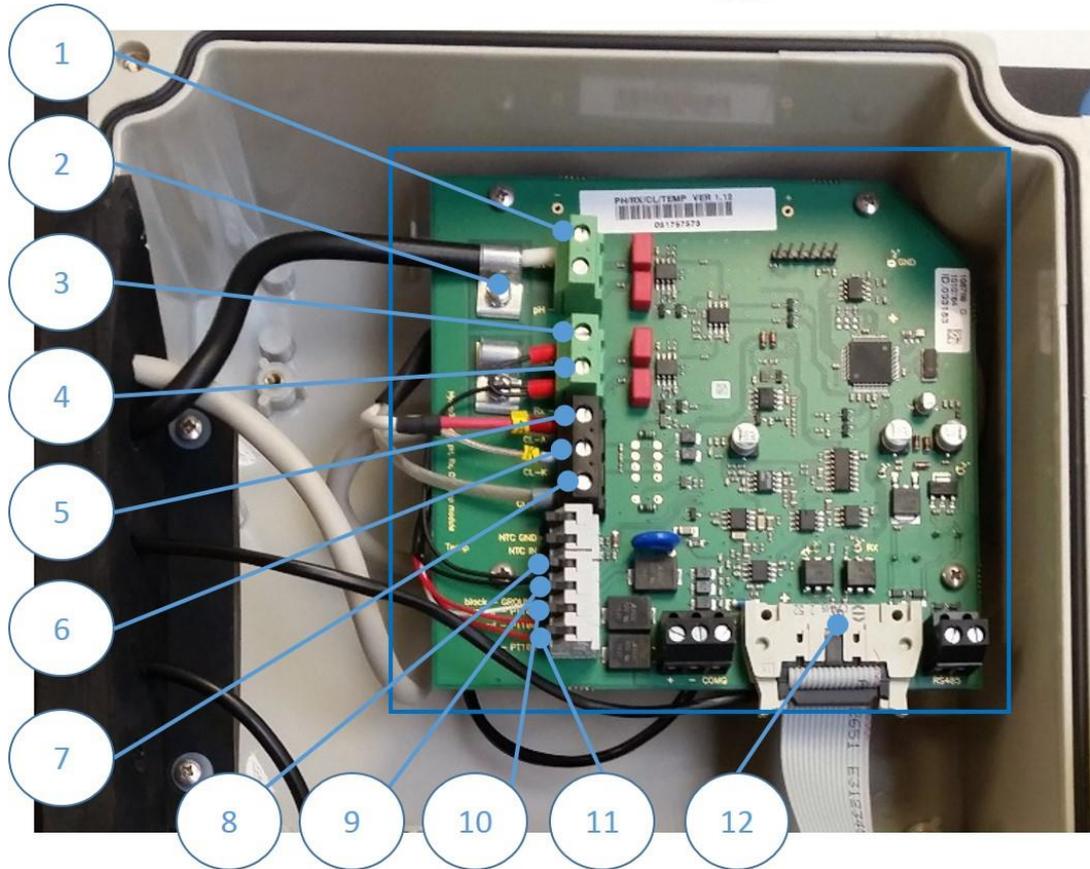


Figure 4: Electrodes card

- | | |
|-----|---------------------------|
| 1. | pH electrode [+] |
| 2. | pH electrode [-] sheath |
| 3. | ORP jumper |
| 4. | ORP jumper |
| 5. | FCL electrode wire A |
| 6. | FCL electrode wire K |
| 7. | FCL electrode wire GROUND |
| 8. | Temp sensor (color coded) |
| 9. | Temp sensor (color coded) |
| 10. | Temp sensor (color coded) |
| 11. | Temp sensor (color coded) |
| 12. | Flat cable from I/O card |

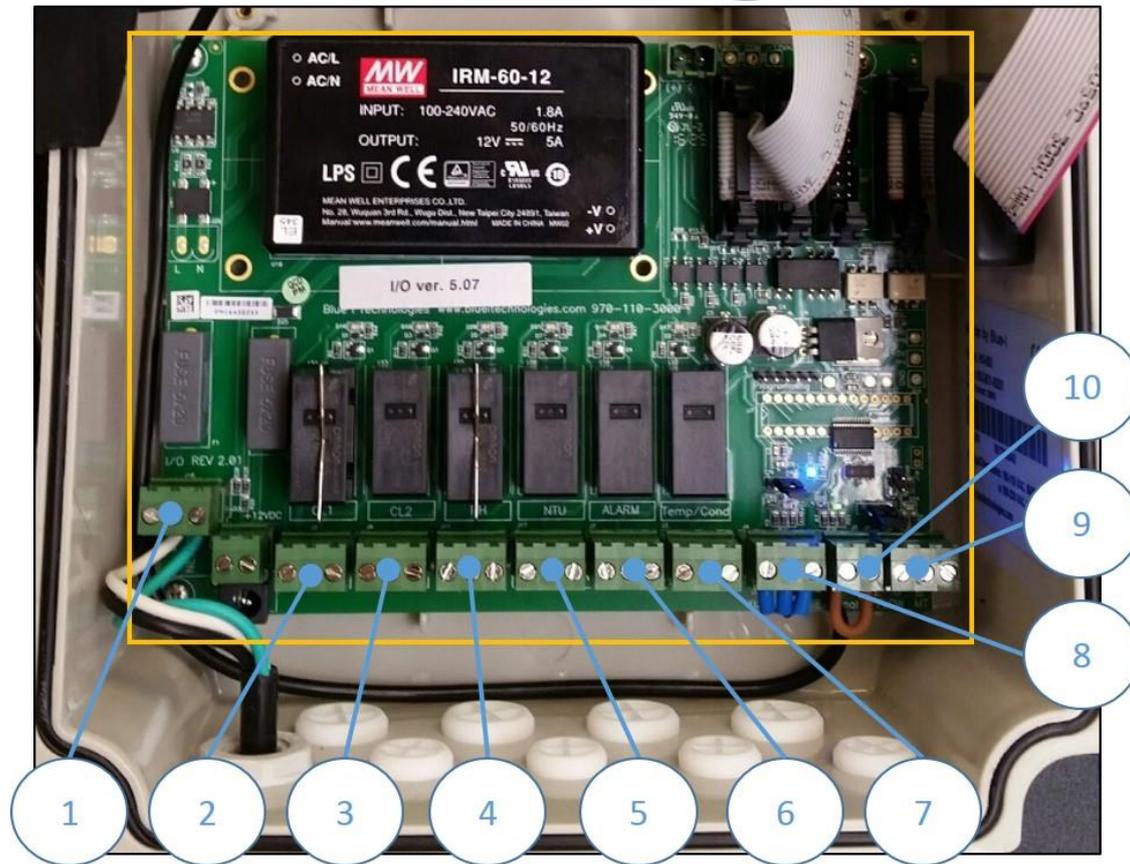


Figure 5: I/O card

- | | |
|-----|--------------------------|
| 1. | Power supply 100-230 VAC |
| 2. | Control output Cl1 |
| 3. | Control output Cl2 |
| 4. | Control output pH |
| 5. | Control output NTU |
| 6. | Control output Alarm |
| 7. | Control output Temp |
| 8. | Internal flow switch |
| 9. | External flow switch |
| 10. | Flow meter |

