ATO

ORP Sensor for Water Quality

User Manual

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User Notes

- Please read the instruction carefully before using and save it for reference.

- Please follow the instructions and precautions.

- When receiving the instrument, please open the packaging carefully, inspect equipment's damage level in case of transportation, if you found spoiled equipment, please immediately notify the manufacturer and distributor, and retain the packaging, in order to send back to processing.

- When the instrument is in trouble, please don't repair it by yourself, please directly contact the maintenance department of the manufacturer.

Content

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Ⅰ、Application environment

Used in environmental water quality monitoring, acid/alkali/salt solution, chemical reaction process, industrial production process, it can meet the requirements of online ORP measurement for most industrial applications.

- Signal output: RS-485 (Modbus/RTU protocol).
- Convenient connection to third-party equipment such as PLC, DCS, industrial control computer, general controller, paperless recording instrument or touch screen.
- Double high-impedance differential amplifier with strong anti-interference and fast response.
- The patented ORP electrode, the internal reference solution oozes extremely slowly from the microporous salt bridge under the pressure of at least 100KPa (1Bar), and its forward bleed continues for more than 20 months. Such a reference system is very stable and the electrode life is extended by a factor of two compared to conventional industrial electrodes.
- Easy to install: 3/4 NPT pipe thread for easy submersible installation or installation in pipes and tanks.
- IP68 protection level.

Ⅱ、Technical performance and specifications

1. Technical parameter

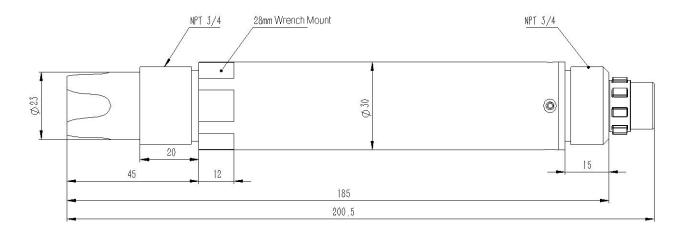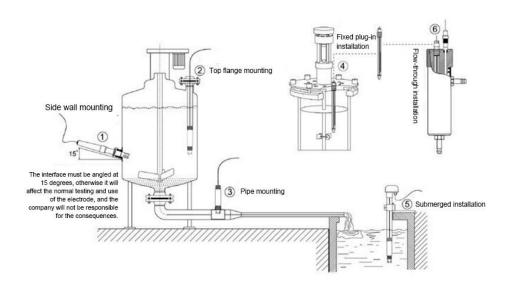| Model	ORP-406-A	
Measuring Range & resolution	-2000～+2000 mV	1
Accuracy	±6mV	
Working temperature	0～50℃	
Working pressure	≤0.2 MPa	
Power supply	12～24VDC	
Signal output	RS-485(Modbus/RTU)&4-20mA(Optional)	
Wetted material	POM and ABS	
Installation	Submerged installation, 3/4 NPT thread	
Cable length	5 meters, other lengths can be customized	
Calibration	One point calibration	
Power consumption	0.2W@12V	
Protection grade	IP68	

2. Dimensional drawing

Note: The sensor connector is m16-5 core waterproof connector male.

Ⅲ、Installation and electrical connection

1. Installation

Note: The sensor should not be installed upside down or horizontally when installed, at least at an angle of 15 degrees or more.

2. Electrical connection

a) Red line - power cord (12 ~ 24 VDC)

b) Black line - ground (GND)

c) Blue line - 485A

d) white line - 485B

E)Yellow wire - current output (if not used, can be left open)

Chemins Technology

After wiring is completed, it should be carefully checked to avoid incorrect connections before powering up.

Cable specification: Considering that the cable is immersed in water (including sea water) for a long time or exposed to the air, all the wiring points are required to do waterproof treatment, the user cable should has certain corrosion resistance.

Ⅳ、 Maintenance

1. Use and maintenance

When measuring the ORP electrode, it should be cleaned in distilled water (or deionized water) first, and the filter paper should be used to absorb moisture to prevent impurities from being introduced into the liquid to be tested. 1/3 of the electrode should be inserted into the solution to be tested.

The electrode should be washed when not in use, inserted into a protective cover with a 3 mol/L potassium chloride solution, or inserted into a container with a 3 mol/L potassium chloride solution. Check if the terminal is dry. If it is stained, wipe it with absolute alcohol and dry it. Avoid long-term immersion in distilled water or protein solution and prevent contact with silicone grease. With a longer electrode, its glass film may become translucent or with deposits, which can be washed with dilute hydrochloric acid and rinsed with water. The electrode is used for a long time. When a measurement error occurs, it must be calibrated with the meter to correct it.

When the calibration and measurement cannot be performed while maintaining and maintaining the electrode in the above manner, the electrode has failed. Please replace the electrode.

2. ORP standard solution preparation method

a) ORP standard solution 256mV preparation method
2.1 g of hydrazine was weighed into 200 mL of a standard pH buffer solution having a pH of 4.00 and mixed.

b) ORP standard solution 86mV preparation method
Weigh 2.1 g of hydrazine to 200 mL of a standard pH buffer solution with a pH of 6.86 and mix.

c) ORP standard solution -40mV preparation method
Weigh 2.1 g of hydrazine to 200 mL of a standard pH buffer solution with a pH of 9.18 and mix.

