

RDO-206 Online Fluorescence Dissolved Oxygen Sensor User Manual



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User Notes

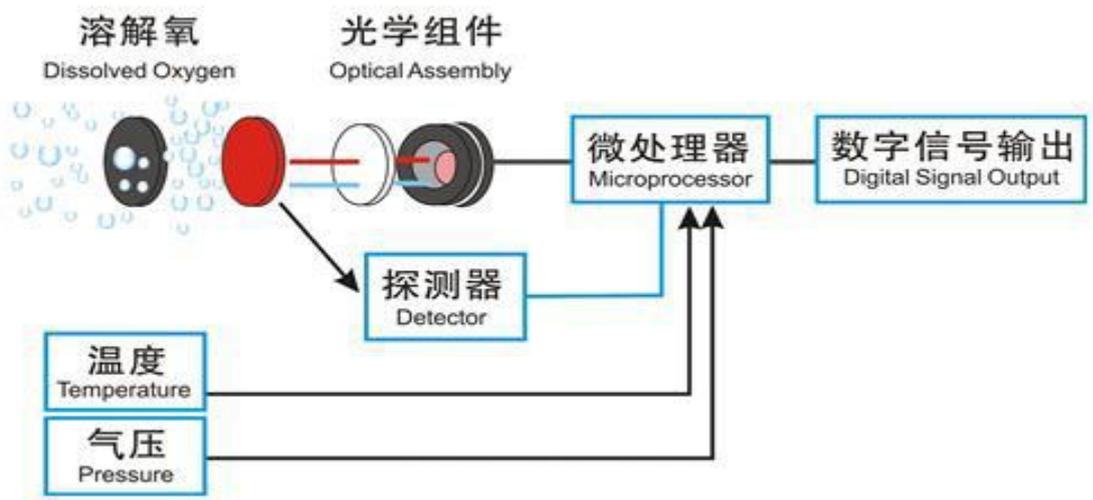
- Please read this manual in detail before using it and save it for reference.
- Please abide by the operating procedures and matters needing attention in this manual.
- When receiving the instrument, please carefully open the package and check whether the instrument and accessories are damaged by shipping. If any damage is found, please inform the manufacturer and distributor immediately and keep the package for return for processing.
- When the instrument fails, please do not repair it on your own, please contact the maintenance department of the manufacturer directly.

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I 、 Operational Principle

RDO-206 integrated on-line fluorescence dissolved oxygen sensor is designed and fabricated based on the quenching principle of excited fluorescence by specific substances in physics. The blue light emitted by the light emitting diode (LED) irradiates on the fluorescent substance on the inner surface of the fluorescent cap, and the fluorescent material on the inner surface is excited and emits red light. by detecting the phase difference between the red light and the blue light and comparing it with the internal calibration value, the concentration of oxygen molecules is calculated, and the final value is automatically compensated by temperature.



- No electrolyte is required and will not be polarized.
- No oxygen consumption, not affected by flow rate.
- Built-in temperature sensor, automatic temperature compensation.
- Free from interference by chemicals such as sulfides
- Small drift, rapid reaction, more accurate measurement.
- Maintenance-free, long service cycle, lower cost of use.
- Simple replacement of fluorescent cap

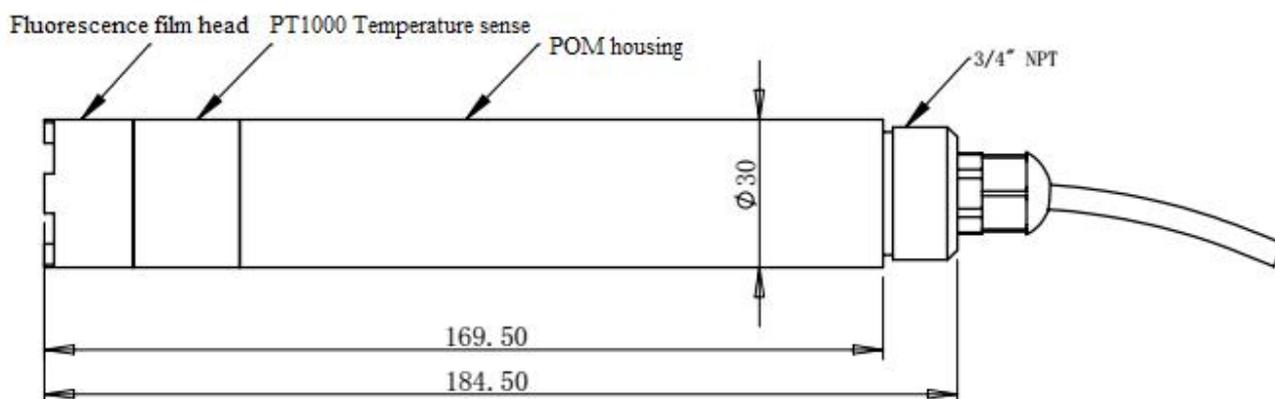
II 、 Technical performance and specifications