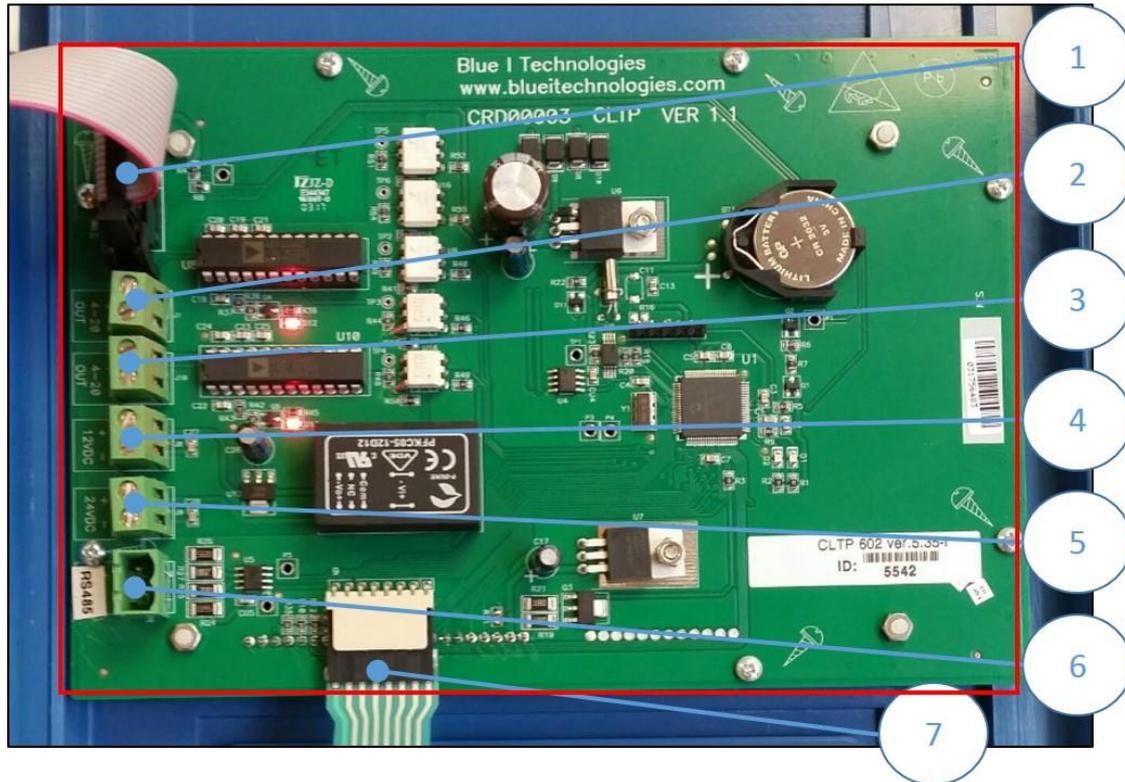


Figure 6: Control panel card

1. Flat cable (from I/O card)
2. 4/20 mA output built-in channel 1
3. 4/20 mA output built-in channel 2
4. 12 VDC
5. 24 VDC
6. RS 485 output (Blue I protocol / MODBUS protocol)
7. Key pad connection cable



4 Installation

4.1 Location Considerations

Take extra time in selecting a location since the installation location will determine the ease of the installation and future operation and maintenance. The location where the WG-602 FCL is installed is dependent on various considerations:

Convenient access – The WG-602 FCL should be installed where it can easily be viewed and operated.

Dry area – The WG-602 FCL requires a clean, dry area for safe operation and electrical connections.

Minimum distance from supply pipe - The water sampling line that is connected to the main pipe should be as short as possible. A long sample line creates an unnecessary delay between supply and measurement.

Drainage – The installation location requires the sample water outlet of the acrylic flow cell to be disposed at gravity drain.

Freezing Temperatures – The WG-602 FCL should be installed in a location that is not susceptible to freezing temperatures. The sample water may freeze, and components may be damaged due to expansion when ice forms.

4.2 Site Requirements and Installation

The WG-602 FCL assembly is wall mounted. The complete unit with all the connections weighs 9 kg (about 20 lbs.), so it must be mounted securely onto a stable wall. The mounting board measures 800 X 550 mm (31.5" X 21.7"). The base of the complete unit assembly should be mounted at least 60 cm (24") above the floor (preferably at eye level), to allow ease of operation and maintenance.

The WG-602 FCL unit and its mounting panel are not shipped with mounting screws or anchors. The installer must provide screws and anchors that can hold the weight of the complete unit. The screws and anchors must be compatible with the wall where it will be installed.

4.2.1 Mechanical Installation

The WG-602 FCL is shipped pre-mounted on a mounting panel, along with pre-filter and pressure regulator. The mounting panel includes four screw holes, compatible with 5/16" (8 mm) screws, one in each corner.

1. Determine the location of one hole on the mounting panel.
2. Secure one corner of the mounting panel to the wall.
3. Level the mounting panel and mark the remaining three (3) screw holes.
4. Secure the remaining corners to the wall using 5/16" (8mm) screws.

