

OHTS1031 Digital Fluorescence Dissolved Oxygen Sensor

1 Product Overview



The OHTS1031 is an online multi-parameter water quality monitoring sensor based on the fluorescence quenching principle, integrating dissolved oxygen (DO), pH, and temperature measurement functions. The sensor features an all-plastic enclosure structure, measures dissolved oxygen concentration by detecting the quenching effect of oxygen molecules on specific fluorescent materials, and incorporates a built-in temperature compensation unit and pH electrode, making it suitable for long-term underwater deployment scenarios. The communication interface utilizes RS485 bus with Modbus RTU protocol support, enabling multi-point networked monitoring.

2 Application Scenarios

- High-density aquaculture systems (dissolved oxygen monitoring for fish, shrimp, and crab ponds)
- Municipal and industrial wastewater treatment process monitoring
- Surface water and groundwater environmental monitoring stations
- Seawater and freshwater aquaculture environmental parameter acquisition
- Laboratory water quality analysis equipment integration
- Smart agriculture irrigation water quality monitoring

3 Product Features

- **Multi-parameter Integration:** Single device simultaneously outputs dissolved oxygen (mg/L and % saturation), pH value (4-11 range), and temperature (0-40°C) data
- **Optical Measurement Principle:** Utilizes fluorescence method for dissolved oxygen measurement, featuring no electrolyte consumption, ion interference immunity, and extended maintenance cycles
- **Digital Communication Interface:** RS485 physical layer, Modbus RTU protocol, supports 9600 bps baud rate, maximum support for 119 device addresses
- **Environmental Parameter Compensation:** Supports altitude (0-8848m) and salinity (0-100 PSU) compensation with automatic correction of dissolved oxygen mg/L calculated values
- **Calibration Functions:** Supports two-point dissolved oxygen calibration (zero oxygen point and saturation oxygen point) and three-point pH calibration (pH 4.00/6.86/9.18 standard solutions)
- **Operating Modes:** Supports online continuous measurement mode, handheld measurement mode, and aquaculture pond dedicated mode (outputs mg/L values only)
- **Protection Design:** All-plastic enclosure, waterproof to 10m depth, measurement sensing membrane must be kept clean and intact

4 Technical Specifications

Parameter Category	Specification
Dissolved Oxygen Measurement	
Measurement Range	0-20 mg/L (ppm) / 0-200% Saturation
Measurement Accuracy	<5 mg/L: ± 0.2 mg/L; ≥ 5 mg/L: ± 0.3 mg/L
Repeatability	0.2 mg/L
Response Time	T90 < 60 s
Temperature Equilibration Recovery	<0.1 mg/L drift recovery requires 300 s stabilization
Thermal Shock Recovery	<0.1 mg/L drift recovery requires 2 hours stabilization
Temperature Measurement	
Measurement Range	0-40°C
Measurement Accuracy	± 0.1 °C
Response Time	T80 < 600 s
pH Measurement	
Measurement Range	4-11
Measurement Accuracy	0.1
Electrical Characteristics	
Supply Voltage	12V-24V DC
Operating Current	20 mA @ 12V
Communication Interface	RS485 (Baud rate 9600 bps, 8N1 format)
Communication Protocol	Modbus RTU
Environmental Adaptability	
Storage Temperature	-5°C ~ 50°C (humidity retention required)
Waterproof Depth	10 m
Reliability and Lifetime	
Sensor Lifetime	Dissolved oxygen fluorescent membrane: 2 years; pH electrode: 1 year

5 Physical Specifications

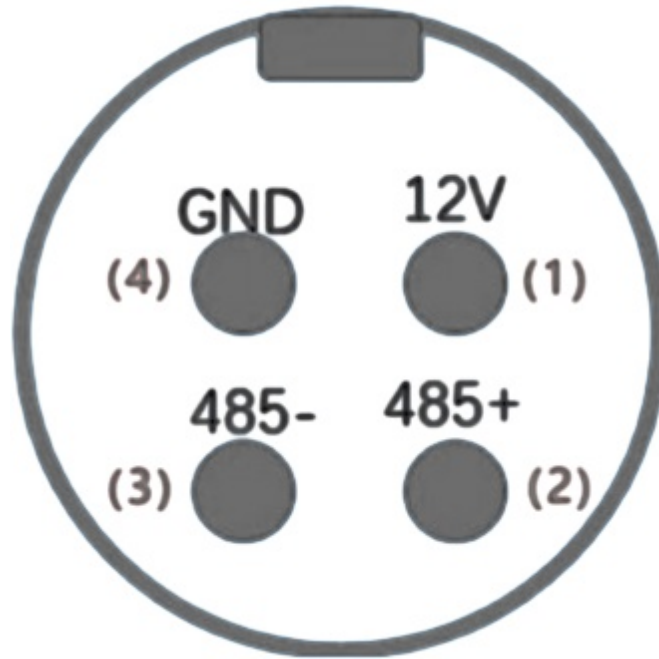
Component	Material
Housing	ABS/PC, 304 Stainless Steel, 316 Stainless Steel
Pigtail Cable	TPU/PVC

Note: Please refer to the product outline drawing for specific dimensions.

6 Installation Instructions

- 1. Electrical Connection:** Connect power and RS485 bus through the waterproof connector; default immersion depth approximately 20cm
- 2. Waterproof Requirements:** Keep the waterproof connector above water level as much as possible; avoid prolonged immersion
- 3. Sensing Membrane Protection:** Ensure the measurement sensing membrane remains clean, intact, and undamaged. If the membrane surface is contaminated, gently wipe with a soft cloth and clean water only. Do not use benzene or alcohol-based solvents for cleaning. Do not scrape or scratch.
- 4. Initial Immersion:** For long-term online measurement applications, the sensor must be immersed for at least 1 hour during first use to allow adequate hydration of the fluorescent membrane before accurate measurement data can be obtained.