1. Technical parameter

Model	RDO-206
Measuring principle	Fluorescence method

Range ability	0~20mg/L (0 ≤ 200% saturation)
Resolution ratio	0.01mg/L, 0.1℃
Precision	±2%F.S., ±0.5℃
Temperature compensation	Automatic temperature compensation (Pt1000)
Output mode	RS-485 bus, Modbus-RTU protocol
Working conditions	0~45℃、<0.2MPa
Storage temperature	-5~65℃
Installation mode	Immersion mounting
Cable length	5 meters, other lengths customizable
Power dissipation	<0.5W
Source	12~24VDC ±10%
levels of protection	IP68
Calibration	Two-point calibration
Fluorescent cap life	Guaranteed use for one year (under normal use)
Sensor shell material	POM and 316L stainless steel

2. Dimensional drawing



III、 Installation and electrical connection

1. Install

The temperature induction part should be immersed below the liquid level to avoid colliding

with the surface of the film head. The attachment of sediment should be avoided in the part of membrane head.

2. Electrical connection

- Red wire-power cord (12~24V)
- Black wire-ground wire (GND)
- Blue Line-485A
- White Line-485B
- Bare wire-shield layer

After the wiring is completed, it should be carefully checked to avoid the wrong connection before the power is turned on.

Cable specification: Considering that the cable is immersed in water (including sea water) or exposed to air for a long time, the cable has a certain corrosion resistance. All interfaces of cable outer diameter Φ 6 mm, have been waterproof.

IV、 Maintenance

1. Maintenance schedule and methodology

1.1 Maintenance schedule

Different from the dissolved oxygen probe technology of electrochemical principle, the fluorescence dissolved oxygen probe does not consume oxygen and does not need to be cleaned frequently (except when it is used in viscous liquid).

Maintenance task	Recommended maintenance frequency
Cleaning sensor	Wash every 30 days
Check for damage to sensors and fluorescent caps	Check every 30 days
Replace the fluorescent cap	Replace it once a year
Calibrate sensors (if required by the competent authority)	According to the maintenance schedule required by the competent department

Note: The maintenance frequency in the above table is only recommended, and the maintenance personnel shall clean the sensor according to the actual use of the sensor; however, the replacement frequency of the fluorescent cap is recommended once a year.

1.2 Maintenance method

Sensor outer surface: clean the outer surface of the sensor with tap water, if there is still debris residue, wipe with wet soft cloth, for some stubborn dirt, you can add some household washing liquid to tap water to clean.

a) External surface of fluorescent cap: remove the protective cover at the front end of the sensor, rinse the dirt on the optical window of the sensor with clean water, and finally cover the cover; If wiping is required, please use a soft cloth and take care of force and force direction; If the fluorescent film layer is scratched, the sensor will not work properly.

b) Inner surface of fluorescent cap: if water vapor or dust invades the inside of fluorescent cap, the cleaning steps are as follows:

- Remove the fluorescent cap;
- Rinse the inner surface of the fluorescent cap with tap water;
- For dirt containing fat and oil, clean with warm water with household washing fluid;
- Rinse the inner surface of a fluorescent cap with deionized water;
- Gently dry all surfaces with a clean velvet-free cloth and put it in a dry place for the

moisture to evaporate completely.

c) Check the cable of the sensor: the cable should not be tightened when it is working properly, otherwise it is easy to break the wire inside the cable and cause the sensor to fail to work properly.

d) Check that the shell of the sensor is damaged by corrosion or other causes.