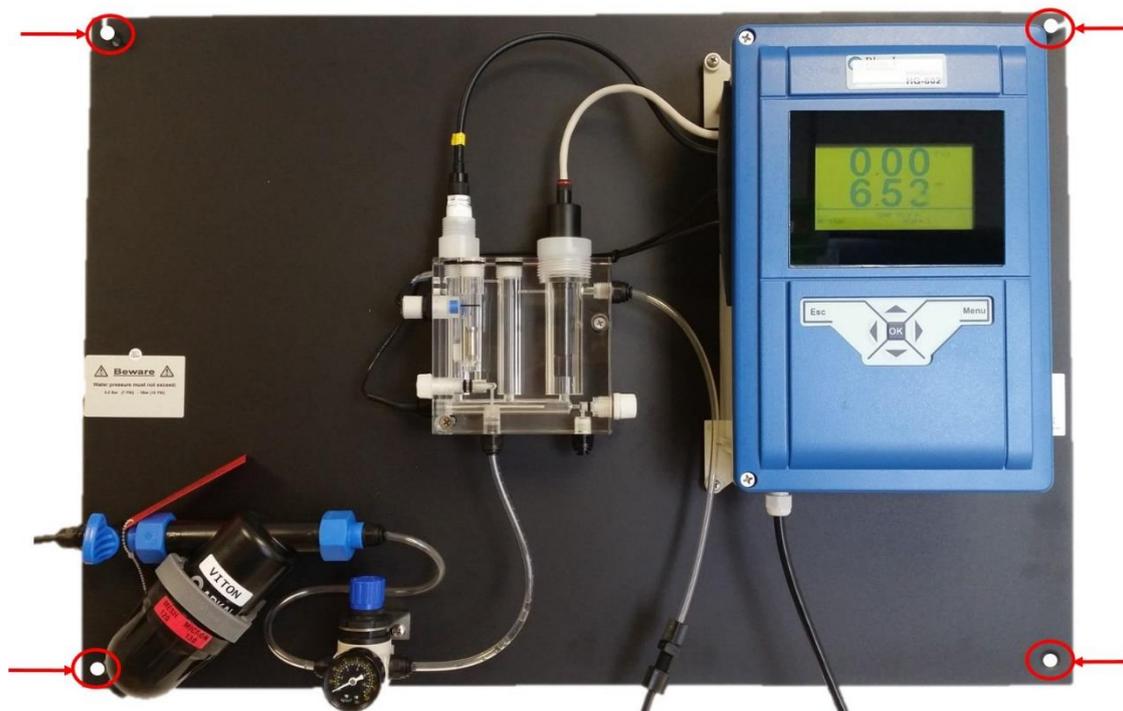


Figure 7: Mounting panel holes and mechanical installation

4.3 Plumbing Requirements and Installation

4.3.1 Water supply and drain

The WG-602 FCL requires a pressurized water supply to the flow cell. An isolating valve must be installed between the main line and the pipe (tube) to the analyzer. The water supply need to be connected to the pre-filter with a 6 mm (1/4") feed tube. The minimum pressure to the analyzer should be 0.5 bar (7 psi) and should not exceed 1 bar (14.5 psi). Set the right pressure using the pressure regulator that attached to the outlet of the pre-filter. Pull up the pressure regulating adjusting valve and set the right pressure by turning the valve. Push down and lock it when finished. Adjust the flow rate through the acrylic flow cell so the metal float will be in front of the proximity flow switch. Use the flow regulating valve (on the bottom left of the acrylic flow cell) to regulate the flow properly. A gravity drain is recommended for the water outlet from the acrylic flow cell.

NOTE:

The distance from the main pipe to the analyzer should be as short as possible, in order to minimize the delay time between the water being sampled and the analyzer measurement.

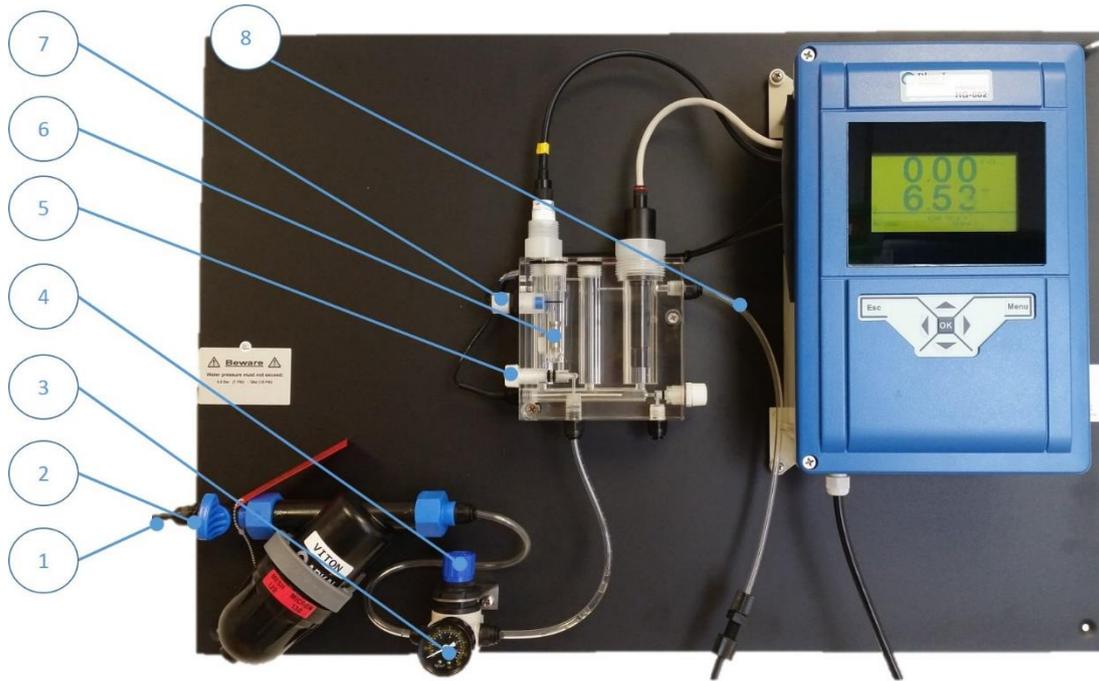


Figure 8: water connections, pressure regulating and flow regulating

-
1. Water inlet – 6mm (1/4") quick connection

 2. Water inlet ball valve

 3. Pressure regulator

 4. Pressure regulator adjusting valve

 5. Flow regulating valve

 6. Metal float

 7. Proximity flow switch

 8. Water outlet (drain)

4.4 Electrical Requirements and Installation

The WG-602 FCL analyzer requires 100-115 Or 200-230 VAC, 50/60 Hz electrical power source on a separate 16A circuit in the plant room's electrical board. The main WG-602 FCL power supply should be connected to a non-dependent power supply, so that the analyzer remains powered constantly. The active relays should be connected to a dependent power supply (interlocked power supply).

4.4.1 Connecting the Main Electrical Power

CAUTION:

Verify that the power switch or circuit breaker to the non-dependent power source is OFF.

NOTE:

The main power supply may be connected to either 100-115 or 200-230 VAC 50/60 Hz.

1. Connect the line (live) wire to the I/O board connector marked line.
2. Connect the neutral wire to the I/O board connector marked Neutral.
3. Connect the earth wire to the I/O board connector marked Ground.
4. Continue with the other electrical connections.
5. Turn on electrical power only after all electrical connections have been completed.

4.4.2 Input Switches

Flow input switch terminal blocks on the I/O card allow for three input switched to be connected to the system as additional layers of security against accidental chemical additions when there is no flow. If a connection is expected but not detected at each input, the analyzer/controller will indicate an alarm and will close all relays (and open the alarm relay). Therefore, if a safety switch (flow, level, etc.) will not be installed, a fixed connection (jumper wire) is required to allow the controller to operate.

Two flow switches and one flow meter may be connected:

1. Proximity flow switch (internal): Flow switch connected to the flow cell of the analyzer. Connect the Black wire to "IN", Blue wire to "GND", and Brown wire to "VCC".
2. External flow switch: Connection for an external 2-wire flow switch. If an external switch is not connected, a jumper must be installed for the analyzer to operate properly.
3. Flow meter: Connection of 2 or 3 wire flow meter. The analyzer will not look for the flow meter connection unless the option is turned ON in the technician menu; therefore, no jumper is required if a meter is not installed.

