PULSE INSTRUMENTS

User Manual
PICL802 Free Chlorine Sensor
0 to 200 ppm

www.pulseinstrument.com

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1.0 INTRODUCTION

The Pulse PICL802 Free Chlorine Sensor is capable of measuring the disinfectant in clean water or in water contaminated with debris. The sensor should not be used in water containing surfactants, organic chlorine or stabilizers such as cyanuric acid, chlorine dioxide, ozone or bromine.

2.0 SPECIFICATION

Calibration	Weekly
Change Electrolyte	3-6 months
Change membrane cap	1 year
Electrical Power Requirements	24 VDC
Signal	4-20mA
Max cable length	1000 feet (305 meters)
Extension cable	2 conductor, 18 AWG, shielded cable
Mechanical Operating Temperature	0 to 45°C (32 to 113°F)
Operating Pressure	0 to 1 atmosphere (0 to 14.7 psi)
Storage Temperature	0 to 50°C (32 to 122 °F)
Shelf Life	3 years
Flow cell inlet	¼" NPTF
Flow cell outlet	¾" NPTF
Flow cell body	Isoplast
O-Ring	FKM

Free Chlorine/Bromine			
Range (Nominal)	**Range (WDIS)**	**Range (WMI,WIND)**	**Resolution**
0-2mg/l	0-1.33 mg/l	0-0.8 mg/l	0.001 mg/l
0-20mg/l	0-13.25 mg/l	0-8 mg/l	0.01 mg/l
0-200mg/l	0-132.5 mg/l	0-80 mg/l	0.1 mg/l
Sample Flow rate	30 to 100 liters/hour (0.13 to 0.44 gal/min)		
pH Range	6.8 – 8.0 (pH must be stable within ± 0.10)		
Conductivity Range	Up to 4% NaCl		
Response time	30 sec		
Conditioning time	60 min		

Free Chlorine/Bromine-Extended pH Range			
Range (Nominal)	**Range(WDIS)**	**Range(WMI,WIND)**	**Resolution**
0-20 mg/l	0-16.75 mg/l	0-10 mg/l	0.01 mg/l
Sample Flow rate	30 to 100 liters/hour (0.13 to 0.44 gal/min)		
pH Range	4.0-12.0		
Conductivity Range	50 to 10,000 µS/cm		
Response time	2 min		
Conditioning time	120 min		

3.0 ASSEMBLY

3.1 Sensor

The PICL802 Free Chlorine Sensor includes the sensor body, a 100-ml bottle of electrolyte fill solution, a replaceable membrane cap and abrasive paper.

3.2 Flow Cell

The flow cell consists of:

- a translucent flow cell body
- mounting nut and o-ring.
- washer set and o-ring.

4.0 INSTALATION

4.1 Assembling the Sensor

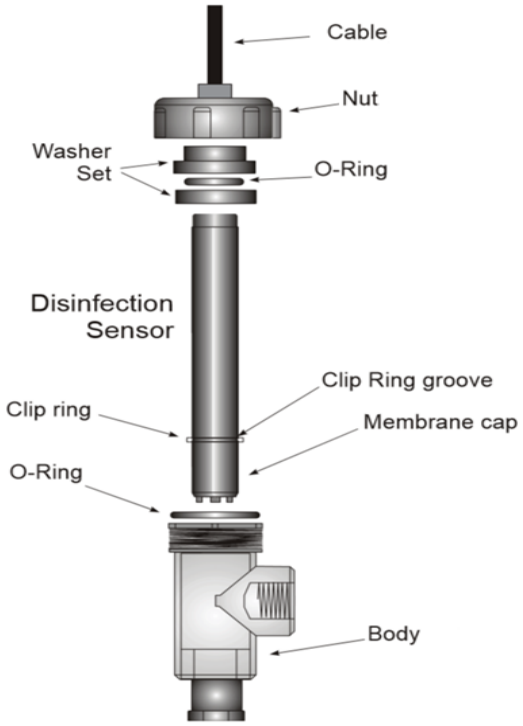
CAUTION: Wear gloves and safety glasses prior to assembling the sensor. When performing this operation, it is recommended to operate over a sink with running water available.


NOTE: Never touch the membrane as it may damage or produce inaccurate reading!

1. Slide the rubber band from the groove in the membrane cap just until the vent holes underneath is exposed, then un-screw the membrane cap and fill to the top of the line with the electrolyte solution. Be sure not to shake the electrolyte bottle as it must stay free of bubbles.
2. Hold the sensor body vertically with the tip pointing down and SLOWLY screw on the membrane cap until it is hand tight. Be aware that some of the solution will squeeze out from the vent hole in the cap.
3. Check sensor for any leaks at the membrane cap and the membrane cap threads. If any leaks are detected, tighten the membrane cap or replace it. Move the rubber band back into the groove. Never remove the membrane cap with rubber band covering the vent hole, or the membrane will be damaged.
4. Push the 4-20mA cable through the end of the sensor top cap. Hook up the red lead to + and black into – terminal of the sensor.
5. Make sure to turn the connector until hand tight to seal the cable connection.

