



# **RS-LDO-N01-1**

# **Fluorescence Dissolved**

# **Oxygen Transmitter**

# **User manual**

Document version:V2.0





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## 1. Product description

This product is a device for measuring the concentration of dissolved oxygen in a solution. It adopts the principle of fluorescence measurement, does not consume oxygen, and does not require electrolyte. Built-in temperature transmitter with automatic temperature compensation function. The calibration function provides a simpler and more convenient way to calibrate. Can be widely used in water treatment, aquaculture, environmental monitoring and other industries.

### 1.1 Function features

- Dissolved oxygen measurement range is 0~20mg/L (0~200% saturation).
- RS485 communication interface: MODBUS RTU communication protocol can be easily connected to the computer for monitoring and communication.
- The Mod Bus communication address can be set, and the baud rate can be modified.
- The equipment adopts wide voltage power supply, DC 10~30V can be used.
- The principle of fluorescence measurement is adopted, no oxygen is consumed, and no electrolyte is required.

### 1.2 Equipment technical parameters

powered by	DC 10~30V
Power consumption	0.2W
Communication Interface	RS485; standard MODBUS-RTU protocol; communication baud rate: default 4800(1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 can be set)
Measuring principle	Fluorescence measurement method
Measuring range	0~20mg/L (0~200% saturation)
Measurement deviation	±3%FS; ±0.5°C (25°C)
Resolution	0.01mg/L; 0.1%; 0.1°C
Response time	≤60s
Equipment working conditions	0~40°C
Fluorescent film lifetime	1 year of normal use
Waterproof level	IP68
Withstanding voltage	0.6MPa
Electrode wire length	Default 5m
Shell material	Corrosion resistant plastic, stainless steel



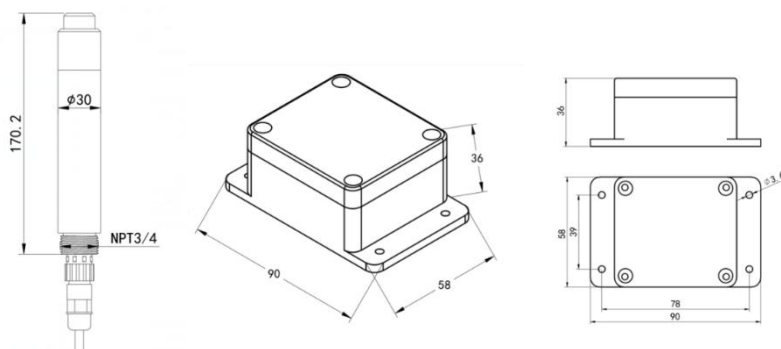
### 1.3 Product model

RS-					Company code
	LDO-				Fluorescence Dissolved Oxygen Transmitter
		N01-			RS485(Mod bus RTU protocol)
			1		Split probe
				20	0~ 20.00mg/L (0~ 200% saturation, 25℃)

### 1.4 Product List

- ◆ Fluorescence Dissolved Oxygen Transmitter 1pc
- ◆ Switching module
- ◆ 5m cable
- ◆ Protective nets, cable ties
- ◆ Certificate of conformity, warranty card, etc.

### 1.5 Equipment size



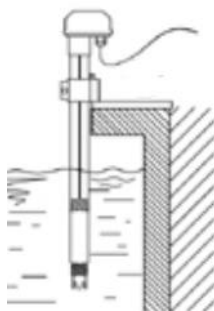
### 1.6 Device installation

The sensor should be immersed below the liquid level and fixedly installed. Avoid to bumping or scratching the surface of the fluorescent film head during installation and use. The fluorescent film head part should be prevented from being attached with the underwater sediments. The rubber protective sleeve should be removed during use.

Submerged installation:

Can be used match with the waterproof pipe of our company.

Submerged installation



## 2. Equipment instructions

### 2.1 Wiring instructions

	Wire color	Instruction
Power supply	brown	V+(10~30V DC)
	black	V-
communication	yellow(green)	485-A
	blue	485-B

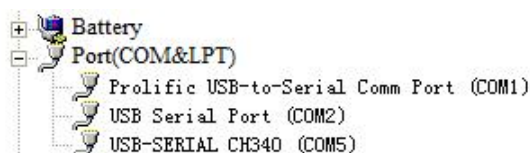
### 2.2 Parameter configuration description