CAUTION:

Electrical connections depicted in this section are ONLY recommendations. All electrical connections should comply with National Electrical Code (NEC) and all local regulations.

4.5 Installing electrodes

4.5.1 Free Chlorine electrode OCS140

General Information

Free chlorine is defined as the sum of Hypochlorous acid (HOCL), hypochlorite ions (OCl^-) and Cl_2 , and the proportion of the different free chlorine species is pH and temperature dependent.

The hypochlorous acid (HOCl) contained in the medium diffuses through the sensor membrane and is reduced to chloride ions (Cl^-) on the gold cathode. On the silver anode, silver is oxidised to silver chloride. The electron release of the gold cathode and electron acceptance on the silver anode result in a current flow which is proportional to the HOCL concentration in the medium under constant conditions. Since the concentration of hypochlorous acid in the medium depends on the pH value, pH has to be measured in order to perform an accurate compensation and present a free chlorine value.

Preparation of the free chlorine sensor for start up

NOTE:

The free chlorine sensor is shipped wet, filled with electrolyte from the factory and does not require electrolyte refilling before using.

NOTE:

The free chlorine cable will arrive connected to the electrodes card. For more information about wiring the free chlorine cable look at figure 4.

1. Verify that the chlorine sensor is full with electrolyte and the membrane is not damaged. Additional information about membrane replacement or electrolyte refilling exist in chapter 6.4 (Chlorine electrode maintenance).
2. Install the sensor into its position in the acrylic flow cell and HAND-tighten.
3. Route the wires (if not wired) through an open hole in the gasket and connect to the electrodes card (figure 3). Connect wire K to CL-K terminal, wire A to CL-A terminal and the unmarked wire (ground) to the ground terminal.

Safety hint:

Some electrolyte contains diluted acids. Please read the warnings on the electrolyte bottle.

Safety hint:

Do not Swallow the electrolyte. Avoid contact of the electrolyte with skin and eyes. Otherwise, wash with a lot of water. in case of eye inflammation, contact a doctor.

NOTE:

It is recommended to read the complete instruction manual provided with the sensor.

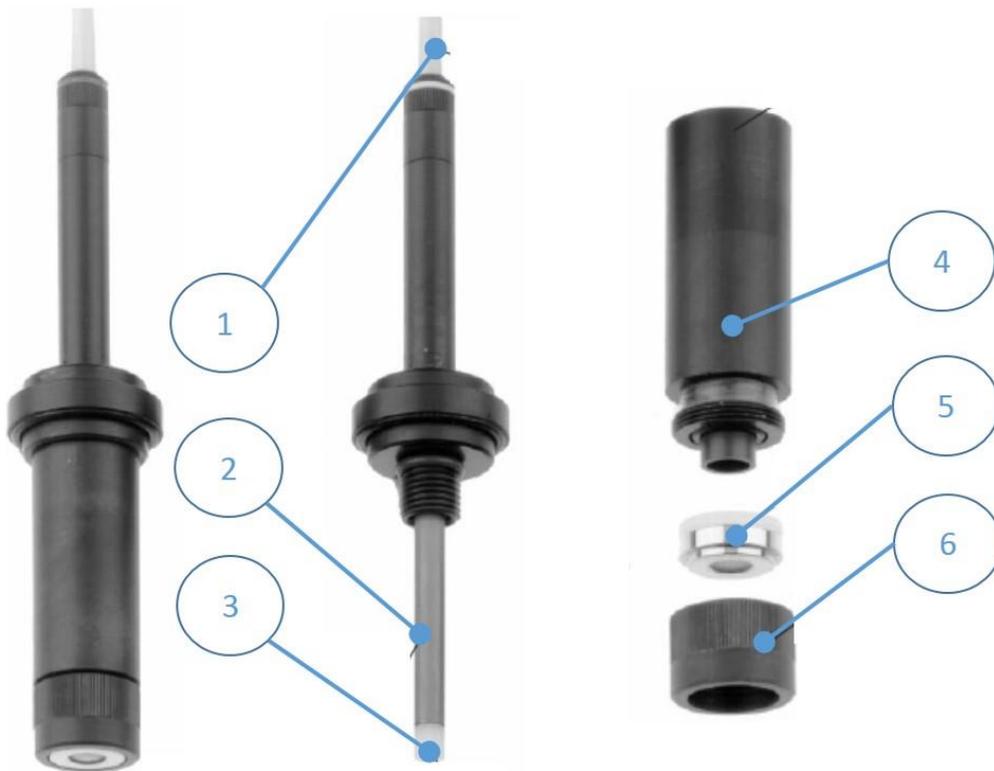


Figure 9: Free chlorine Electrode

-
1. Electrode cable

 2. Large surface silver / silver chloride anode

 3. Gold cathode

 4. Measuring chamber

 5. Membrane cap

 6. Screw cap for fixing of the membrane cap



4.5.2 pH electrode

pH electrode is shipped from the factory in the original package. Open the package and install the electrode into its position in the acrylic flow cell and HAND-tighten. Connect the pH cable on the top of the electrode and HAND-tighten.

Connecting the pH electrode cable:

1. Connect the center wire to the pH (+) terminal block
2. Connect the clamp onto the outside of the wire being sure that the wire mesh is in contact with the metal plate on the electronics card.
3. The pH (-) terminal block will remain empty.

NOTE:

The pH electrode cable will arrive connected to the electrodes card. For more information about wiring the pH electrode cable look at figure 4.

4.5.3 Temperature sensor

Temperature sensor is shipped from the factory installed within the flow cell, and wired to the electrodes card.

Connecting the temperature cable to the electrodes card:

1. Connect the Black wire to the connection labeled Black
2. Connect the White or Yellow wire to the connection labeled Yellow
3. Connect the Red wires to the connections labeled Red. Either Red wire may go to either connection.

NOTE:

The Temperature sensor will arrive connected to the electrodes card. For more information about wiring the temperature cable look at figure 4.

5 First Time Operation and Calibration

5.1 Menu Setup

This section describes how to configure the various settings (set points, alarms, and calibrations) using the WG-602 control panel.

CAUTION:

The WG-602 FCL controller should not be opened except for initial installation and troubleshooting and should only be opened by a trained and approved technician.

