Digital Residual chlorine sensor

BH-485-CL2407

Operational Manual

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Catalogue

Chapter 1 Product specifications

1.1 Technical Indexes

Specification		Details
Measure parameter		HCLO、CLO2
Measuring system		Microelectronics MEMS technology, special membrane structure
Measuring range		0-2ppm/0-5ppm
Accuracy @25℃ pH7.2	0-2ppm	≤0.1mg/L，absolute error ±0.01mg/L 0.1≤X≤2mg/L，±5% of measure value or ±0.03mg/L（use the maximum value）
	2-5ppm	±5% of measure value or ±0.25mg/L（use the maximum value）
Resolution(ppm)		0.01
Polarization time		First time using, please pass water for 2 hours in chlorinated water, and then power on for half an hour.
Response time		Less than 30s after polarization
Minimum Conductivity		≥100μS /cm，cannot use in ultra pure water
Working Temp		0~40℃（No Condensation）
Temp compensation		PT1000，Integrated with sensor
Max Pressure		10bar
Recommend Flow		≥10L/h，（In FCL-2 flow cell）
PH range		5-9，Below 5 will damage the membrane will damage when pH value less than 5
Power Supply		12V DC±2V (support customization）
Power consumption		1.5W Min power consumption:0.5W Recommended power supply capacity: 1.5W
Communication		MODBUS RS485
Cable length		3 meters for standard (support customization）
Sensor Weight		210g
Sensor size		Refer to pic1 on fourth page
Thread size		NPT 3/4
Connection		5-pin waterproof aviation plug
Moisture-proof material		PVC or Viton® O-ring seal

Warranty	2 years for sensor, no warranty for membrane as it is Consumables
Maintenance	The replacement cycle of the membrane cap is one year (depending on the water quality)

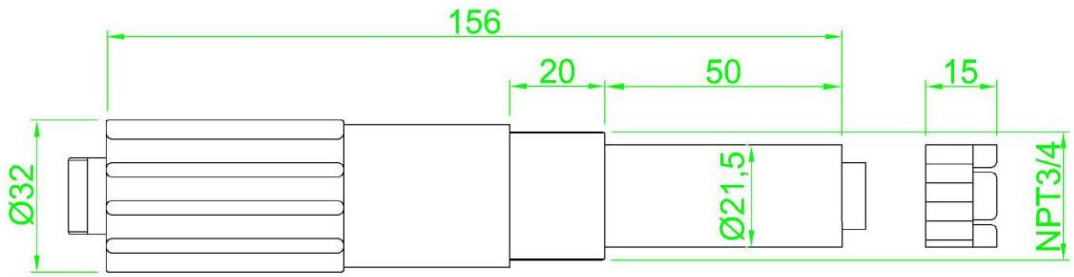
Chapter 2 Product Introduction

2.1. Product Description

Different from other electrodes in the market, this sensor uses silicon nitride-covered photopolymer film and silicon crystal semiconductor as conductive elements, built-in chlorine and temperature probes, and injects and encapsulates microelectronic components through MEMS technology. As the concentration of free chlorine or chlorine dioxide in the water sample changes, the sensor generates different current intensities, which are processed by the voltage stabilizer and signal amplifier, and converted into standard MODBUS RS485 signals.

There is no need to replace reagents during the use of the sensor, and the maintenance is simple, ensuring the stability, reliability and accuracy of the long-term operation of the instrument. It can be used in water plants, rural drinking water, water stations, secondary water supply and other fields.