4.2 Installing Sensor into Flow Cell (small)

1. Assemble the flow as shown below from top down.
2. Slide the bottom washer (concave side up) over the cable end of the sensor, followed by the O-ring, followed by the top washer (concave side down), followed by the nut.
3. Place the O-ring in the top o-ring groove of the flow cell body.
4. Place the sensor body into the flow cell body, and tighten the nut until it is hand-tight. Before tightening completely, pull the sensor up until the clip ring is up against the bottom washer.
5. Loosen up the cap on the end of the sensor and run the 2-conductor shielded cable through the cord grip on the cap. Using a small screwdriver, connect the red wire to the + terminal and the black wire to the – terminal. Retighten cap and tighten the cord grip until it is snug.

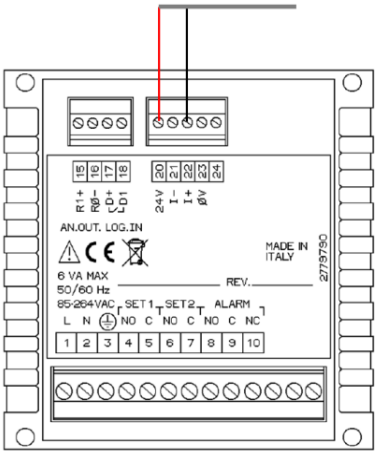


4.3 Installing Sensor into Flow Cell (bowl type)

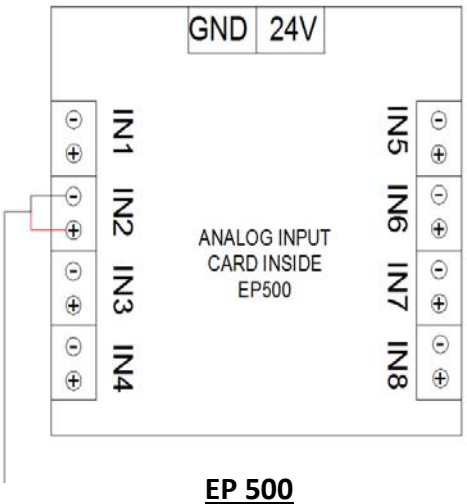
Loosen up the gray compression fitting at the top of the flow cell bowl. Insert the assembled sensor through the compression fitting until there is about 3” of the sensor remaining outside of the flow cell. Tighten the compression fitting. Loosen up the cap on the end of the sensor and run the 2-conductor shielded cable through the cord grip on the cap. Using a small screwdriver, connect the red wire to the + terminal and the black wire to the – terminal. Retighten cap and tighten the cord grip until it is snug.

4.4 Electrical Installation

The sensor produces an approximate output of 4 mA in air and 20mA at the top range of free chlorine output (0-200ppm)



7635 Controller



EP 500

5.0 SENSOR CONDITIONING

The sensor requires conditioning prior to generating stable values.

Recommended conditioning times:

New Sensor	12 – 24 hours
After membrane or electrolyte replacement	1-3 hours (See SPECIFICATIONS)

6.0 CALIBRATION

On initial installation, a calibration must be performed or after cleaning or replacing the membrane or electrolyte. The following conditions must be met prior to calibrating the sensor:

- The sensor has been conditioned as described above.
- The sensor has equilibrated to the temperature of the sample (for 1 point process calibration) or the water (for the zero calibration).

6.1 One Point Process Calibration

1. Ensure the calibration conditions from above have been met and that the sample flow rate is between 30 and 100 liters/hour.
2. Perform a DPD test or other manual analysis on the water sample.
3. Go to the One Point Process Calibration menu of the controller. Refer to the controller instructions.
4. Once reading is stable, continue to the final steps of calibration.

6.2 Zero Calibration

1. Remove sensor from flow cell and place it in a beaker of, oxidizer-free water.
2. Allow 15 minutes for sensor to equilibrate to the water temperature.
3. Go to the Zero Calibration menu of the controller. Refer to controller instructions.

4. Stir the water with the sensor until the mV reading is stable for at least 5 minutes.
5. Once reading is stable, continue to the final steps of the calibration.
6. Return the sensor to the flow cell and check for leaks.

7.0 TROUBLESHOOTING

The disinfectant reading is LOWER than the manual analysis.

