

Dissolved oxygen sensor

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Preface

- Thank you for purchasing our product.
- This manual is about the various functions of the product, wiring methods, setting methods, operating methods, troubleshooting methods, etc.
- Please read this manual carefully before operation, use this product correctly to avoid unnecessary losses due to incorrect operation.
- After you finish reading, please keep it in a place where it can be easily accessed at any time for reference during operation.

Note

- Modification of this manual's contents will not be notified as a result of some factors, such as function upgrading.
- We try our best to guarantee that the manual content is accurate, if you find something wrong or incorrect, please contact us.
- The content of this manual is strictly prohibited from reprinting or copying.

Version

U-SUP-DO7018-EN1

Safety Precautions

In order to use this product safely, be sure to follow the safety precautions described.

About this manual

- Please submit this manual to the operator for reading.
- Please read the operation manual carefully before applying the instrument. On the precondition of full understanding.
- This manual only describes the functions of the product. The company does not guarantee that the product will be suitable for a particular use by the user.

Precautions for protection, safety and modification of this product

- To ensure safe use of this product and the systems it controls, Please read carefully the operation manual and understand the correct application methods before putting into operation, to avoid unnecessary losses due to operation mistakes. If the instrument is operated in other ways not described in the manual, the protections that the instrument give may be destroyed, and the failures and accidents incurred due to violation of precautions shall not be borne by our company.
- When installing lightning protection devices for this product and its control system, or designing and installing separate safety protection circuits for this product and its control system, it needs to be implemented by other devices.
- If you need to replace parts of the product, please use the model specifications specified by the company.
- This product is not intended for use in systems that are directly related to personal safety. Such as nuclear power equipment, equipment using radioactivity, railway systems, aviation equipment, marine equipment, aviation equipment and medical equipment. If applied, it is the responsibility

of the user to use additional equipment or systems to ensure personal safety.

- Do not modify this product. The following safety signs are used in this manual:



Hazard, if not taken with appropriate precautions, will result in serious personal injury, product damage or major property damage.



Warning: Pay special attention to the important information linked to product or particular part in the operation manual.



- Confirm if the supply voltage is consistent with the rated voltage before operation.
- Do not use the instrument in a flammable and combustible or steam area.
- To prevent from electric shock, operation mistake, a good grounding protection must be made.
- Thunder prevention engineering facilities must be well managed: the shared grounding network shall be grounded at is-electric level, shielded, wires shall be located rationally, SPD surge protector shall be applied properly.
- Some inner parts may carry high voltage. Do not open the square panel in the front except our company personnel or maintenance personnel acknowledged by our company, to avoid electric shock.
- Cut off electric powers before making any checks, to avoid electric shock.
- Check the condition of the terminal screws regularly. If it is loose, please tighten it before use.
- It is not allowed to disassemble, process, modify or repair the product without authorization, otherwise it may cause abnormal operation, electric shock or fire accident.
- Wipe the product with a dry cotton cloth. Do not use alcohol, benzene

or other organic solvents. Prevent all kinds of liquid from splashing on the product. If the product falls into the water, please cut off the power immediately, otherwise there will be leakage, electric shock or even a fire accident.

- Please check the grounding protection status regularly. Do not operate if you think that the protection measures such as grounding protection and fuses are not perfect.
- Ventilation holes on the product housing must be kept clear to avoid malfunctions due to high temperatures, abnormal operation, shortened life and fire.
- Please strictly follow the instructions in this manual, otherwise the product's protective device may be damaged.



- Do not use the instrument if it is found damaged or deformed at opening of package.
- Prevent dust, wire end, iron fines or other objects from entering the instrument during installation, otherwise, it will cause abnormal movement or failure.
- During operation, to modify configuration, signal output, startup, stop, operation safety shall be fully considered. Operation mistakes may lead to failure and even destruction of the instrument and controlled equipment.
- Each part of the instrument has a certain lifetime, which must be maintained and repaired on a regular basis for long-time use.
- The product shall be scrapped as industrial wastes, to prevent environment pollution.
- When not using this product, be sure to turn off the power switch.
- If you find smoke from the product, smell odor, abnormal noise, etc., please turn off the power switch immediately and contact the company in time.

