Dissolved Oxygen Sensor

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Preface

- Thank you for purchasing our company's products.
- This manual is an instruction manual about the various functions, wiring methods, setup methods, operation methods, fault handling methods, etc. of the product.
- Please read this manual carefully before operation, use this product correctly, and avoid unnecessary losses caused by incorrect operation.
- After you finish reading, please keep it in a convenient place for easy access at any time for reference during operation.

Note:

- If there are any modifications to the content of this manual due to functional upgrades or other reasons, we will not notify you.
- We strive to ensure the accuracy of the content in this manual. If you find any errors, please contact us.
- The content of this manual is strictly prohibited from being reproduced or copied.
- This product is prohibited from use in explosion-proof environments.

Version:

U-SUP-DO-7013-EN2

Confirm Packaging Content

After opening the packaging box, please confirm the contents of the packaging before starting the operation. If you find any errors in the model and quantity or physical damage to the appearance, please contact our company.

Product List

Product Packaging Contents

Number	Product Name	Quantity	Remarks
1	Dissolved Oxygen Sensor	1	
2	Information Card	1	
3	Certificate	1	

Contents

1. Product Overview

Our company has designed a DO digital sensor for the aquaculture industry, with an RS485 digital interface, which can be used to measure the changes in DO values in aqueous solution systems within a range.

It has a standard RS485 Modbus RTU protocol interface function and can communicate remotely with the upper computer.

2. Main Characteristics

- Isolation power supply design, data stability, strong anti-interference ability, mature sensor manufacturing process, high reliability, good long-term working stability, use of durable dissolved oxygen electrolyte formula, extended maintenance cycle, digital interface method.
- Communication method: RS485 interface * 1
- Communication speed: 4800/9600 (default)/14400/19200 Optional communication protocol: Modbus RTU protocol.
- Dissolved oxygen DO supports automatic temperature and manual atmospheric pressure, and seawater salinity compensation temperature compensation range: 0.0-60.0 ℃.
- Temperature correction range: ± 0.5 ℃ Atmospheric pressure compensation range: 600.0-800.0 mmHg Seawater salinity compensation range: 0-40.0 ppt.

3. Technical Parameter

Table 1

Measurement	DO
Measurement Range	0-40.00mg/L
Resolution	0.01mg/L
Temperature Range	-20-60℃
Sensor Type	Improved primary battery DO sensor
Measurement Accuracy Error	＜0.5mg/L
Output Mode	RS485
Communication Protocol	Standard MODBUS-RTU Protocol
Address	1-255
Setting Method	RS485 Remote calibration and parameter setting
Power Supply Mode	12VDC
Power Consumption	30mA@12VDC

4. Electrical Connection

Table 2

Color	Red	Black	Green	White
Description	VCC	GND	485A	485B

5. Maintenance

（1）Electrode storage: When the electrode is not used for a long time, please pour out the solution inside the membrane head and keep the chamber dry. The electrode membrane cover and rubber cover are used to protect the top breathable membrane of the membrane head. Do not discard them.

（2）Accessory replacement cycle

Electrode membrane cover: It is recommended to replace it every 6 months.

Electrolyte: It is recommended to replace it every 3-6 months

（3）Maintenance - Check the old electrode membrane cover

Unscrew the electrode membrane cover, observe the head of the electrode membrane cover - breathable membrane, check if its appearance is complete and flawless. If it is damaged, replace it with a new membrane cover, pour out the old electrolyte, clean the membrane cover and electrode rod body with clean water, and dry them for later use.

（4）Maintenance - Clean Sensor Metal Reaction Pole

Observe the metal part of the electrode head rod. If it turns black or has a large amount of oxidation product spots, fill the new electrolyte into the membrane head, tighten and place it vertically. Depending on the amount of reaction product on the surface of the metal reaction electrode, wait for 10-30 minutes or more. After the waiting time is up, unscrew the membrane sleeve and try wiping it with a tissue until it is shiny. If there are still residual products, repeat the above steps.

（5）Maintenance - Add Electrolyte

Add new electrolyte to approximately 3/4 of the electrode membrane sleeve. To avoid the formation of bubbles that may affect the measurement, please slowly screw in and gently tap to release the bubbles. (If there are bubbles, please repeat the above operation.) Let it stand still for more than 20 minutes before calibration can be performed.

6. Warranty and After-Sales Service

Our company promises to customers that the hardware accessories provided during the supply of this instrument have no defects in material and manufacturing process.

Starting from the date of purchase of the instrument, if we receive notification from the user regarding such defects during the warranty period, our company will provide unconditional free maintenance or replacement for products that are indeed defective. We guarantee that all non customized products can be returned or exchanged within 7 days.

Disclaimer

During the warranty period, product malfunctions caused by the following reasons are not within the scope of the three guarantee service:

(1) Improper use by the customer resulted in product malfunction.

(2) The customer's self disassembly, repair, and modification of the product resulted in product malfunction.

After sales service commitment:

(1) We promise to respond and handle customer technical questions within 2 hours after receiving them.

(2) We promise to provide test results within 3 working days and repair results within 7 working days after receiving the instruments for factory repair.

7. Communication Protocol

Communication interface RS485, baud rate 9600, no checksum, 8-bit data bits, default address 1, protocol specification Modbus RTU, instructions support 0x03 read register, 0x06 write register, 0x10 continuous write register.