Note that when preparing the pH, a total of 250 mL is prepared, and 200 mL is used for use.

pH to prepare the corresponding standard solution method:
Take 250mL of distilled water from a measuring cylinder, pour it into a beaker, add a packet of calibration powder with pH=6.86/4.00/9.18, stir evenly with a glass rod until the powder is completely dissolved, and prepare a solution with pH=6.86/4.00/9.18.

3. Calibration

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Place the sensor in the prepared 86mV (or 256mV or -40mV) solution and wait for 3 to 5 minutes. After the value is stable, see if the displayed value is 86mV (or 256mV or -40mV). If not, calibration is required. See the appendix for calibration instructions.

Ⅴ、 Quality and service

1. Quality assurance

- The quality inspection department has standardized inspection procedures, advanced and perfect testing equipment and means, and strictly in accordance with the regulations, to do 72-hour aging test and stability test on the product, and not to allow one unqualified product to leave the factory.
- The receiving party directly returns the product batch with a failure rate of 2%, and all the costs incurred are borne by the supplier. The reference standard refers to the product description provided by the supplier.
- Guarantee the quantity of goods and the speed of shipment.

2. Accessories and spare parts

This product includes:
- 1 sensor
- 1 copy of the manual
- 1 certificate
- 1 Cable(5 meters)

3. After-sales service commitment

The company provides local after-sales service within one year from the date of sale, but does not include damage caused by improper use. If repair or adjustment is required, please return it, but the shipping cost must be conceited. Damaged on the way, the company will repair the damage of the instrument for free.

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Appendix data communication

1. Data Format

The default data format for Modbus communication is: 9600, n, 8, 1 (baud rate 9600bps, 1 start bit, 8 data bits, no parity, 1 stop bit).

Parameters such as baud rate can be customized.

2. Information frame format

a) Read data instruction frame

04	03	xx xx	xx xx	xx xx
Address	Function code	Register address	Number of registers	CRC check code (low byte first)

b) Read data response frame

04	03	xx	xx......xx	xx xx
Address	Function code	Bytes	Answer data	CRC check code (low byte first)

c) Write data instruction frame

04	06	xx xx	xx xx	xx xx
Address	Function code	Register address	Write data	CRC check code(low byte first)

d) Write data response frame (same data command frame)

04	06	xx xx	xx xx	xx xx
Address	Function code	Register address	Write data	CRC check code (low byte first)

3. Register address

Register address	Name	Instruction	Number of registers	Access method
40001 (0x0000)	Measured value	Two double-byte integers, which are measured values and measured decimal places.	2（4 bytes）	Read
44097 (0x1000)	Zero calibration	Calibrate in the standard solution and write the data to the actual value of the standard solution.	1（2 bytes）	Write
44103	Zero	Returns the zero	1（2 bytes）	Read

(0x1006)	calibration value	calibration value.		✈
48195 (0x2002)	Device address	Default address is 4, data range is 1-255.	1（2 bytes）	Write/ Read
48196 (0×2003)	baud rate	Default is 9600.0-9600,1-19200.	1（2 bytes）	Write/ Read
48225 (0x2020)	factory reset	Restore calibration values to factory settings, write data to 0. Note that the sensor must be calibrated again after reset before use.	1（2 bytes）	Write

4. ommand example

a)Start measurement command
Function: Get the ORP measured by the sensor. The unit of ORP is mV.
Request frame: 04 03 00 00 00 02 C4 5E
Response frame: 04 03 04 00 78 00 00 2F 2A
Reading example:

ORP value
00 78 00 00

For example, ORP value: 00 78 represents the ORP value in hexadecimal reading, 00 00 represents the ORP value without a decimal point, and the converted decimal value is 120.
b) Calibration instructions
The ORP sensor requires only one point of calibration. Before calibrating with another calibration fluid, the latter calibration fluid must be used to clean the electrode, otherwise it will cause large test errors.
In the prepared 86mV or 256mV standard solution, enter the corresponding calibration instructions.
The standard liquid is 86mV:
Request frame: 04 06 10 00 00 56 0D 61;
Response frame: 04 06 10 00 00 56 0D 61;
The standard liquid is 256mV:
Request frame: 04 06 10 00 01 00 8C CF;
Response frame: 04 06 10 00 01 00 8C CF.
Note: ORP values have negative values, and the response data is greater than 0x7FFF (decimal: 32767), then the actual measured value = response data-0xFFFF; for example, the calculation

method of -40mV is: the response data is 0xFFD7, then the actual measured value = 0xFFD7-0xFFFF=65495- 65535=-40.

c)Set device ID address

Function: Set the Modbus device address of the sensor;

Change the sensor address 04 to 01, the example is as follows

Request frame: 04 06 20 02 00 01 E2 5F

Response frame: 04 06 20 02 00 01 E2 5F

5. Error Respond

If the sensor does not correctly execute the host command, it will return the following format information:

Definition	Address	Function code	Code	CRC check
Data	ADDR	COM+80H	xx	CRC 16
Number of bytes	1	1	1	2

a) CODE: 01 –Function code error

03 – Data is wrong

b) COM: The received function code