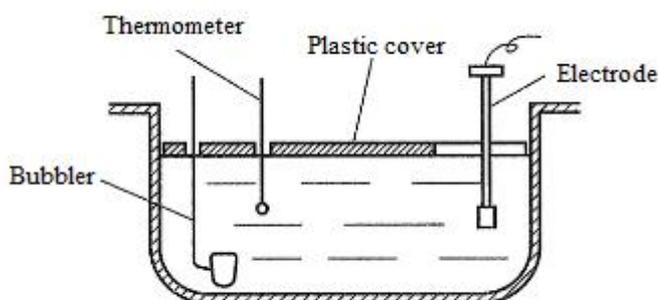
e) Daily preservation of fluorescent caps: when not in use, put in a shield with a wet sponge to keep the sensor moist for a long time. If the head of the sensor fluorescent cap is dry for a long time, it will produce the drift of the measurement results and need to be immersed in water for 48 hours before use.

2. Frequently questions

Wrong	Probable cause	Solution
The operating interface cannot connect or does not display the measurement results	Error connecting controller to cable	Reconnect the controller and cable
	Cable failure	Please contact us.
	The fluorescent cap is not tightened or damaged	Refit and tighten the fluorescent cap or replace the fluorescent cap.
The measured value is too high, too low, or the numerical value remains unstable.	The outer surface of the fluorescent cap is attached to the outer object	Clean the outer surface of the fluorescent cap and stir the probe during measurement
	The fluorescent cap was damaged	Replace the fluorescent cap
	The fluorescent cap has exceeded its service life	
The temperature measurement value is beyond the range of measurement or there is a reading disorder code.	The temperature sensor is attached to the foreign object.	Gently brush the attachment with a soft brush

3. Calibration of sensors

- a) Zero calibration
weighing 2 g of sodium sulfite by a balance, adding 98 mL of water into a 250-mL measuring cylinder, pouring the water into a beaker, adding the sodium sulfite which has been weighed, stirring with a glass rod, dissolving, and obtaining a solution of 2% sodium sulfite, putting the sensor in a solution, And the zero point calibration is carried out after the three-minute numerical stability is stable. Refer to the Appendix to the instructions
- b) Slope calibration
The sensor probe is placed in air saturated water and the slope is calibrated after 3 minutes of numerical stability. The instructions refer to the appendix.
- c) Preparation of air saturated water: add 2% 3 volume fresh distilled water to the constant temperature water bath to float the porous plastic sheet on the water surface (see figure below). At the same time, the bubbler (air pump) is used to aerate the water continuously for more than 1 hour, stop aeration, and get air saturated water after 20 minutes or so. Put the sensor into the water and calibrate the slope after the numerical value is stable.



Note: as an option, slope calibration can also be performed in water-saturated air. Put the sensor in a calibration bottle with a small amount of water (the probe is higher than the water surface 2-3mm) to ensure that the sensor film cap remains wet but has no water droplets, and the calibration slope is calibrated after 3 minutes of numerical stability.

4. Points for attention

- Avoid sun exposure to the inner surface of the fluorescent cap.
- Please don't touch the fluorescent film with your hands.
- Measuring and calibrating the surface of fluorescent film to avoid attaching bubbles.
- Avoid directly applying any mechanical stress (pressure, scratches, etc.) to the fluorescent film in use.

V、Quality and service

1. Quality assurance

- The quality inspection department has a standard inspection procedure, with advanced and complete detection equipment and means, and according to the procedure inspection, the product is subjected to 72-hour aging experiment and stability experiment, so that a

non-conforming product is not allowed to leave the factory.

- The consignee shall refund directly the product batches with a failure rate of 2%, and all expenses incurred shall be borne by the supplier. Consider the standard reference to the product description provided by the supplier.
- Ensure the quantity of goods and the speed of shipment.

2. Spare parts and spare parts

This product includes:

- 1 sensor
- 1 copy of the manual
- 1 certificate

3. After-sales service commitment

The company provides after-sales service for this machine within one year from the date of sale, but does not include the damage caused by improper use. If you need to repair or adjust, please send it back, but the freight must be borne by yourself, and it is necessary to make sure that the packing is good to avoid damage in transit. We will repair the damage of the instrument free of charge.

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 check, 1 stop bit).