The WG-602 FCL menu is a simple and intuitive interface with a large display. The control panel includes the following components:

1. LCD display: measurements displayed on the top; alarms displayed on the bottom.
2. Menu bottom – Enters and scrolls through the menus.
3. Esc bottom – Moves one level back in the menu without making changes.
4. OK – Enters setting change mode and accepts setting change
5. Up/Down arrows – Changes values up or down

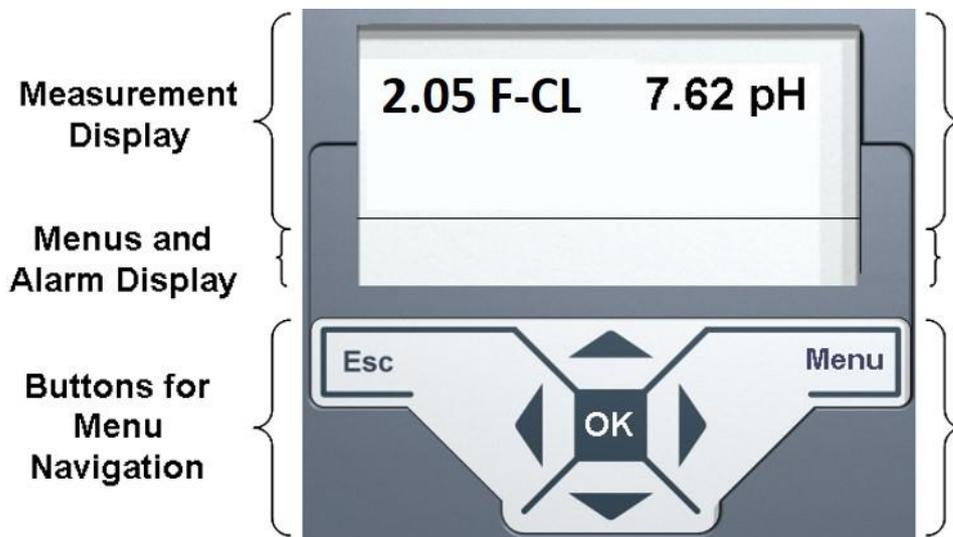


Figure 10: WG602 FCL control panel and display

WG-602 FCL includes operator menu and technician menu. Each menu has a separate password.



5.2 Operator Menu

Each of the parameters in the operator Menu is configured in the same way. The following procedure describes how to configure a typical setting:

1. Locate the desired parameter in the menu:
 - a) Press Menu until the desired parameter name appears in the LCD display.
2. Press OK. "Enter Password 100" appears in the LCD display.
3. Enter the operator password 123 (or technician password 456; both are accepted).
4. Press the up arrow or down arrow until the password number is reached.
5. Press OK to accept the password. The parameter's name and current setting appear in the LCD display.
6. Press OK, again. The LCD display shows the parameter and the current setting.
7. Enter the new parameter setting:
 - a) Press the up arrow or down arrow until the desired value is reached.
 - b) The second row of the menu display, below the value that is being changed, shows the current value.
8. Press Enter to save the new setting or Esc to abort without saving the new setting. To change the settings of additional parameters, press menu until the desired parameter appears in the LCD display. Repeat steps 6-8 above to set the new parameter.

NOTE:

The factory-set operator password is 123. The operator password can be changed in the technician menu (see technician menu setup).

NOTE:

Holding Menu while pressing up or down will advance the first digit. Holding up or down for an extended period of time will proceed through the numbers more quickly.

NOTE:

The Menu button displays the next parameter in the list, so that the operator can check every parameter in the menu. There is no scroll-back option. To view or change a previous parameter in the menu, you must exit the menu by pressing Esc, and start the above procedure from the beginning.



OPERATOR MENU FUNCTIONS AND DESCRIPTIONS		
#	Function name	Description
# 1	Shock chlorination	Additional Cl dosing mode (On/OFF)
# 2	Menu relays	Manual activation of relays
# 3	Cl set point 1	Control Cl relay 1 – On/OFF or proportional
# 4	Cl shock set point	Control Cl relay shock mode
# 5	Cl set point 2	Control Cl relay 2 – On/OFF only
# 6	FCI calibrated to	FCI calibration
# 7	Cl low alarm	Cl low limit / alarm
# 8	Cl high alarm	Cl High limit / alarm
# 9	pH set point	Control pH relay 3 – On/Off or proportional
# 10	pH 7 calibrated to	pH calibration
# 11	pH 4, 10 calibrated to	pH calibration
# 12	pH low alarm	pH low limit / alarm
# 13	pH high alarm	pH high limit / alarm
# 14	ORP calibrated to	ORP calibration
# 15	ORP low alarm	ORP low limit / alarm
# 16	ORP high alarm	ORP high limit / alarm
# 17	Temp. calibrat. to	Temp calibration
# 18	Temp. low alarm	Temp low limit / alarm
# 19	Temp. high alarm	Temp high limit / alarm
# 20	Turbidity set point	Control turbidity relay 4
# 21	NTU1 calibrated to	Low Turbidity calibration
# 22	NTU _h calibrated to	High Turbidity calibration
# 23	Turb. high alarm	Turbidity high limit / alarm
# 24	Conduc. set point	Control conductivity relay 6
# 25	Conduc. calibrated to	Conductivity calibration
# 26	Conduc. low alarm	Conductivity Low limit/ alarm
# 27	Conduc. high alarm	Conductivity High limit/ alarm
# 28	Conduc. active time	Activation time of conductivity relay
# 29	Alarm delay	Time delay for relay 5 (alarm)
# 30	Flow low limit	Low limit for external flow meter
# 31	Flow K-factor	K-factor for external flow meter
# 32	Total alkalinity	Manually entered for Langelier Index
# 33	Total hardness	Manually entered for Langelier Index
# 34	TDS	Manually entered for Langelier Index
# 35	Language	Choice of language
# 36	SYSTEM RESET	On/Off for controller power

OPERATOR MENU AND VARIABLES LIMITS					
#	Function name	Min value	Max value	Default	Units
# 1	Shock chlorination	Off	On	Off	---
# 2	Menu relays	OFF	ON	OFF	---
# 3	Cl set point 1	0	9.99	1.50	ppm
# 4	Cl shock set point	0	9.99	3.00	ppm
# 5	Cl set point 2	0.1	9.99	0.50	ppm
# 6	FCI calibrated	0.1	9.99	1.50	ppm
# 7	Cl low alarm	0	9.99	0.50	ppm
# 8	Cl high alarm	0	10	2.00	ppm
# 9	pH set point	4	14	7.40	---
# 10	pH 7 calibrated to	---	---	7.40	---
# 11	pH 4, 10 calibrated to	---	---	7.40	---
# 12	pH low alarm	4	9.99	7.00	---
# 13	pH high alarm	7	9.99	7.8	---
# 14	ORP calibrated to	0	1999	740	mV
# 15	ORP low alarm	0	1999	600	mV
# 16	ORP high alarm	0	1999	850	mV
# 17	Temp. calibrat. to	---	---	22.0/ 71.6	C / F
# 18	Temp. low alarm	1/34	49.9/121.9	0.0/ 32.0	C / F
# 19	Temp. high alarm	1/34	49.9/121.9	100/ 212	C / F
# 20	Turbidity set point	0	200	0.60	NTU
# 21	NTU1 calibrated to	---	---	0.50	NTU
# 22	NTUh calibrated to	---	---	1.01	NTU
# 23	Turb. high alarm	0	99.9	99.99	NTU
# 24	Conduc. set point	1	10000	1000	μS/cm
# 25	Conduc. calibrated to	1	5000	740	μS/cm
# 26	Conduc low alarm	1	5000	0	μS/cm
# 27	Conduc. high alarm	1	5000	4900	μS/cm
# 28	Conduc active time	---	---	0:01	Min
# 29	Alarm delay	0	10	0:30	Min
# 30	Flow low limit	0	200 or 999	0=OFF	m ³ /h / GPM
# 31	Flow K-factor	0.001	655	0.01	---
# 32	Total alkalinity	0	600	0	ppm
# 33	Total Hardness	0	600	0	ppm
# 34	TDS	0	5000	0	ppm
# 35	Language	---	---	English	---
# 36	SYSTEM RESET	---	---	---	---



5.3 Technician Menu

NOTE:

The technician menu includes advanced parameter settings and accessible separately from the operational menu. Anyone can view the settings, however, only someone with the technician password can make changes in the technician menu.

