



Water Quality Fluorescence
Dissolved Oxygen Sensor

W02-ST-SZ-DO-B
User Manual



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I. Preface

• 1.1 Copyright Information

Without prior written permission from Shenzhen Masoon Technology Co., Ltd., no individual or organization may reproduce or copy any part of this manual in any form (electronic, mechanical, photocopying, recording, or otherwise).

The contents, specifications, and technical data described in this manual represent the latest information available at the time of publication. Masoon Technology reserves the right to make improvements or modifications without further notice.

• 1.2 User Notice

To ensure proper use, installation, operation, and maintenance of this equipment, please read this manual carefully and keep it for future reference.

Follow the operation instructions and safety notes in this manual. If you encounter any problems during installation or operation, please contact us promptly.

When unpacking the equipment, handle it with care. Check for any signs of damage during shipping. If any damage or missing parts are found, please contact your supplier immediately and keep the packaging materials for return handling.

Our company is not responsible for any damage or malfunction caused by improper use or unauthorized modification.

Product design and specifications are subject to change without notice as we continuously improve our products. The company reserves the right to make such changes without prior notice and bears no responsibility for any incidental losses that may result.

Except for defects covered by the warranty, the company makes no other guarantees.

If the product is used improperly or operated against the instructions in this manual, the company shall not be liable for any direct or indirect damages, equipment malfunctions, or other unforeseen losses caused by misuse.

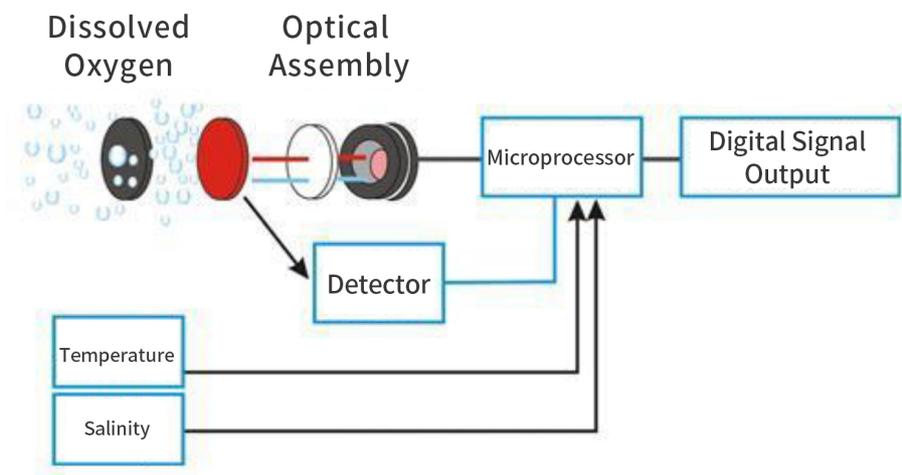
• 1.3 Safety Precautions

Installation: The equipment must be installed by qualified personnel.

Operation: Proper training is required before operating the device.

II. Product Overview

The optical fluorescence dissolved oxygen sensor is designed based on the physical principle of fluorescence quenching of specific substances when excited by light. When the excitation light strikes the fluorescent material on the probe cap, it emits blue light. The decay time and intensity of this fluorescence are affected by the concentration of oxygen molecules on the surface of the sensing membrane. By detecting the phase difference between the excitation light and the fluorescence, and comparing it with an internal reference, the oxygen concentration can be calculated. The final dissolved oxygen value is then obtained after temperature and salinity compensation.