Disclaimer

- The company does not make any guarantees for the terms outside the scope of this product warranty.
- This company is not responsible for damage to the instrument or loss of parts or unpredictable damage caused directly or indirectly by improper operation of the user.

Package contents

Serial number	Item Name	Quantity
1	DO sensor	1
2	Manual	1
3	Test report	1

After opening the box, please confirm the package contents before starting the operation. If you find that the model and quantity are incorrect or there is physical damage in appearance, please contact us.

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Chapter 1 Introduction

Optical dissolved oxygen sensor measures dissolved oxygen using the principle of oxygen dynamic luminescence quenching technique. When blue light excites sensor film, the sensing film emits red light. The phase difference between the blue excitation and returned red emission is measured, and the result is used to calculate DO concentration.

Chapter 2 Features

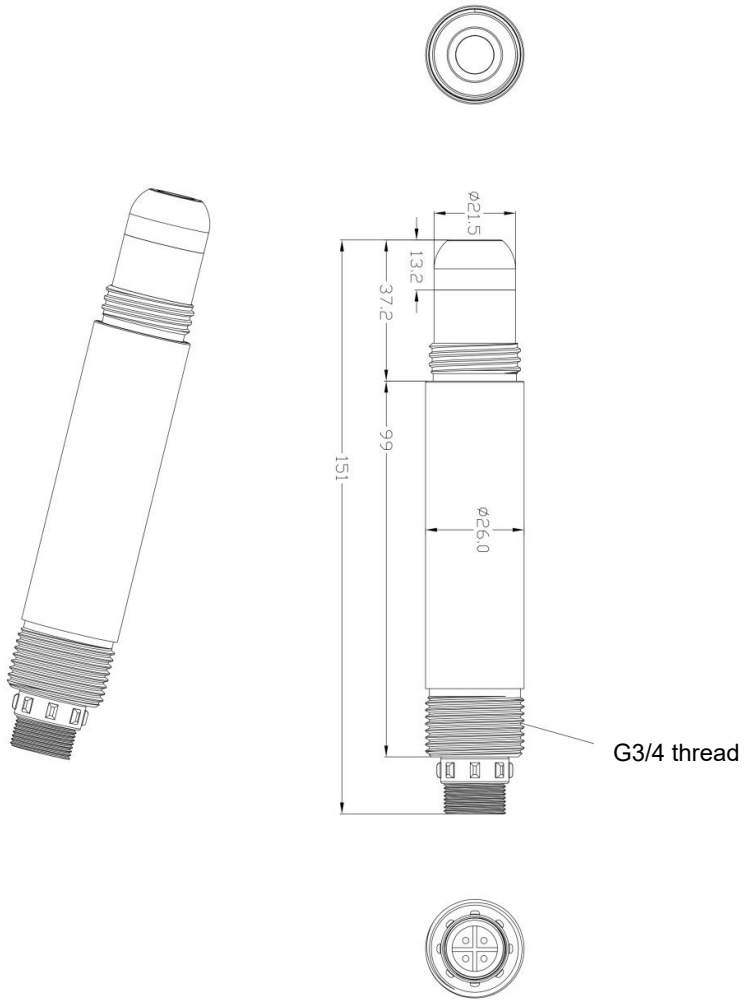
- Membraneless, no electrodes design
- No oxygen consumption
- Flow Independent
- Automatic temperature compensation
- No H₂S Interference
- Low Drift, fast response, and more accurate
- Low Maintenance, low operating cost
- Easy sensor cap replacement
- RS-485; MODBUS protocol compatible