NOTE:

Entering into the technician menu is simple. Press menu to enter into the operator menu. When in the operator menu, press the up and down arrows simultaneously. The first function in the technician menu will be #51.

NOTE:

Changing settings in the technician menu is similar to changing settings in the operator menu. Only technician password is allowed in order to make changes.

Each of the parameters in the technician Menu is configured in the same way. The following procedure describes how to configure a typical setting:

1. Press menu to enter into the operator menu. When in the operator menu, press the up and down arrows simultaneously.
2. Locate the desired parameter in the menu:
 - a) Press Menu until the desired parameter name appears in the LCD display.
3. Press OK. "Enter Password 100" appears in the LCD display.
4. Enter the technician password 456 (only technician password is accepted).
5. Press the up arrow or down arrow until the password number is reached.
6. Press OK to accept the password. The parameter's name and current setting appear in the LCD display.
7. Press OK, again. The LCD display shows the parameter and the current setting.
8. Enter the new parameter setting:
 - a) Press the up arrow or down arrow until the desired value is reached.
 - b) The second row of the menu display, below the value that is being changed, shows the current value.
9. Press Enter to save the new setting or Esc to abort without saving the new setting. To change the settings of additional parameters, press menu until the desired parameter appears in the LCD display. Repeat steps 7-9 above to set the new parameter.

NOTE:

The factory-set technician password is 456. Restoration of the technician password is not possible. If lost, replacing the control panel card is required.

NOTE:

Holding Menu while pressing up or down will advance the first digit. Holding up or down for an extended period of time will proceed through the numbers more quickly.

NOTE:

The Menu button displays the next parameter in the list, so that the operator can check every parameter in the menu. There is no scroll-back option. To view or change a previous parameter in the menu, you must exit the menu by pressing Esc, and start the above procedure from the beginning.



TECHNICIAN MENU FUNCTIONS AND DESCRIPTIONS		
#	Function name	Description
# 51	Cl P factor	Proportional Factor for Cl Relay 1
# 52	Cl pump period	1 Pump cycle (on+off time) for Cl relay
# 53	Cl pump freq.	Cl pump max pulses/min, 0 for on/off pump
# 54	Cl averaging	Displays an average of the last 4 Cl readings
# 55	Cl sensor type	Not relevant for Free Cl.
# 56	pH P factor	Proportional Factor for pH Relay 3
# 57	pH pump period	1 pump cycle (on + off time) for pH relay 3
# 58	pH pump freq.	pH pump max pulses/min, 0 for on/off pump
# 59	pH balance type	Selection of Acid or Base to adjust pH
# 60	Flow sensor	Turns Flow sensor on/off (optional module)
# 61	Flow rate	Choose between metric and US units
# 62	Celsius / Fahrenheit	Choose between metric and US units
# 63	pH P factor	Proportional Factor for pH Relay 3
# 64	Turbidity	Turbidity module on/off (Ask SUPERIOR™)
# 65	NTU wiper interval	Cleaning interval for turbidity sensor
# 66	Turbidity range	Selection of turbidity measurement range
# 67	Conductivity range	Selection of conductivity measurement range
# 68	Minutes	Current time for Data Logger
# 69	Hour	Current time for Data Logger
# 70	Day	Current time for Data Logger
# 71	Month	Current time for Data Logger
# 72	Year	Current time for Data Logger
# 73	Recording interval	Time interval for Data Logger
# 74	View Free Chlor	Displays measurement value on LCD
# 75	View pH	Displays measurement value on LCD
# 76	View Conductivity	Displays measurement value on LCD
# 77	View ORP	Displays measurement value on LCD
# 78	Address	Controller ID – used with remote comm.
# 79	Software ver.	Current SW version
# 80	Max Flow Range	Maximum Flow Rate of 4-20mA module
# 81	4-20 mA Output Settings	Configures 4/20 mA outputs
# 82	On Alarm go to	Configures 4/20 mA outputs
# 83	Blue I /Modbus. Format	Communication protocol
# 84	Operator password	Change operator's password
# 85	Technical password	Change technician's password

TECHNICIAN MENU AND VARIABLES LIMITS					
#	Function name	Min value	Max value	Default	Units
# 51	Cl P factor	0.1	50	1	---
# 52	Cl pump period	0.5	4	0:30	min
# 53	Cl pump freq.	0=on/off	120	0	Pulse/min
# 54	Cl averaging	OFF	ON	ON	---
# 55	Cl sensor type	1	2	1	---
# 56	pH P factor	0.1	100	1.0	---
# 57	pH pump period	0.5	4	0:30	min
# 58	pH pump freq.	0=on/off	120	0	Pulse/min
# 59	pH balance type	Acid	Base	Acid	---
# 60	Flow sensor	OFF	ON	OFF	---
# 61	Flow rate	m ³ /h	gpm	m ³ /h	---
# 62	Celcius / Fahrenheit	C°	F°	C°	---
# 63	Temperature sensor	---	---	Pt 100	---
# 64	Turbidity	OFF	ON	OFF	---
# 65	NTU wiper interval	1	60	2:00	min
# 66	Turbidity range	0	20	20	NTU
# 67	Conductivity range	0	5000	5000	µS/cm
# 68	Minutes	1	59	20	min
# 69	Hour	0	23	19	hour
# 70	Day	1	31	2	day
# 71	Month	1	12	8	month
# 72	Year	1	99	17	year
# 73	Recording interval	1	240	0:03	min
# 74	View Free Chlor	OFF	ON	ON	---
# 75	View pH	OFF	ON	ON	---
# 76	View ORP	OFF	ON	ON	---
# 77	View Conductivity	OFF	ON	OFF	---
# 78	Address	1	32	1	---
# 79	Software ver.	N/A	N/A	N/A	---
# 80	Max Flow Range	9	200/999	100	m ³ /h / gpm
# 81	4-20 mA Output Settings	See menu	See menu	See menu	See menu
# 82	On Alarm go to	2 or hold	20 or hold	2	mA
# 83	Modbus. Format	0	31	0	---
# 84	Operator password	1	999	123	---
# 85	Technical password	1	999	456	---

5.4 Calibration

Parameters must be calibrated with measurements taken with external testing devices. Always use digital calibration devices, not the less accurate visual test kits. Alternatively, standard solutions may be used. Make sure the standard solution is not expired or contaminated prior to using. Follow the procedures below as instructed.