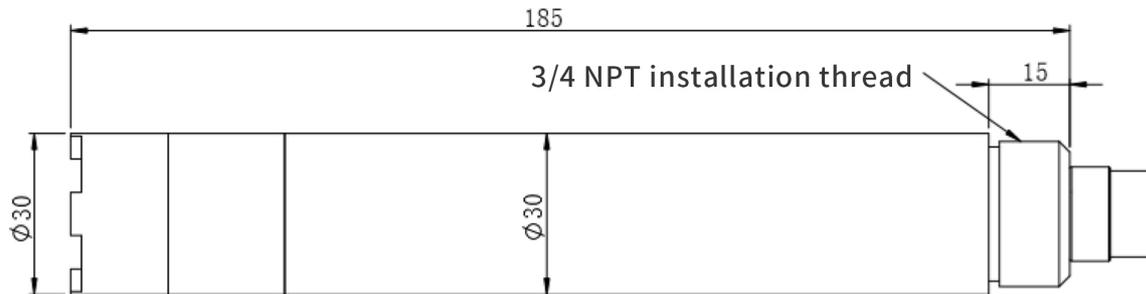
- No need for electrolyte solution; no electrode polarization.
- No oxygen consumption; unaffected by water flow velocity.
- Built-in temperature sensor for automatic temperature compensation.
- Internal salinity compensation; adjustable parameters.
- Unaffected by sulfide and other chemical interference.
- Fast response with minimal drift; highly accurate measurements.
- Long service life and low maintenance cost.
- Easy to replace fluorescent cap; simple maintenance.
- RS-485 interface, supports Modbus/RTU protocol.
- Low-power and anti-interference design.

III. Technical Performance and Specifications

3.1 Technical Parameters

Model	ST-SZ-DO-KMS
Housing Material	POM, ABS/PC Alloy, 316L Stainless Steel
Measurement Principle	Fluorescence Method
Measuring Range	0–20.00 mg/L (0–200% saturation, 25 °C)
Resolution	0.01 mg/L / 0.1 °C
Accuracy	±2% / ±0.3 °C
Response Time (T90)	< 30 s
Detection Limit	0.08 mg/L
Calibration Method	Two-point calibration
Cleaning Method	/
Temperature Compensation	Automatic temperature compensation (Pt1000)
Output Interface	RS-485 (Modbus RTU)
Storage Temperature	–5 °C ~ 65 °C
Operating Conditions	0 °C ~ 50 °C ; ≤ 0.2 MPa
Installation Method	Submersible type; 3/4 NPT
Power Consumption	0.2 W @ 12 V
Power Supply	12 – 24 V DC
Protection Grade	IP68
Optical Cap Lifetime	1 year (under normal operating conditions)
Cable Length	10 m (default); customizable on request

3.2 Dimensional Drawing



Note: The sensor connector uses an M16-5 core waterproof male connector.

III. Technical Performance and Specifications

4.1 Installation

The sensor should be installed in a fixed, submerged position below the liquid surface. During installation and operation, avoid collision or scratching of the optical membrane surface. Ensure that the probe head is not covered by sediment or debris at the bottom. Remove the rubber protective cap before use.

4.2 Electrical Connection

The sensor uses a 4-core shielded cable.
The wire sequence is defined as follows:

Red — Power supply (12–24 VDC)

Black — Ground (GND)

Blue — 485A

White — 485B

Before powering on, carefully check the wiring to avoid incorrect connections that may cause unnecessary loss.

Connection Note:

Since the sensor cable may be immersed in water (including seawater) or exposed to the atmosphere for long periods, all connections must be waterproofed. Users should ensure that the cable has adequate corrosion resistance.

V. Maintenance and Servicing

5.1 Maintenance Schedule

Unlike traditional dissolved oxygen electrodes, the optical dissolved oxygen probe does not consume oxygen and requires no frequent cleaning (except in environments with heavy fouling or adhesion).

Maintenance Task	Recommended Frequency
Clean the sensor	Once every 30 days
Check whether the optical cap is damaged	Once every 30 days
Replace the optical cap	Once every year
Calibration (if required by the user)	Carry out maintenance according to the schedule required by the competent authorities.

Note : The above frequencies are for reference only. Please adjust based on the actual operating environment. In severely contaminated environments, clean the probe more frequently. It is recommended to replace the optical cap once a year.