PROBABLE CAUSES	CORRECTIVE ACTIONS
Insufficient conditioning	Wait for the appropriate amount of time before attempting a calibration.
Insufficient sample flow	Increase flow rate to between 30 and 100 liter per hour.
Air bubbles on membrane	Dislodge bubbles. Adjust flow rate higher if necessary.
Dirty membrane	Clean membrane.
Loose membrane cap	Tighten membrane cap.
Faulty membrane	Replace membrane cap.
High Pressure	Reduce pressure to below 1 atmosphere and refill cap with electrolyte.
No electrolyte fill solution in membrane cap.	Fill membrane cap with electrolyte. Replace membrane cap if it will not hold solution.
Faulty analysis equipment or reagents	Consult test equipment instructions.
Faulty sensor	Replace sensor.

The disinfectant is much HIGHER than the manual analysis.

PROBABLE CAUSES	CORRECTIVE ACTIONS
Insufficient conditioning	Wait for the appropriate amount of time before attempting a calibration.
Faulty membrane	Replace membrane cap.
Faulty sensor	Replace sensor.
Faulty analysis equipment or reagents	Consult test equipment instructions.
Sample contaminated with interfering molecule (refer to SPECIFICATIONS.)	Remove source of contamination.

The message displays “Sensor Error”.

PROBABLE CAUSES	CORRECTIVE ACTIONS
Faulty wiring.	Check wiring.
Faulty sensor.	Replace sensor.
Faulty controller sensor input	Go to Sensor input menu and perform a self-test. If this passes, then the problem is with the wiring or the sensor. If it fails, then disconnect the sensor from the circuit board and try the self-test. If it still fails, replace the circuit board.

Disinfectant reading is unstable.

PROBABLE CAUSES	CORRECTIVE ACTIONS
Air bubbles on membrane.	Dislodge bubble. Adjust flow rate higher if necessary.
Air bubbles in electrolyte	Refill membrane cap with electrolyte.
Faulty membrane	Replace membrane cap.
Faulty wiring	Check wiring.
Faulty controller sensor input	Go to Sensor input menu and perform a self-test. If this passes, then the problem is with the wiring or the sensor. If it fails, then disconnect the sensor from the circuit board and try the self-test. If it still fails, replace the circuit board.

8.0 MAINTENANCE

8.1 Cleaning the Membrane

NOTE: Do not use cleaners or detergents containing surfactants on the membrane, as these will reduce the life of the membrane.

Instructions for cleaning the membrane vary depending upon the type of contamination.

- For general deposits, rinse in cold water.
- For calcium scale, soak in dilute (1% by volume) hydrochloric acid, then rinse in cold water.
- For oils, Rinse in isopropyl alcohol.

8.2 Replacing the Membrane

CAUTION: Wear gloves and safety glasses prior to assembling the sensor. When performing this operation, it is recommended to operate over a sink with running water available.

Note: Always remove the rubber band to expose the vent holes before removing the membrane cap, or else the membrane will be destroyed.

1. Slide the rubber band away from the groove to have the vent holes exposed.
2. Hold the sensor body vertically with the membrane facing down and carefully unscrew the membrane cap.
3. With cold water, rinse the electrolyte fill solution off the cap and electrodes.
4. Discard the membrane cap.
5. Unpack the new membrane cap without touching the membrane or getting it dirty.
6. Fill the membrane cap to the top of the line with the electrolyte solution.
7. Hold the sensor body vertically with the tip pointing down and SLOWLY screw on the membrane cap until it is hand tight. Be aware that some of the electrolyte solution will squeeze out from the cap.
8. Rinse your hands, the sensor, and all surfaces contaminated with electrolyte solution with running water.

9. Check sensor for any leaks at the membrane cap and the membrane cap threads. If any leaks are detected, tighten the membrane cap or replace it. Move the rubber band back into the groove.

9.0 SENSOR STORAGE

The sensor may be stored for up to a month in the flow cell as long as the membrane is submerged in water.

CAUTION: Wear gloves and safety glasses prior to assembling the sensor. When performing this operation, it is recommended to operate over a sink with running water available.

For long term storage (up to 3 years):

Note: Always move the rubber band to expose the vent holes before removing the membrane cap, or else the membrane will be destroyed.

1. Slide the rubber band away from the groove to have the vent holes exposed.
2. Hold the sensor body vertically with the membrane facing down and carefully unscrew the membrane cap.
3. Rinse the electrolyte fill solution off the cap and electrodes with cold water.
4. Allow parts to air dry.
5. Loosely screw the membrane cap back on and store the sensor in a clean dry place. The electrode tip must not touch the membrane.
6. The old membrane cap used to protect the sensor during storage must be discarded and replaced when the sensor is put back into service.

10.0 REPLACEMENT PARTS

MAINTENANCE/REPLACEMENT PARTS
Replacement Electrolyte, 100mL - #103474
Replacement Membrane/Cap - #103463