2.2. Sensor Structure



Pic1：Sensor Dimension

Chapter 3 Installation

3.1. Sensor flow cell installation

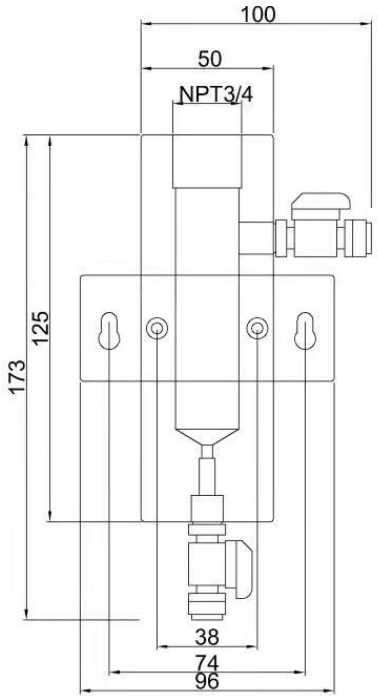
Installation Steps:

1、Use screws to fix the flow cell to the wall or panel;

2、Screw the residual chlorine sensor into the flow cell;

3、Use 6mm water pipes to connect to the water inlet and outlet of the flow tank;

4、Refer to Figure 2 for a dimensional drawing of the flow cell.



Pic2：Flow cell dimension

3.2. Sensor Connection

The sensor is connected correctly according to the following wire core definitions:

Wire core no	**1**	**2**	**3**	**4**	**5**
Sensor wire	Red	Black	Yellow	Green	White
Signal	POWER+	POWER-	RS485 A	RS485 B	GND

Chapter 4 Operation Instruction

4.1 Hydration polarization before use

After long standing or before first using, install the sensor in the flow cell, then connect the inlet and outlet water circuits, and hydrate for at least 2 hours (the sensor is not powered during the hydration process).

After the hydration is completed, the sensor is energized for 30 minutes to 1 hour for electrode polarization, and the value can be read after the observed value becomes stable.

Attention：

1) Insufficient hydration time will cause short-term instability and even reduce the performance of the sensor. When allowed, it is recommended to hydrate for more than 12 hours, and the measurement effect is better.

2) If the hydration time is insufficient or the power is applied before contact with the solution, the calibration value of the sensor may be changed.

3) When the sensor is used again after drying and storage, it still needs to be hydrated and polarized again before it can be used.

4.2 Working Condition

1、The sensor must work in flowing water, flow cell or pipe plug-in installation.

2、The sensor must be placed in water. Long-term power on without water will damage sensor.

3、Sensors that are energized and used in water that is sometimes absent will shorten the life of the sensor.

4、Air bubbles in the flow cell or piping can cause low or fluctuating values, so avoid air bubbles.

5、The sensor is not suitable for measuring deionized water.

6、The residual chlorine sensor will be cross sensitive to chlorine dioxide, ozone and hydrogen peroxide. Among them, hydrogen peroxide will significantly shorten the life of the sensor.

7、When it is used to detect residual chlorine produced by electrolysis of salt water, the sampling point should be at a sufficient distance from the dosing point to avoid

damage to the sensor silicon membrane caused by hydrogen ions released during electrolysis.

Chapter 5 Communication

The sensor is MODBUS RS485 communication, please refer to 3.3 of this manual for the communication wiring. Specific MODBUS-RTU table is as follows.

MODBUS-RTU	
Equipment ID	Default ID 1
Baud Rate	19200
Data Bit	8 bits
Verification Bit	No verification
Stop Bit	1

Data Type	
Float	Big Endian（ABCD）
Unsigned char [...]	Big Endian (AB)

Command type	
Command	Function
0x03	Read Holding Registers (16-bit)
0x10	Write to multiple registers

Data Instruction

Communication setting						
Register address	**Access method**	**Data types**	**Parameter**	**Data range**		**Default value**
0x0016	R/W	Unsigned char [...]	ID	1-254		1
0x0017	R/W	Unsigned char [...]	Baud Rate	3	9600	4
				4	19200	
0x0015	R/W	Unsigned char [...]	Decimal	0-4		2

			places		

Measuring Data			
Register addresses	**Access method**	**Data types**	**Parameters**
0x0000	R/O	Float	Chlorine concentration/ppm L
0x0001			Chlorine concentration/ppm H
0x0002	R/O	Float	Hypochlorous acid concentration/ppm L
0x0003			Hypochlorous acid concentration/ppm H
0x0004	R/O	Float	Temp L
0x0005			Temp H