7 Wiring Definition



Pin	Color	Definition
1	Red	Power Positive (+12V~24V DC)
2	Green	RS485 A-line (485+)
3	Yellow	RS485 B-line (485-)
4	Black	Power Negative (GND)

8 Communication Protocol and Data Conversion

8.1 Communication Parameters

- **Physical Layer:** RS485
- **Baud Rate:** 9600 bps
- **Data Format:** 8 data bits, no parity bit, 1 stop bit (8N1)
- **Floating Point Format:** IEEE754 standard
- **Checksum Method:** CRC16/MODBUS

8.2 Modbus Register Mapping (S20 Model)

Register Name	Address (Decimal)	Register Count	Read/Write	Data Description
Online Mode Parameters	0	2	R/W	Reg0: Measurement interval (5-10s); Reg1: Average count (10-180). Not saved on power loss
Handheld Mode Parameters	2	2	R/W	Reg0: Measurement duration (5-60min); Reg1: Average count (1-180). Not saved on power loss
Altitude	4	2	R/W	Reg0: Altitude (0-8848m); Reg1: Reserved (0)
Salinity	6	2	R/W	Reg0: Salinity (0-100 PSU); Reg1: Reserved (0)
Device Address	10	2	R/W	Reg0: Address (1-119); Reg1: Sensor type (20: S20)
Power-on Auto Measurement	12	2	R/W	Reg0: Measurement interval (5-10s); Reg1: Average count (10-180). Saved on power loss
DO Calibration Operation	14	2	R/W	Write 1: Start zero oxygen calibration; Write 2: Start saturated oxygen calibration; Write 3: Exit calibration
Temperature	16	2	R	Reg0: Unsigned short integer ($uint16_t$)($(T + 50) \times 100$); Reg1: Signed short integer ($int16_t$)($T \times 100$), unit °C
DO Saturation Ratio	18	2	R	Reg0: DO saturation (0-25000, corresponding to 0%-250%), value scaled 100x; Reg1: Reserved (0)
DO Concentration	20	2	R	Reg0: Dissolved oxygen concentration (0-10000, corresponding to 0-100mg/L), value scaled 100x; Reg1: Reserved (0)
Status Word	22	2	R	Reg0: Measurement countdown (s); Reg1: Status flags (Bit0: Data valid flag)
pH Measurement	38	2	R	Reg0: pH value (0-14000, corresponding to pH 0-14.0), scaled 1000x; Reg1: Valid flag (1 valid / 0 invalid)
pH Calibration Operation	40	2	R/W	Write 1/3/5: Start pH 4.00/6.86/9.18 calibration; Write 2/4/6: Clear corresponding calibration point
Factory Reset	42	2	R/W	Write key 0x23456789 to execute reset
Aquaculture Pond Mode	44	2	R/W	Reg0: 0=One-time enable / 1=One-time disable / 2=Always enabled / 3=Always disabled; In this mode, only mg/L values are output

8.3 Data Conversion Formulas

Temperature Conversion:

$$T_{actual} = \frac{Reg0}{100} - 50 \quad \text{or} \quad T_{actual} = \frac{Reg1}{100}$$

Where $Reg0$ is unsigned short integer, $Reg1$ is signed short integer, unit °C.

DO Saturation Conversion:

$$DO_{\%} = \frac{Reg0}{100}$$

Where $Reg0$ is the value from register 18, unit %.

Dissolved Oxygen Concentration Conversion:

$$DO_{mg/L} = \frac{Reg0}{100}$$

Where $Reg0$ is the value from register 20, unit mg/L.

pH Conversion:

$$pH = \frac{Reg0}{1000}$$

Where *Reg0* is the value from register 38.

9 Precautions

- **Electrical Safety:** During installation, ensure the sensor connector does not immerse in water; the waterproof connector must remain above water level
- **Sensing Membrane Maintenance:** The fluorescent membrane surface must not contact organic solvents (benzene, alcohols). Clean using only clean water and a soft cloth. Do not scrape or scratch.
- **Calibration Requirements:** When performing two-point calibration, you must calibrate the zero oxygen point first, then the saturated oxygen point. pH calibration requires stabilization in standard solution for more than 1 minute.
- **Measurement Conditions:** Tap water aerated for more than 1 hour reaches approximately 100% saturation and can serve as a reference for saturated oxygen calibration.
- **Storage Requirements:** Long-term storage temperature -5°C to 50°C; the fluorescent membrane must be kept moist.
- **Exception Handling:** When DO saturation ratio/DO concentration reads 65535, this indicates a measurement fault; check the status word and hardware connections.

10 After-sales Support

This product is subject to after-sales service and quality assurance in accordance with relevant laws of the People's Republic of China and company regulations. Failures caused by manufacturing defects during the warranty period are eligible for free repair or replacement. The fluorescent membrane and pH electrode are consumables with lifetimes of 2 years and 1 year respectively; performance degradation beyond these lifetimes is not covered under warranty.

Users shall take necessary measures in product design and usage to prevent accidents, including but not limited to correct electrical connections, periodic calibration maintenance, and avoiding operation beyond specifications. The manufacturer assumes no liability for damage caused by user mishandling, operation beyond technical specifications, or force majeure.

11 Manufacturer Information

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12 Revision History

Version	Date	Description
V1.0	-	Initial release