Open the data package, select "Debug software" --- "485 parameter configuration software",



find and just open it

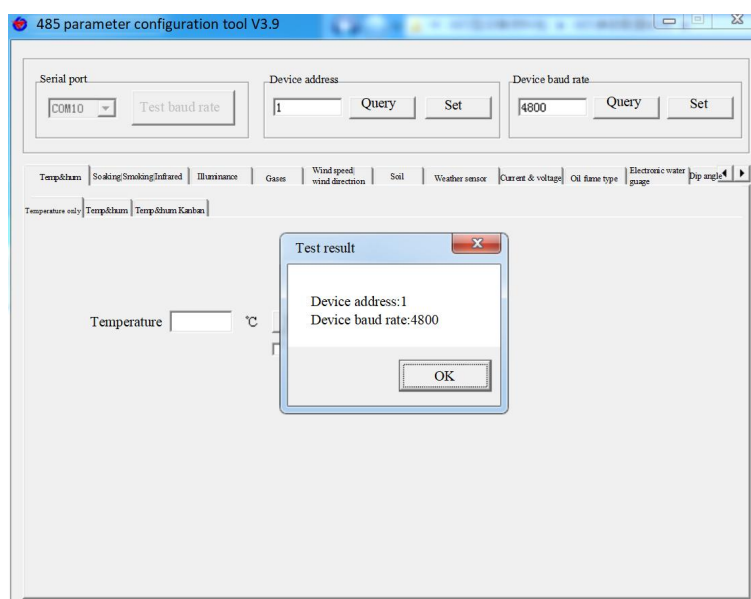
1) Select the correct COM port (view the COM port in "My computer—Properties—Device Manager—Port"). The following figure lists the driver names of several different 485 converters.



2) Connect only one device separately and power it on, click the test baud rate of the software, the software will test the baud rate and address of the current device, the default baud rate is 4800bit/s, and the default address is 0x01.

3) Modify the address and baud rate according to the needs of use, and at the same time query the current function status of the device.

4) If the test is unsuccessful, please recheck the equipment wiring and 485 driver installation.