Calibration parameters					
Register addresses	**Access Method**	**Data Types**	**Parameters**	**Data range**	**Default value**
0x000A	R/W	Float	pH compensation L	5~9	7.5
0x000B			pH compensation H		
0x000C	R/W	Float	Chlorine Bias/ppm L	-5~5	0
0x000D			Chlorine Bias/ppm H		
0x000E	R/W	Float	Temp Bias L	-5~5	0
0x000F			Temp Bias H		
0x0010	R/W	Float	Chlorine zero point voltage L		
0X0011			Chlorine zero point voltage H		
0x0012	R/W	Float	Chlorine sensitivity L		
0x0013			Chlorine sensitivity H		
0x0031	R/W	Float	Zero point calibration L		0
0x0032			Zero point calibration H		
0x0033	R/W	Float	sensitivity calibration L		0
0x0034			sensitivity calibration H		

Equipment data					
Register addresses	**Access Method**	**Data Type**	**Parameter**	**Data Range**	**Default value**
0x0015	R/W	Unsigned char [...]	Decimal places	0-4	2
0x001A-0x0022	R/O	Character [16]	Data type	BH-485-CL2407	
0x0023-0x002A	R/O	Character [16]	Sensor No	M710459	

Internal parameter			
Register addresses	**Access Method**	**Data Type**	**Parameter**
0x0006	R/O	Float	Temp voltage/ppm L
0x0007			Temp voltage/ppm H
0x0008	R/O	Float	Chlorine voltage/ppm L
0x0009			Chlorine voltage/ppm H
0x004A	R/O	Float	Factory zero voltage L
0x004B			Factory zero voltage H
0x004C	R/O	Float	Factory sensitivity L
0x004D			Factory sensitivity H

Chapter 6 Calibration

The sensor has been calibrated when it leaves the factory, and the output value is the actual residual chlorine value or chlorine dioxide value after the data is compensated for temperature and pH. Among them, the temperature compensation is automatic compensation, and the pH compensation is manual compensation (to be written). When using on-site, when the sensor is already in normal working state, it is necessary to confirm the specific data of the pH of the water in the field, and make compensation and correction by modifying the pH compensation value (the default value is 7.5).

When the pH correction still cannot meet the accuracy requirements, one-key calibration can be performed by modifying the value in the zero point calibration/sensitivity calibration register. Input the value measured by DPD into the

corresponding register in floating-point form to automatically correct the electrode zero value/sensitivity value, so as to achieve the function of single-point calibration. The calibration principle is that when the displayed value is less than 0.1mg/L, perform zero calibration; when the displayed value is greater than or equal to 0.1mg/L, perform sensitivity correction

Chapter 7 Maintenance

In order to obtain the best measurement results, regular maintenance and upkeep are required. Maintenance and upkeep mainly include cleaning the sensor and flow cell, replacing the membrane cap, and checking whether the sensor is damaged.

7.1 Cleaning sensor and Flow cell

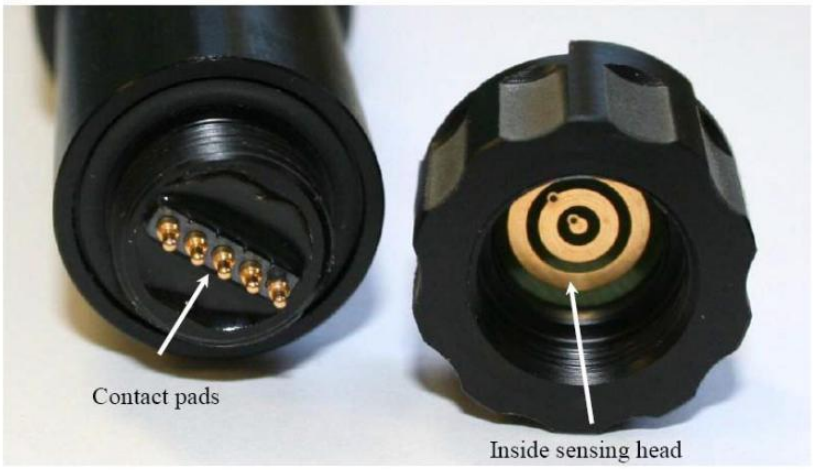
After long-term use of the sensor, the surface and membrane head will be stained. Please do regular maintenance according to the actual situation to ensure the accuracy of the measurement. When cleaning the electrode, only use water to rinse it, and it is not allowed to wipe the sensor membrane head with any chemical or physical method.