NOTE:

Always take water for calibration from the sampling valve, NOT from the process line directly. The analyzer should always be calibrated with water from the same source.

5.4.1 Temperature Calibration

Calibration of temperature requires an accurate external thermometer.

1. Place the external thermometer in the flow cell or place both the PT-100 and thermometer in the same sample.
2. Wait for temperature readings to stabilize.
3. Press menu (Operator menu) until "Temp Calibrated to" (#17) appears in the LCD display.
4. Press OK.
5. Enter the password (operator or technician password). Press the up arrow or down arrow until the password is reached.
6. Press OK.
7. The value that appears is the last calibrated value.
8. Press OK again.
9. Press the up arrow or down arrow until the value is the same as the independent digital thermometer.
10. Press OK to save the new calibration or Esc to abort without saving.
11. Press Esc to return to the main display.



5.4.2 pH Calibration

pH is calibrated using an external testing device or Buffer solutions.

1. Shut off the water inlet and outlet from the flow cell.
2. Remove the pH sensor and temperature probe from the flow cell.
3. Wipe the sensor probe with a dry cloth and submerge it and the (PT-100) temperature sensor into a cup with a buffer 7 solution. Wait for the reading to stabilize.
4. Press menu until "pH 7 Calibrated to" (#10) appears in the LCD display.
5. Press OK.
6. Enter the password. Press the up arrow or down arrow until the password is reached.
7. Press OK.
8. Press OK again.
9. Press the up arrow or down arrow until the value is the same as the value printed on the buffer 7 solution.
10. Press OK to save the new calibration or Esc to abort without saving.
11. Press menu until "pH 4,10 Calibrated to" (#11) appears in the LCD display.
12. Press OK.
13. Enter the password. Press the up arrow or down arrow until the password is reached.
14. Press OK.
15. Press OK again.
16. Press the up arrow or down arrow until the value is the same as the value printed on the buffer 4 or 10 solution.
17. Press OK to save the new calibration or Esc to abort without saving.
18. Press Esc to return to the main display.

NOTE:

When calibrating pH using buffer solutions, the reading of the pH electrode will not stabilize if the temperature probe is not also in the buffer solution.



5.4.3 Chlorine Electrode Calibration

NOTE:

Calibrate the free chlorine sensor after operating at least 1 hour. Check for calibration after 24 hours of operation. If required, perform another calibration.

NOTE:

Reliable chlorine testing device is required for proper calibration of chlorine electrode.

1. Open the water sampling valve.
2. Test the water sample for chlorine using a digital photometer or other reliable external device.
3. Press menu until "Cl Calibrated to" (#6) appears in the LCD display.

The top line will display "Cl Calibrated to" and a number. The number displayed is the last value entered for the calibration.

The bottom line will display "Cl Sensor was" and a number. This number is the sensor reading without any calibration at the time of the last calibration.

If there is a large discrepancy between the above two numbers - the sensor was calibrated improperly or there is a problem with the analyzer.

The analyzer uses the calibrated value, as shown on the main screen, to determine dosing rates.

4. Press OK.
5. Enter the password. Press the up arrow or down arrow until the password is reached.
6. Press OK.
7. Press OK again.

The display will now show "Calibrate Cl to" on the top line and "Sensor Reading" on the bottom line.

The "Sensor Reading" is the current reading of the sensor with no calibration.

The "Calibrate Cl to" value is the new value which you want to set.

8. Press the up arrow or down arrow until the value is the same as the value given by the digital photometer.
9. Press OK to save the new calibration or Esc to abort without saving.
10. Press Esc to return to the main display.

NOTE:

Chlorine calibration should always be performed within 25% of the set point. If current chlorine level is 25% above or below the set point, do not perform calibration until the chlorine level is closer to the set point.

5.5 4 to 20 mA Output configuration

The WG-602 TCL analyzer includes 2 built-in 4/20 mA analog outputs that can be used for any of the measured parameters. If required, there is an option to add additional 4 outputs on the "Conductivity / NTU card". For additional information about the "Conductivity / NTU card" contact your local representative.

Set the 4-20 mA outputs

The menu for "4-20 mA output settings" is found in the technician menu (#81).

1. Enter the technician menu and scroll until "4-20mA output settings" appears in the LCD display (#81).
2. Press OK.
3. Enter the technician password and press OK.
4. Select "Built-in ch. # (1 or 2)" and press OK.
5. Select parameter (Cl for free chlorine reading, pH, etc.) and press OK.
6. Select "Set value for 4mA" and press OK.
7. Select "Set value for 20mA" and press OK.
8. Select "set test channel" (to be used for troubleshooting purposes or initial tests): 2mA, 4mA, 12mA, 20mA, and press OK.
9. Press Esc to return to the set-up menu and repeat the above steps for all active 4/20 mA outputs.

Set the 4/20 mA alarm

The menu for "On alarm go to" is found in the technician menu (#82).

This is the 4-20mA output value that will indicate whenever an alarm condition exists or communication between the analyzer and 4-20 module is interrupted.

1. Enter the technician menu and scroll until "On alarm go to" appears in the LCD display (#82).
2. Press OK.
3. Enter the technician password and press OK.
4. Press OK again.
5. Select the desired output 2mA, 4mA, 20mA, or hold and press OK.
6. Press Esc to return to the main display.

NOTE:

The alarm will not activate at low or high chlorine levels. It will only go on in case of low or no flow and /or when there is a communication failure between the analyzer and the mA output i.e. power failure.

Confirming operation and communication

Prior to connecting to the external monitoring or control system, it is best to confirm that all desired outputs are working properly using a digital multimeter. This must be done without output wires connected to an external system. Set the multimeter to measure current and connect the multimeter to an active output (an output is inactive if it does not have a chipset installed next to the terminal block). Record the output in mA and confirm that the value is accurate using the following equation:

$$mA = [16 \times (\text{Measured Value} - \text{Min Value})] / [\text{Max value} - \text{Min Value}] + 4$$



6 Routine Operation and Maintenance

6.1 Filter Cleaning

The WG-602 FCL analyzer has a pre-filter installed in its water supply pipe, which collects particles and impurities. It should be cleaned or replaced periodically, depending on water quality. The filter is a washable disc filter. Open the filter cap and remove the discs. Separate the discs and wash them under flowing water. Place the disc back in the filter and close the filter cap.

6.2 Shut-down and Winterizing

If the analyzer will not be operating for an extended period of time or in areas where temperatures drop below freezing, all water must be removed from the analyzer to prevent components from breaking. The probes must be removed and stored in a warm area and kept wet at all times. Drain the flow cell completely and leave the valve in open position to allow complete drying. Check the controller doors to ensure maximal weather-proof and seal.