## 2.3 Calibration instructions

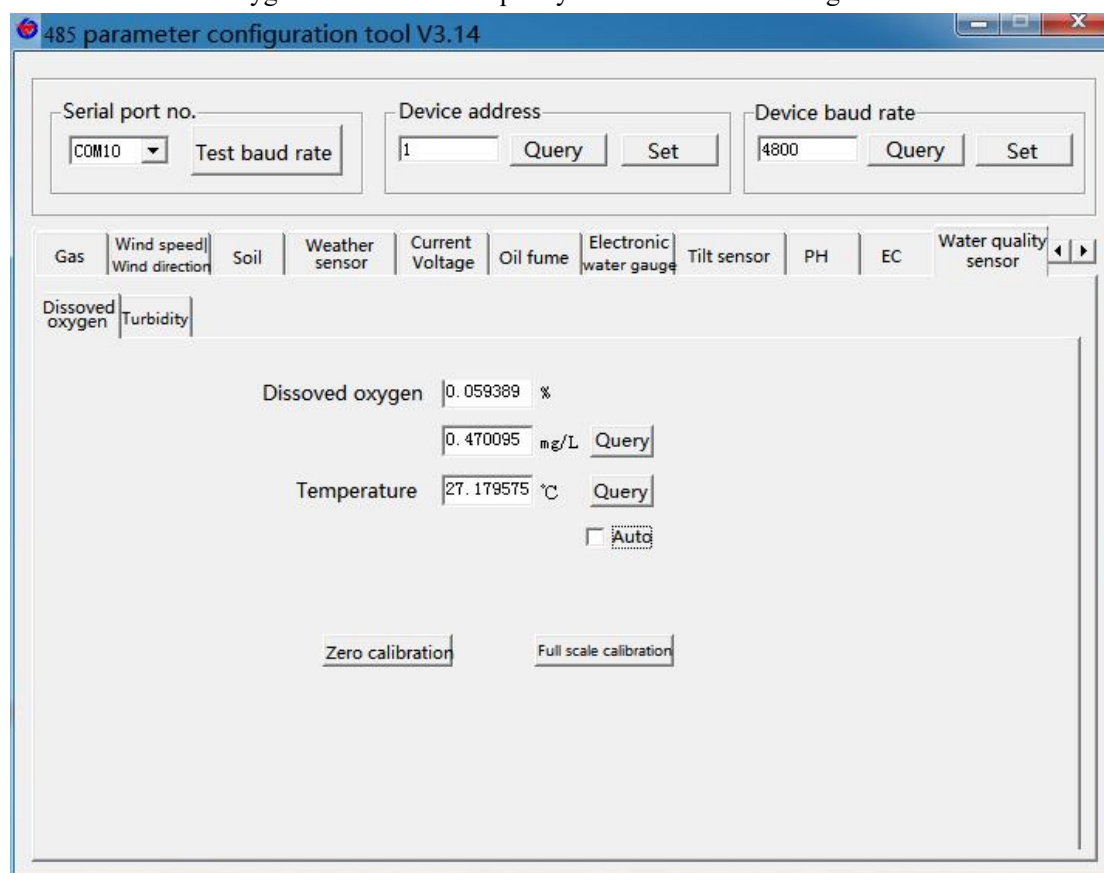
### 2.3.1 Calibration preparation

Zero oxygen standard solution preparation: In a place without wind and direct sunlight, take enough pure water (distilled water, deionized water) that can cover the stainless steel part of the equipment, add 5g anhydrous sodium sulfite in every 95g water, stir fully to dissolve to get the 5% sodium sulfite solution, leave it for 1 hour to ensure that the oxygen in the solution is consumed completely. Trace cobalt chloride can be added as catalyst if conditional.

100% oxygen environment preparation: In a place without wind and direct sunlight, take enough pure water (distilled water, deionized water) that can cover the stainless steel part of the equipment, use an air pump, continue to expose air to the water for 1 hour, and then stand for 30 minutes to get an air saturated water. Or in a place where there is no wind or direct sunlight, use a closed container, take a small amount of water and shake it vigorously for 30 seconds to get the water-saturated air. During calibration, the fluorescent film of the equipment is kept about 1cm away from the water surface to ensure that the fluorescent film is moist but without water beads.

### 2.3.2 Calibration

Find the dissolved oxygen tab in the water quality sensor tab of the configuration tool.





Put the sensor in a 100% oxygen environment, and after the dissolved oxygen value is stable, click the full-scale calibration button to complete the calibration of 100% oxygen saturation.

Then put the sensor in the zero oxygen standard solution, stir it gently to accelerate the response, stand it. After the dissolved oxygen value is stable, click the zero oxygen calibration button to complete the zero oxygen calibration.

Note: The device should standing in each calibration environment longer enough, to ensure the device temperature is same with the environment temperature.

## 2.4 MODBUS communication and register details

### 2.4.1 Basic parameters of device communication

Code	8-bit binary
Data bit	8-bit
Parity check bit	no
Stop bit	1-bit
Error checking	CRC (Redundant Cyclic Code)
Baud rate	Factory default is 4800bit/s

### 2.4.2 Data frame format definition

Using Modbus-RTU communication protocol, the format is as follows:

Initial structure  $\geq 4$  bytes of time

Address code = 1 byte

Function code = 1 byte

Data area = N bytes

Error check = 16-bit CRC code

Time to end structure  $\geq 4$  bytes

Address code: the address of the transmitter, which is unique in the communication network (factory default 0x01).

Function code: the command function instruction issued by the host.

Data area: The data area is the specific communication data, pay attention to the high byte of 16bits data first!

CRC code: two-byte check code.





### 2.4.3 Register address

Register address	Support function code	Illustrate
0x0000, 0x0001	0x03/0x04	Dissolved oxygen saturation (%; floating point number big endian)
0x0002, 0x0003	0x03/0x04	Dissolved oxygen concentration (mg/L; floating point number big endian)
0x0004, 0x0005	0x03/0x04	Temperature (°C; floating point number big endian)
0x1010	0x06/0x10	Calibration (write 0x0001 calibration zero point, Write 0x0002 to calibrate 100% saturation point)
0x1020	0x03/0x04/0x06/0x10	Salinity (‰; 16-bit unsigned integer, default 0)
0x1022	0x03/0x04/0x06/0x10	Atmospheric pressure (kPa; default 101.33, 16-bit unsigned integer, actual value expanded 100 times)
0x07D0	0x03/0x04/0x06/0x10	1~254(16-bit unsigned integer, factory default 1)
0x07D1	0x03/0x04/0x06/0x10	0 represent 2400, 1 represent 4800, 2 represent 9600 3 represent 19200, 4 represent 38400, 5 represent 57600 6 represent 115200, 7 represent 1200

### 2.4.4 Communication protocol example and explanation

Example 1: Read the current dissolved oxygen saturation (%), dissolved oxygen concentration (mg/L) and temperature of the device with address 01

Send frame:

Address code	Function code	Register address	Register content	Check code low bit	Check code high bit
0x01	0x03	0x00 0x00	0x00 0x06	0xc5	0xc8

Reply frame:

Address code	Function code	Number of valid bytes	Register content	Check code low bit	Check code high bit
0x01	0x03	0x0c	0x3f 0x6a 0xeb 0x52 0x40 0xe2 0x48 0xb0 0x41 0xe5 0x85 0xc5	0xa7	0x49



The floating point number big endian 3f 6a eb 52 is 0.917653, which means that the dissolved oxygen saturation is 91.8%