If the flow cell turns yellow and gray, it can be wiped with detergent and a brush to remove stubborn stains after rinsing. The flow cell is made of plexiglass, do not wipe it with alcohol.

7.2 Sensor membrane replace

It is not allowed to touch the silicon wafer of the sensor by hand during the replacement process. Water should also be prevented from entering the membrane cap.

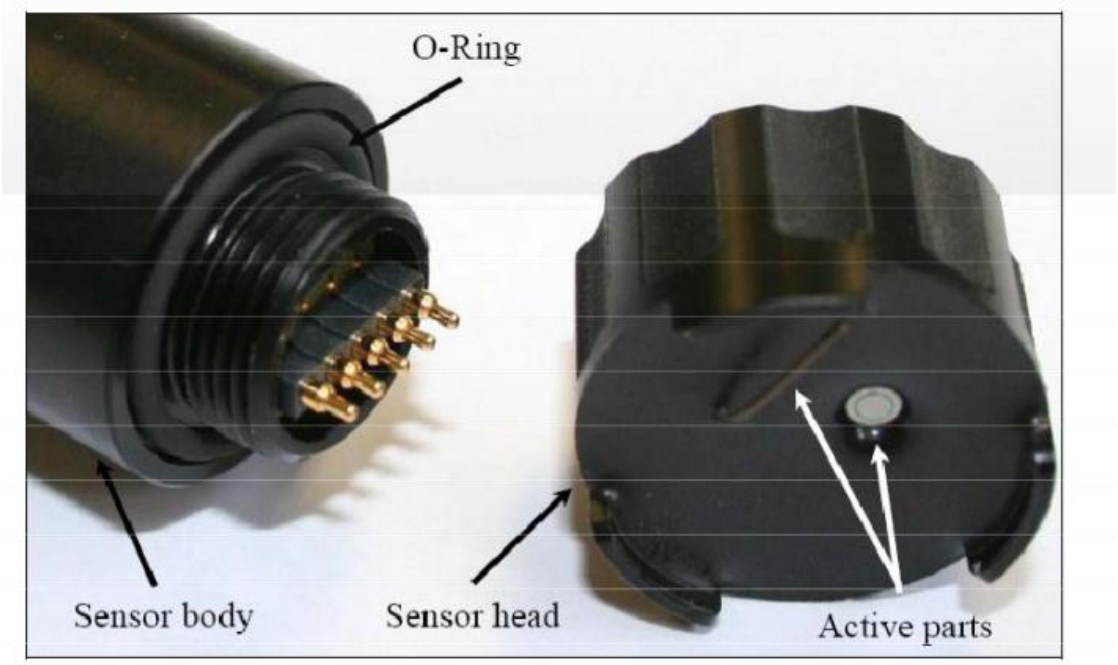
Do not allow water to enter the interior of the sensor probe or into the internal pins.



- Dry it without touching the sensor active part.
- It is important to dry the sensor properly and have dry hands as no water should enter

in the sensing head.

- Unscrew the head.
- Make sure the O-ring is still in place and properly installed.
- Take a new sensing head.
- Screw it on the sensor body.
- Make sure you have screw the head to the maximum to assure water tightness



Chapter 8 Problems and solutions

Common problems and solutions

Problems	Solutions
No response when powered on	Check whether the power supply 12VDC is normal and whether the wiring is
No response after replacing the membrane cap	Check whether the membrane cap is tightened, and re-tighten the membrane
After used and storage, the response time is slow when used again	Put the sensor into 2~3ppm chlorinated water and hydrate for 12 hours

Note: If you have other problems that cannot be solved, please contact our after-sales service or technical support department