Chapter 3 Parameters

Name	Parameter
Range	0-20mg/L or 0-200% Saturation
Response Time	10 sec
Housing IP Rating	IP68
Accuracy	±0.3mg/L
Drift	<1% per year
Working Temperature Range	0~50℃
Temperature Accuracy	±0.2℃
Interface	Support RS-485, MODBUS protocols
Construction	G 3/4
Power Requirements	DC 5~24V+/-5%, current<50mA
Temperature Sensor Type	NTC
Sensor OD	26mm
Sensor Length	177.5mm
Cable Length	10m standard;5m,15m,and 30m optional
Calibrations	Support one point and two-points calibrations
Sensor Cap Lifetime	1 Year (at normal use)
Body materials	Ti2

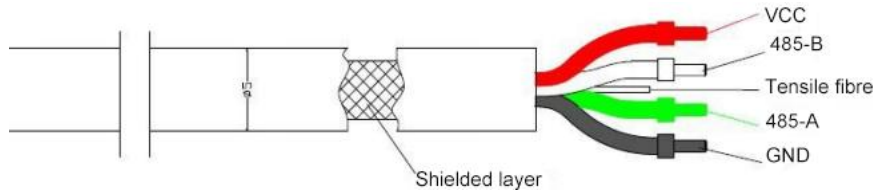
The above technical specifications are tested under standard solution in laboratory environment.

Chapter 4 Constructions



26x151 mm(Φ xL)

Chapter 5 Wring



- 1.Red—Power (VCC)
- 2.White—485 Date_B (485_B)
- 3.Green ---485 Date_A (485_A)
- 4.Black --- Ground (GND)
- 5.Bare wire ---- Shield

Chapter 6 Installation

6.1 Part list

Item	Number	Note
DO sensor	1	
Cable	1	10m
Protective cover	1	
Rubber protective Cap	1	

6.2 Before use

Take off the protect cap: Please take off the protect cap of Optical dissolved oxygen sensor ,before installation and keep them properly for future use.Meanwhile, tighten the protective cover.

6.3 Sensor Installation

1) Wiring and power supply:

The female and male connector of sensor cable should be screwed tightly to avoid moisture incursion

Do not use the sensor cable to pull the sensor! It is required to install sensor in a secure and stable mounting bracket.

Make sure power supply voltage is correct before power on.

2) Sensor installation:

- It is recommended to install the sensor vertically with electrodes facing down.
- Considering water level change, the sensor should be installed 30cm below water level. The sensor should not be installed no more than 2m below water surface for maintenance purpose.
- The sensor must be securely installed to avoid damage caused by water flow and other things.

Chapter 7 Calibration

7.1 Calibration

7.1.1 Calibration Solution Preparation

Preparation for zero oxygen environment: take 200mL distilled water and pour it into the prepared beaker, then add anhydrous sodium sulfite, add and stir at the same time, until anhydrous sodium sulfite is insoluble and solid crystallization occurs, then the standard solution can be regarded as close to 0 oxygen.

Preparation for 100% oxygen environment: Prepare 1 beaker, take 200mL purified water (or distilled water) and pour it into the cup, add to the air pump, and fully aerate the solution (at least 30 minutes).

Note: If the field conditions really do not allow, the sensor can be directly put into the air (calibration accuracy will be slightly deviated).

7.2 Calibration (take 2-point calibration as an example)

Restore user calibration data by default, $K=1$, $B=0$ (see modbus documentation for details).

Take the sensor out of the zero oxygen, wipe the sensor measurement end face with a paper towel, put the sensor into 100% environment (air), read the value of dissolved oxygen, wait for the data to stabilize, the value is close to 1 (Saturation is 100%), and record the value as Y.

Place the sensor in the prepared zero-point solution, immerse the front end of the sensor completely in the solution, read the value of dissolved oxygen, and wait for the data to stabilize, with the value approaching 0.01 (Saturation is 1%), for example

Dissolved oxygen = 0.015, recorded as X.

Record K and B values according to the following formula:

$$K=(1-0)/(Y-X), B= - KX$$

Write K, B values to the sensor.