The floating point big endian 40 e2 48 b0 is 7.071373 The dissolved oxygen concentration is 7.07mg/L

The floating point number big endian 41 e5 85 c5 is 28.690317, which means the temperature is 28.7°C

#### Example 2: Write atmospheric pressure

Send frame: write atmospheric pressure 101.35kPa to the device with address code 1

Write 10135 to the 0x1022 register, convert to hexadecimal is 2797

Address code	Function code	Register address	Register content	Check code low bit	Check code high bit
0x01	0x06	0x10 0x22	0x27 0x97	0x77	0x5e

Response frame: (According to the MODBUS standard, the response is a mirrored message of the send frame)

Address code	Function code	Register address	Register content	Check code low bit	Check code high bit
0x01	0x06	0x10 0x22	0x27 0x97	0x77	0x5e

#### Example 3: Zero point calibration

Writes 0x0001 to the 1010H register after the sensor value is stable in oxygen-free water.

Address code	Function code	Register address	Register content	Check code low bit	Check code high bit
0x01	0x06	0x10 0x10	0x00 0x01	0x4d	0x0f

Reply frame: (According to the MODBUS standard reply is a mirrored message of the send frame)

Address code	Function code	Register address	Register content	Check code low bit	Check code high bit
0x01	0x06	0x10 0x10	0x00 0x01	0x4d	0x0f



### 3. Precautions and maintenance

- ◆ When there is an obvious failure of the equipment, please do not open it and repair it yourself, and contact us as soon as possible!
- ◆ Avoid collision or scratching of the fluorescent film on the front of the equipment. Any damage will cause the measurement accuracy to drop or even be unusable.
- ◆ Avoid using it in organic solvents, and avoid using organic solvents to clean the fluorescent cap.
- ◆ When installing the equipment, try to avoid excessive tension or stress on the cables.

- ◆ Equipment cleaning:

For the outer surface of the equipment, it can be cleaned with tap water and wiped with a moist soft cloth. For some stubborn dirt, you can add some household detergent to the tap water to cleaning.

For the outer surface of the fluorescent cap, you can clean the dirt on the light window of the sensor with clean water. If it needs to be wiped, wipe it gently with a soft cloth, do not scrape hard, to prevent damage the fluorescent film, resulting in inaccurate measurement settings and unable to measure.

If there is dust or water vapor in the fluorescent cap: unscrew the fluorescent cap, rinse the inner surface of the fluorescent cap and the optical glass window of the equipment with tap water. If there is dirt with grease-like, it can be cleaned with tap water which is mixed with household detergent, and then rinse the detergent, wipe all the cleaned surface with a soft lint-free cloth, and then put it in a dry place to completely evaporate the water.

It is recommended to wash every 30 days.

- ◆ Before measuring, the black rubber protective cover should be removed.
- ◆ For long-term storage, should add water to the sponge in the protective cover and squeeze out excess water to ensure that the fluorescent film is wet, and the temperature should be kept above 0 °C to prevent the fluorescent film from freezing and damage. If store in a dry place, the temperature can be as low as -10 °C. When use it again, the device needs to be soaked in water for 48 hours to restore the response of the fluorescent membrane.
- ◆ It is recommended to replace the fluorescent film once a year.
- ◆ The equipment should be calibrated before each measurement. It is recommended to calibrate it every 3 months for long-term use. The calibration frequency should be adjusted according to different application conditions (the degree of dirt in the application, the deposition of chemical substances, etc.).



## 4. Appendix

Table of dissolved oxygen values in air      Air pressure 101.32KP							
Temperature (°C)	Dissolved oxygen (mg/L)	Temperature (°C)	Dissolved oxygen(m g/L)	Temperature (°C)	Dissolved oxygen (mg/L)	Temperature (°C)	Dissolved oxygen (mg/L)
0	14.63	11	11.04	22	8.77	33	7.17
1	14.23	12	10.79	23	8.58	34	7.06
2	13.84	13	10.55	24	8.42	35	6.94
3	13.47	14	10.32	25	8.26	36	6.83
4	13.11	15	10.09	26	8.11	37	6.72
5	12.78	16	9.88	27	7.97	38	6.61
6	12.45	17	9.67	28	7.83	39	6.51
7	12.15	18	9.47	29	7.69	40	6.41
8	11.85	19	9.29	30	7.55	41	6.31
9	11.57	20	9.10	31	7.41	42	6.21
10	11.30	21	8.92	32	7.29	43	6.12



## 5. Contact information

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Official website



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## 6. Document history

- |      |  |
|------|--|
| V1.0 | Document establishment                                   |
| V1.1 | Model modification                                       |
| V1.2 | Add calibration frequency to precautions and maintenance |
| V2.0 | Product update   |