6.3 Start-up and Preventive Maintenance

A preventative inspection and cleaning of components should be completed whenever the analyzer is restarted after a long (> 2 weeks) downtime or at least annually if the analyzer is operating constantly. Likewise, the analyzer has several mechanical components that will wear out over time. To prevent future problems, these components should be checked and/or replaced periodically.

6.4 Chlorine Electrode Maintenance

6.4.1 Cleaning the electrode

Check the sensor regularly for dirt, algae and bubbles. If the membrane is visibly soiled, remove the electrode from the flow cell. Clean the membrane mechanically with a gentle water jet or swirl solution of 2% hydrochloric acid (no other additives). If the membrane cannot be cleaned properly, replace the membrane.

6.4.2 Electrolyte Change

1. Unscrew the measuring chamber from the shaft.
2. Hold the measuring chamber at an angle and fill approximately 7 to 8 ml electrolyte, up to approximately 1 cm under the top edge.
3. Tap the filled chamber several times on a flat surface, so that adherent air bubbles can detach and rinse.
4. Screw the electrode shaft into the measuring chamber vertically from above, ensuring that all inside air is displaced.
5. As soon as the inserted O-ring begins to seal, tighten slowly to the stop.

NOTE:

Refill the electrode with every 6-12 months, or when unstable values displayed. Depending on the chlorine content on site, this period can be reduced or expended.

NOTE:

If the chlorine electrode continues to display unstable values, a new membrane cap must be used.

WARNING:

Do not swallow the electrolyte. Avoid contact of the electrolyte with skin or eyes. In case of accidental contact, wash with a lot of cold water!
In case of eye inflammation contact a doctor immediately. Wear safety glasses and gloves when working with the electrolyte solution.

CAUTION:

Do not touch or damage the electrolyte. The electrolyte is sensitive to oxidation: Always keep the electrolyte bottle closed after use. Do not transfer the electrolyte into other containers. The electrolyte should not be stored for more than one year and should be clear (not yellow) in appearance (use by date, see label). Avoid forming air bubbles when pouring the electrolyte into the measuring chamber.

6.4.3 Membrane Cap Change

1. Unscrew the measuring chamber from the shaft.
2. Unscrew the front screw cap holding the membrane.
3. Remove the old membrane and replace with a new membrane.
4. Refill the measuring chamber with electrolyte.

NOTE:

Change the membrane cap once a year, or when unstable values displayed.

NOTE:

If the chlorine electrode continues to display unstable values, a check / reconditioning by the manufacturer has to be done.



6.4.4 Storage

The chlorine electrode can remain in the flow cell for short term, as long as the flow cell is not drained. If this is not ensured, remove the electrode from the flow cell and place the yellow protection cap on top of the electrode to keep it wet. Make sure that the inner sponge inside the yellow protection cap is wet.

NOTE:

When maintaining chlorine electrodes, follow guidelines and information in user manuals and operating instructions that supplied together with the total chlorine electrode.

7 Technical Specifications

MEASURED PARAMETERS	
Chlorine electrodes	Free Chlorine standard range 0.05- 10 ppm or Free Chlorine low range 0.03-5* ppm
Flow Cell	Chlorine, pH, Temp, CRP
External connection	Turbidity or Conductivity
FREE CHLORINE (FC) MEASUREMENT	
Free Chlorine Electrode	Passive- operated Chlorine sensor with gold cathode & silver/silver chloride anode
Measuring Range	0.05- 10 ppm (standard)
Accuracy	± 2 % or ±0.01 ppm whichever is greater
Minimum Detection Limit	0.05 ppm
Resolution	0.01 ppm
Repeatability	1% span
Response time	Approx. 2 min
pH operation range	4 to 8
Body material	PVC
Membrane material	PTFE
pH MEASUREMENT	
Electrode	Ceramic diaphragm and gel filling
Measurement Range	0 to 12
Input impedance	0.5 x 1.12kΩ
ORP (REDOX) MEASUREMENT	
Sensor	Ceramic diaphragm and gel filling
Measurement range	0 to 2000 mV
TEMPERATURE MEASUREMENT	
Sensor	PT- 100
Measurement range	0°C to 100°C (32°F to 212°F)
ANLYZER FLOW MONITORING	
Flow sensor	Inductive proximity switch
FLOW MEASUREMENT (Main line)	
Measurement range	0- 1000 Cu.m/h (0- 11 Mgpd)
Frequency input	Via I/O card
Or 4- 20 mA input	Via NTU card



ELECTRICAL CONNECTION	
Power supply	100- 115 VAC, 50/60 Hz, 1.0 Amp 200- 230 VAC, 50/60 Hz, 0.5 Amp
Power consumption	Approx. 60 VA
Power supply for RTC	3.6V Lithium Battery memory (CR2032)
MECHANICAL DATA & DIMENSIONS	
Dimensions (controller) (L x W x D)	340 x 220 x 120 mm (14.0" x 7.0" x 5.0")
Dimensions (Mounting board) (L x W x D)	800 x 550 x 5 mm (31.5" x 21.7" x 0.2")
Weight (approx.)	9 kg (22 lbs.)
Display	5.5" graphic monochromatic display
Cable entries	PG9 cable Glands
Enclosure rating	IP 65 (NEMA 4 equivalent)
OPERATIONAL REQUIREMENTS	
Sample and drain connection	Pressurized sample inlet and gravity drain
Inlet Pressure	0.35- 1 bar (5- 14.5 psi)
Outlet pressure (Closed cell)	up to 0.9 bar (13 psi)
Measuring cell flow rate	35- 60 l/h (9- 16 gph)
Ambient temperature	2°C to 50°C (35.6°F to 122°F)
Sample temperature	1°C to 45°C (33.8°F to 113°F)
DATA OUTPUT	
Digital communication	RS485 Modbus OR BLUE I protocol
Local I/O	2 Standard 4- 20 mA outputs 4 or 6 Optional 4- 20 mA outputs
SECURITY	
Operation password	Yes
Technician password	Yes

RELAYS	
Cl (Chlorine) set point 1	250 VAC/DC8 Amp max**
Cl (Chlorine) set point 2	250 VAC/DC8 Amp max**
pH1	250 VAC/DC8 Amp max**
Turbidity control* 1	250 VAC/DC8 Amp max**
Temperature control	250 VAC/DC8 Amp max**
General Alarm	250 VAC/DC8 Amp max**
CHLORINE CONTROL #1	
Control function	PI or On/Off or frequency
Proportional band	Yes
Relay function	Pulse length proportional controller Pulse frequency proportional controller
CHLORINE CONTROL #2	
Control function	On/Off
Proportional band	No
Relay function	Pulse length proportional controller Pulse frequency proportional controller
pH VALUE CONTROL	
Control function	P or PI or On/Off or frequency
Characteristics	Normal / Inverted
Relay function	Pulse length proportional controller Pulse frequency proportional controller
ORP CONTROL	
Control function	High alarm as chlorine override

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