7.1. Information Frame Format

Table 3

0x03 Read Data【HEX】				
01	03	××××	××××	××××
Address	Function Code	Initial Data Address	Data Length	Check Code

Table 4

0x06 Write Data【HEX】				
01	06	××××	××××	××××
Address	Function Code	Data Address	Write Data	Check Code

Table 5

0x10 Continuously Writing Data【HEX】						
01	10	××××	××××	××	××××	××××
Address	Function Code	Data Address	Number of Registers	Byte Count	Write Data	Check Code

Note: The checksum is 16CRC, with low bytes coming first.

7.2. Register Data Format

Table 6

Address	Data Name	Conversion Coefficient	State
0	Temperature	0.1℃	R
1	DO	0.01mg/L	R
2	Saturation	0.1%DO	R
3	Sensor, Zero Point	0.1%	R
4	Sensor, Slope	0.1mV	R
5	Sensor、mV	0.1%S	R

Address	Data Name	Conversion Coefficient	State
6	System State.01	Format 4*bits 0xFFFF	R
7	System Status. 02 User Command Address	Format 4*bits 0xFFFF	R/W

Note: Each address data is a 16 bit signed integer with a length of 2 bytes

Actual result=Register data * Conversion coefficient

Status: R=Read Only R/W=Read/Write

7.3. Parameter Settings

Table 7

Address	Data Name	Set Range
11	RS485. Address	1-255（Default 01）
12	RS485.Baud Rate	4800，9600（Default），14400，19200
13	RS485. Communication Format	0=N81（Default），1=N82，2=E81，3=081
14	DO Salinity	0-4000@0.01ppt
15	DO Atmospheric pressure	6000-8000 @0.1mmHg
17	Temperature Drift	±50@0.1℃
18	Temperature.MTC	-200～600@0.1℃
19	Temperature.Type	Manual Operation=0/NTC=1（Default）22K
20	Temperature.Unit	Unit.C=0（Default），Unit F=1 Address 0 Numerical display of different types of temperatures

7.4. Common Instruction Sets【HEX】

1. Read Temperature，DO，Saturation

[Send Tx]: 01 03 00 00 00 03 05 CB

[Receive Rx]: 01 03 06 00 FA 03 39 03 E8 29 96

Temperature = 00FA = 250 * 0.1℃= 25.0℃

DO = 0339 = 825 * 0.01mg/L = 8.25 mg/L

Saturation = 03E8 = 1000* 0.1%DO = 100.0%DO

2. Set up RS485.Address Original Address：0x01 Need to be modified to: 0x02

[Send Tx]: 01 06 00 0B 00 02 79 C9

[Receive Rx]: 01 06 00 0B 00 02 79 C9 (Setting successfully)

3. Query RS485 Address（Standalone Mode）

Unknown device address, You can use the address 0x00 to send the 03 command

[Send Tx]: 00 03 00 00 00 03 04 1A

[Receive Rx]: 01 03 06 00 FA 02 BC 00 06 B9 3F

Current Device Address = 0x01

4. Electrode Calibration

Please use the user command set to write the command to address 0x07 to complete the operation

Calibrate Zero Oxygen| [Send Tx]: 01 06 00 07 00 00 38 0B

Calibrate Saturated Oxygen | [Send Tx]: 01 06 00 07 00 01 F9 CB

[Receive Rx] Return the same command as [Send Tx], indicating successful calibration.

Notice on Calibration of Zero Oxygen

Zero oxygen configuration: Please prepare a glass container and add an appropriate amount of water. Add a sufficient amount of anhydrous sodium sulfite analytical reagent to the container to make the aqueous solution supersaturated. Then place the electrode in the zero oxygen solution and wait for the signal to stabilize before sending the calibration.

Notice on Calibration of Saturated Oxygen

When calibrating, please stabilize the electrode in air for 20 minutes before performing the calibration operation. If any abnormalities are returned, please confirm whether the abnormal command or sensor status is abnormal.

5. Restore Factory Defaults

Please use the user command set to write the command to address 0x07 to complete the operation and restore the factory default | TX: 01 06 00 07 00 D2 B8 56

[Receive Rx] returns the same instruction as [Send Tx], indicating successful recovery.

7.5. Execute User Commands

Register address: 0x07. Use 0x06 to write instructions. After performing the corresponding operation and modifying the baud rate, the device will take effect on the next restart.

Table 8

Number	User Command	Decimalism	Hexadecimal
01	Calibrate Zero Oxygen	0	0x0000
02	Calibrate Saturated Oxygen	1	0xs0001
03	Restore Factory Default	210	0x00D2
04	Select Baud Rate 4800	4800	0x12C0
05	Select Baud Rate 9600	9600	0x2580
06	Select Baud Rate 14400	14400	0x3840
07	Select Baud Rate 19200	19200	0x4B00

7.6. User Command Error Code Returned

Table 9

	Address	Return Code	Error Code	Check Code
Error Return	01	86	02	C3 A1

Table 10

Error Code	Description
0x01	Invalid instruction or current instruction unavailable
0x02	The content of this address cannot be written with data. If a command is executed, it indicates that the current sensor status cannot perform this operation.
0x03	The current input data is invalid and exceeds the input range.

Others：

Instruction 0x03 error returns instruction：0x83

Instruction 0x06 error returns instruction：0x86

Instruction 0x10 error returns instruction：0x90

7.7. Equipment Status Code

System Status. 01 Address: 0x06, Content Format: 4 * 4 bits, 0xFFFF

Table 11

【HEX】	Err_04	Err_03	Err_02	Err_01
Number	3	2	1	0
Description	System Reserved	DO Calibration	DO	Temperature