(See modBus documentation)

The DO sensor has also developed pc-based calibration software for dissolved oxygen sensor. You only need to connect the probe to the calibration

software through the computer interface, and you can easily complete the calibration of the sensor according to the software prompts.

7.3 Appliances and raw materials required

Anhydrous sodium sulfite powder

Distilled water or deionized water (Watsons distilled Water)

Beakers, gloves, stirring rod, air pump

Chapter 8 Maintenance and trouble shooting

8.1 Maintenance Schedule

Unlike traditional electrical chemical sensors, optical DO sensors require low maintenance. There are no need for frequent solution filling and calibrations.

Maintenance task	Frequency
Sensor cleaning	Every 30 days
Sensor and sensor cap inspection	Every 30 days
Sensor cap replacement	Every one year
Calibration	Calibration based on required schedule

8.2 Maintenance

1) Clean the sensor surface: Wash the outer surface of sensor with tap water, if there is still residue, using soft brush, for some stubborn dirt, household detergent can be added in tap water to clean.

2) Clean the cap outer surface: Remove the protective cover, flush the dirt on the light window of the sensor with clean water, and finally put the cover on; If you need to wipe it, please wipe it gently with a soft cloth and do not scratch it forcefully.

Otherwise, once the fluorescent film is scratched or scratched, the sensor will not work properly

3) Clean the cap inner surface: If water vapor or dust gets inside the fluorescent cap, the cleaning steps are as follows:

① Remove the fluorescent cap

- ② Rinse the inner surface of the fluorescent cap with tap water
- ③ For dirt containing fat and oil, wash it in warm water with household detergent
- ④ Rinse the inner surface of the fluorescent cap with deionized water
- ⑤ Gently dry all surfaces with a clean flannelless cloth and place in a dry place to allow water to completely evaporate

4) Check the cable: inspect the sensor cable if there is damage.

5)Store the cap: Regular electrode maintenance requires cap to be stored in a protective cover with a damp sponge and checked and watered regularly, so as to keep the fluorescent film in a moist state for a long time.If the sensor fluorescent cap head is dry for a long time, the measurement results will drift, and it needs to be soaked in water for 48 hours before continuing to work.

8.3 Attention

Protect the inner surface of the fluorescent cap from sun exposure.

Do not touch the fluorescent film with your hands.

Avoid applying any mechanical stress (pressure, scratch, etc.) directly to the fluorescent film during use.

8.4 Trouble Shooting

Table 5-1 lists the symptoms, possible causes, and recommended solutions for common problems encountered with the sensor. If your symptom is not listed, or if none of the solutions solves your problem, please contact us.

Table 5-1 Troubleshooting

Error	Possible cause	Solution
No data displayed on controller(if sensors are connected)	Connection issue	Reconnect sensor to controller
	Cable failure	Contact customer service
	Bad sensor cap or loose sensor cap	Reinstall sensor cap or replace

Unstable DO reading	Dirty sensor cap	Clean sensor cap
	Damaged sensor cap	Replace sensor cap
	Sensor cap expired	
	Hardware failure	Contact customer service
Bad Temperature reading	Bad connection	Reconnect sensor to controller
	Dirty temperature sensor	Contact customer service

Chapter 9 Warranty & After-sales Service

We promise to the customer that the hardware accessories provided during the supply of the instrument have no defects in material and manufacturing process. From the date of the purchase, if the user's notice of such defects is received during the warranty period, the company will unconditionally maintain or replace the defective products without charge, and all non customized products are guaranteed to be returned and replaced within 7 days.

Disclaimers:

- During the warranty period, product faults caused by the following reasons are not in the scope of Three Guarantees service
- Product faults caused by improper use by customers.
- Product faults caused by disassembling, repairing and refitting the product.

After-sales service commitment:

- We promise to deal with the customer's technical questions within 2 hours.
- For the instruments returned to the factory for maintenance, we promise to issue the test results within 3 working days and the maintenance results within 7 working days after receiving the