5.2 Maintenance Methods

a. Sensor Exterior : Rinse the exterior surface of the sensor with clean water. If dirt remains, wipe gently with a soft, damp cloth. For stubborn stains, add a small amount of household detergent to the water.

b. Optical Cap Surface : If there is dirt or sediment on the surface of the optical cap, rinse with clean water and gently wipe with a soft cloth. Avoid scratching the optical film surface, which may affect measurement accuracy.

c. Inside the Optical Cap : Normally does not require cleaning. If water or sediment enters the inner cavity, clean carefully as follows:

- Unscrew the optical cap.
- Rinse the inner surface of the cap and the probe end with clean water.
- For oil contamination, use warm water with mild detergent.
- Wipe with a lint-free cloth and air-dry completely before reinstalling.
- Reinstall the optical cap securely.

d. Cable and Connector : Check the cable and connector regularly for looseness or corrosion. The connector should not be immersed in water. If damaged, replace the cable immediately to ensure proper sensor operation.

e. Sensor Probe : If the sensor still cannot function properly after cleaning, check whether the optical cap is scratched or damaged and replace it if necessary.

f. Optical Cap Maintenance : When not in use, cover the optical cap with a protective sleeve containing moist sponge to keep the measurement area slightly wet. If the sensor’s optical membrane area dries out for an extended period, measurement errors or unstable readings may occur. In such cases, immerse the sensor in clean water for 48 hours before reuse.

VI. Fault Analysis and Troubleshooting

Error	Possible Cause	Solution
Unable to connect to the interface or no measurement display	Controller or cable connection error	Reconnect the controller and cable
	Communication failure	Please contact us
Measurement value too high, too low, or data unstable	Optical cap not tightened	Reinstall and tighten the optical cap
	Dirt or foreign matter on the surface of the optical cap	Clean the surface of the optical cap and the measuring area before use
	Optical cap damaged	Replace the optical cap
Optical cap expired or exceeded service life		
Temperature value slow to respond	Temperature sensing area (stainless steel probe) covered by debris	Use a soft brush or sponge to gently remove the attached material

VII. Sensor Calibration

a. Zero Calibration

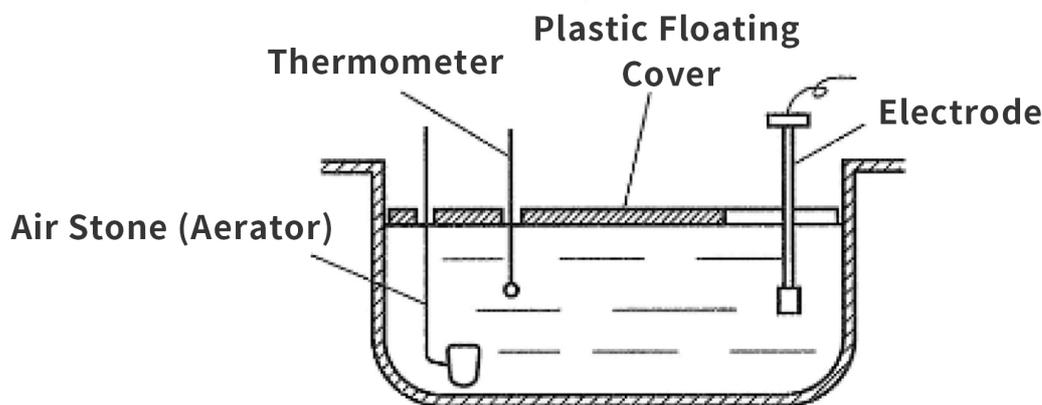
Dissolve 5 g of sodium sulfite (Na_2SO_3) into 250 mL of water. Pour 95 mL of the water into a beaker, then add the sodium sulfite solution and stir well until evenly mixed to form a 5% sodium sulfite solution. Immerse the sensor in the solution and wait for about 3 minutes until the reading stabilizes, then perform zero calibration according to the instructions provided.