2. Information frame format (xx stands for one byte)

a) Read data instruction frame

06	03	xx	xx	xx	xx	xx	xx
Address	FC	Register start address		Number of registers		CRC check code (low bytes in front)	

b) Read data response frame

06	03	xx	xx.....xx	xx	xx
Address	FC	Number of bytes	Response data	CRC check code (low bytes in front)	

c) Write data instruction frame

06	06	xx	xx	xx	xx	xx	xx
Address	FC	Register address		Read-in data	CRC check code (low bytes in front)		

d) Data response frame

06	06	xx	xx	xx	xx	xx	xx
Address	FC	Register address		Read-in data	CRC check code (low bytes before)		

3. Register address

Register address	Name	Instruction	Number of registers	Access method
44353 (0x1100)	Switch machine	Boot write data 1, shut down write data 0. The power on defaults to the boot state.	1 (2 bytes)	write
40001 (0x0000)	Measured value+temperature	Four double-byte integers, measured, measured decimal, temperature decimal places, respectively, measured, decimal places.	4 (8 bytes)	read
40005 (0x0004)	Dissolved oxygen saturation (0-200%)	Two double-byte integers, saturation values and decimal places, respectively.	2 (4 bytes)	read
44097 (0x1000)	Zero calibration	Calibrated in anoxic water, writing data 0; readout data zero offset.	1 (2 bytes)	Write / read
44101 (0x1004)	Slope calibration	Calibrate in air-saturated water, write data to 0, read data to slope value $\times 1000$.	1 (2 bytes)	Write / read
44113 (0x1010)	temperature correction	In the solution, the written data is the actual temperature value $\times 10$, and the readout data is the temperature calibration offset $\times 10$.	1(2 bytes))	Write / read
44129 (0x1020)	Salinity compensation	The read / write data is salt value (PSU) $\times 10$, which is used for salinity compensation, and the factory default is 0, no salinity compensation.。	1 (2 bytes)	Write / read

48195 (0x2002)	Sensor address	The default is 6, and the data range is 1-127.	1 (2 bytes)	Write / read
48225 (0x2020)	Reset sensor	The calibration value restores the default value, and the write data is 0. Note that the sensor needs to be calibrated again after resetting.	1 (2 bytes)	write

4. Command example

a) Boot instruction:

Function: let the probe emit light continuously and begin the measurement of dissolved oxygen value.

Request frame: 06 06 11 00 00 01 4C 81

acknowledgement frame : 06 06 11 00 00 01 4C 81

b) Start measurement instruction:

Function: obtain the temperature and dissolved oxygen value of the measuring probe; the unit of temperature is degrees Celsius, and the unit of dissolved oxygen value is mg/L.

Request frame: 06 03 00 00 00 04 45 BE

acknowledgement frame : 06 03 08 01 02 00 02 00 B0 00 01 D4 48

Reading example:

Dissolved oxygen value	temperature scale
01 02 00 02	00 B0 00 01

For example, the dissolved oxygen value 01 02 indicates the hexadecimal reading dissolved oxygen value, and 0002 indicates the dissolved oxygen value with 2 decimal points, which is converted to a decimal value of 2.58.

The temperature value 00B0 represents the hexadecimal reading temperature value, 0001 indicates the temperature value with 1 decimal point, converted to a decimal value of 17.6.

c) Calibration instruction:

Zero calibration

Function: set the calibration value of dissolved oxygen zero point of electrode;

Request frame: 06 06 10 00 00 00 8C BD

acknowledgement frame : 06 06 10 00 00 00 8C BD

Slope calibration

Function: set the slope calibration value of dissolved oxygen for the electrode; here the slope value is calibrated in air saturated water。

Request frame: 06 06 10 04 00 00 CD 7C

acknowledgement frame : 06 06 10 04 00 00 CD 7C

d) Set the device ID address:

Function: set the MODBUS device address of the electrode;

Change the device address 06 to 01, with the following example

Request frame: 06 06 20 02 00 01 E3 BD
acknowledgement frame : 06 06 20 02 00 01 E3 BD

5. Error response

If the sensor does not execute the upper computer command correctly, the following format information is returned:

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

- a) CODE: 01 – Functional code error
 03 – Data error
- b) COM: Received function code