b. Slope Calibration

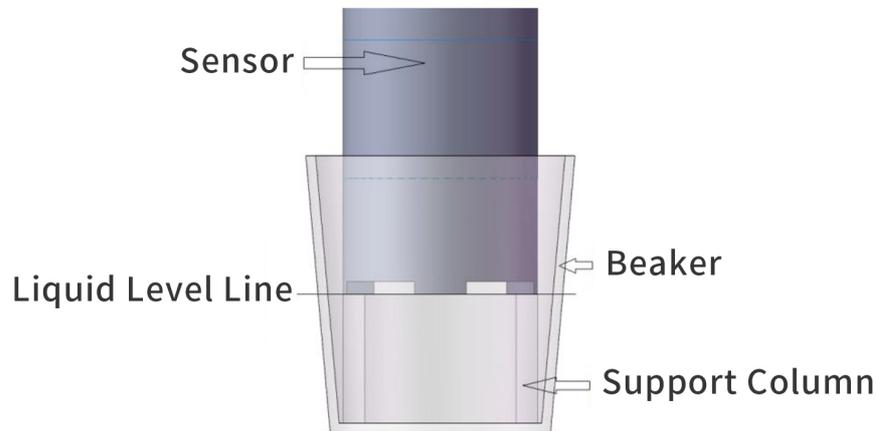
Place the sensor in oxygen-saturated water and wait for approximately 3 minutes until the reading stabilizes, then perform slope calibration as instructed.

c. Preparation of Oxygen-Saturated Water

In a constant-temperature water bath, fill about two-thirds of a clean beaker with fresh water. Float a perforated plastic plate on the water surface (see diagram below). Use an air pump to aerate the water continuously for at least 1 hour, then stop aeration and let it stand for 20 minutes to obtain oxygen-saturated water. Place the sensor into the water, wait for the reading to stabilize, and then conduct slope calibration.



Note : As an alternative, slope calibration can also be performed in air-saturated water. Pour water into a calibration cup to a liquid height of approximately 1 mm above the probe's optical membrane. Tilt the sensor slightly backward to prevent water from covering the optical film. Keep the sensor upright in the calibration cup (as shown below) and ensure the water surface does not cover the optical window. Wait about 3 minutes until the reading stabilizes before performing slope calibration.



VIII. Data Communication

8.1 Data Format

The Modbus communication data format is set as follows:
 9600, n, 8, 1 (serial transmission rate: 9600 bps; 1 start bit,
 8 data bits, no parity, 1 stop bit)

8.2 Data Frame Format (xx represents one byte)

a) Read Data Command Frame

05	03	xx	xx	xx	xx	xx	xx
Address	Function Code	Byte Count		Response Data		CRC Check Code (low byte first)	

b) Read Data Response Frame

05	03	xx	xx.....xx	xx	xx
Address	Function Code	Register Address	Data	CRC Check Code (low byte first)	

c) Write Data Command Frame

05	06	xx	xx	xx	xx	xx	xx
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Address	Function Code	Register Address	Write Data	CRC Check Code (Low Byte First)
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d) Write Data Response Frame

05	06	xx	xx	xx	xx	xx	xx
Address	Function Code	Register Address	Write Data	CRC Check Code (Low Byte First)			

1. Register Addresses

Register Address	Name	Description	Number of Registers	Access Method
40001 (0x0000)	Measurement Value + Temperature	4 groups of 16-bit integers, representing: measurement value, measurement value (decimal part), temperature, and temperature (decimal part)	4 (8 bytes)	Read
40005 (0x0004)	Dissolved Oxygen and Temperature (0-200%)	2 groups of 16-bit integers, representing: dissolved oxygen (integer part) and decimal part.	2 (4 bytes)	Read
44097 (0x1000)	Zero Calibration	Write data = 0 during calibration in air-free water; read to obtain calibration offset.	1 (2 bytes)	Read/Write
44101 (0x1004)	Slope Calibration	Write data = 0 during calibration in air-saturated water; read to obtain calibration slope value $\times 1000$.	1 (2 bytes)	Read/Write
44113 (0x1010)	Temperature Calibration	Write actual temperature value $\times 10$ when in solution; read to obtain temperature calibration value $\times 10$.	1 (2 bytes)	Read/Write

44129 (0x1020)	Salinity Compensation	Read/write data as salinity value (PSU) ×10. Used for salinity compensation. Default is 0 (no salinity compensation). Write range: 0–500, corresponding to 0.0–50.0 PSU.	1 (2 bytes)	Read/Write
48195 (0x2002)	Sensor Address	Default is 5; write data range: 1–255.	1 (2 bytes)	Read/Write
48196 (0x2003)	Serial Transmission Baud Rate	Default is 9600; 0 = 9600, 1 = 19200.	1 (2 bytes)	Read/Write
48225 (0x2020)	Restore Factory Settings	Write 0 to restore to factory default. Note: after resetting, calibration must be performed again before measurement can resume.	1 (2 bytes)	Write

2. Command Examples

a) Measurement Command Function:

Retrieve the dissolved oxygen and temperature values from the sensor.

- Dissolved oxygen unit: mg/L
- Temperature unit: °C

Request Frame : 05 03 00 00 00 04 45 8D

Response Frame : 05 03 08 01 02 00 02 00 B0 00 01 DB 0C

Read Example:

Dissolved Oxygen	Temperature
01 02 00 02	00 B0 00 01

Example: Dissolved oxygen value 01 02 represents the hexadecimal dissolved oxygen data. 00 02 indicates two decimal places.

Converted to decimal: 2.58.

Temperature value 00 B0 represents the hexadecimal temperature data. 00 01 indicates one decimal place. Converted to decimal: 17.6.

b) Calibration Command :

Zero Calibration

Function: Set the dissolved oxygen sensor zero calibration value

Request frame: 05 06 10 00 00 00 8C 8E

Response frame: 05 06 10 00 00 00 8C 8E

Slope calibration

Function: Set the dissolved oxygen sensor slope calibration value. This slope calibration should be performed in air-saturated water.

Request frame: 05 06 10 04 00 00 CD 4F

Response frame: 05 06 10 04 00 00 CD 4F

c) Set device address

Function: Set the MODBUS device address of the sensor. The address range is from 0x05 to 0xA0. Example below:

Request frame: 05 06 02 00 01 E3 8E

Response frame: 05 06 02 00 01 E3 8E

d) Salinity compensation command

Function: Set salinity compensation for the sensor. When measuring water with a salinity of 35.0 PSU, add salinity compensation. Example below:

Request frame: 05 06 10 20 01 5E 0D 2C

Response frame: 05 06 10 20 01 5E 0D 2C

3. Error Response

If the sensor fails to correctly execute an upper-level command, it will return data in the following format:

Definition	Address	Function Code	CODE	CRC Check
Data	ADDR	COM + 80H	xx	CRC 16
Byte Count	1	1	1	2

- a) CODE 01 – Function code error
03 – Data error
- b) COM: Function code received

IX. Precautions

- Avoid exposing the inner surface of the fluorescent membrane cap to sunlight.
- Do not touch the fluorescent membrane by hand.
- During measurement and calibration, make sure there are no air bubbles on the surface of the fluorescent membrane cap.
- Do not apply any mechanical force (pressure, scratching, etc.) directly to the fluorescent membrane cap.

X. Warranty Period

Within one year from the date of shipment, if the product is used properly according to the instructions and the appearance remains intact, it will be repaired or replaced free of charge.

XI. Technical Support

This manual is intended to help users correctly operate and use the product. If you encounter any questions during use, please contact our technicians, who will provide satisfactory answers.

XII. Contact Information

Company Name: EZ Instrument Technology Co., Ltd.

Head Office Address: —

Website: —