User's Manual of

Dissolved Oxygen (DO) Sensor

Galvanic Type

1. Precautions

Please follow operation instructions and precautions in this manual. Do not energize before all wires are completely connected to avoid hazards.

During the usage, if any device fault or damage is found, please contact the distributors. Do not repair it by yourself.

In order to ensure measuring accuracy, the device must be calibrated in conjunction with the electrode.

If your electrode is used for nearly a year or it has any quality problem, please pay attention to and replace it when necessary.

Please energize the device to preheat it for 30 minutes before calibration. Due to product upgrades, this manual is subject to change without notice.

2. Product application

Aquaculture, water quality testing, informational data collection, IoT water quality testing

Product feature

- Isolated power supply design, data stability, strong anti-interference ability,
- Mature sensor manufacturing process, high reliability, long-term work stability
- Durable DO electrolyte formula, extended maintenance cycle
- Digital interface

  Communication mode:RS485 port*1

  Communication speed:

  4800/9600(by default)/14400/19200 optional

  Communication protocol: Modbus-RTU protocol

  (03,06,0x10 support command)

DO support auto temperature, manual atmospheric pressure, sea salinity compensation

Temperature compensation range:0.0~60.0℃

Atmospheric pressure compensation range: 600.0~800.0 mmhg

Sea salinity compensation range:0~40.0 ppt

3. Product overview

DO digital sensor is designed for aquaculture industry. Equipped with RS485 digital serial ports, it can be used for measuring the variation of DO value of water-dissolvent fluid system within the measuring range. It has standard RS485 Modbus RTU protocol function and allows remote communicate with upper computer.

4. Technical parameter

Measurement	DO value in water
Measure range	0~20.00mg/l
Resolution	0.01mg/l
Temperature range	-20~60℃
Type of sensor	Galvanic Cell sensor
Measuring accuracy	<0.5mg/l
Output mode	RS485 port*1
Communication protocol	Compatible with standard MODBUS-RTU protocol
Communication mode	RS485 9600,8,1,N (by default)
ID	1~255 Default ID 01 (0x01)
Fixing method	RS485 remote setting calibration and parameters
Power supply mode	12VDC
Power consumption	30mA @12VDC

5. Ordering information

Standard configuration: DO digital sensor*1; cable length

selective; length for cleaning floating body: 40 cm; electrode

cable length 5m

Intelligent module communication protocol

Introduction

Communication port: RS485

Port setting: 9600,N,8,1 (by default)

Device address: 0x01 (by default)

Protocol specifications: Modbus RTU

Commands support: 0x03 read register

0X06 write register| 0x10 continuous write register

Information frame format

0x03 read data [HEX]				
01	03	×× ××	×× ××	×× ××
Address	Function code	Data head address	Data length	Check code

0x06 write data [HEX]				
01	06	×× ××	×× ××	×× ××
Address	Function code	Data address	Write data	Check code

Remarks: The check code is 16CRC with low byte ahead.

0x10 Continuous write data [HEX]			
01	10	×× ××	××××
Address	Function code	Data address	Register number
××	×× ××	×× ××	
Byte number	Write data	Check code	

Format of register data

Address	Data name	Switch coefficient	Status
0	Temperature	0.1°C	R
1	DO	0.01mg/L	R
2	Saturability	0.1%DO	R
3	Sensor. null point	0.1%	R
4	Sensor. slope	0.1mV	R
5	Sensor. MV	0.1%S	R
6	System status. 01	Format 4*4bit 0xFFFF	R
7	System status.02 User command address	Format: 4*4bit 0xFFFF	R/W

Remarks:Data in each address is a 16-bit signed integer, the

length is 2 bytes.

The real result=Register data * switch coefficient

Status:R=only read; R/W= read/write

6. Parameter setting

Address	Data range	Setting range
11	RS485.address	1~255(By default 0x01）
12	RS485. Baud rate	4800, 9600 (by default) 14400 ,19200
13	RS485. Communication format	0 = N81(by default) ,1 = N82 2 = E81, 3 = O81
14	DO salinity	0~4000@0.01ppt
15	DO atmospheric pressure	6000~8000 @0.1mmHg
17	Temperature. shift	±50 @ 0.1℃
18	Temperature. MTC	-200~ + 600 @ 0.1℃
19	Temperature. type	Manual = 0	NTC=1 (by default) 22K
20	Temperature. unit	Unit.C = 0（by default）, Unit.F = 1 Address 0 data indicates different types of temperature

7. Common command set [HEX]

1) Read temperature, DO, saturability

[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°C= 25.0°C

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

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

2) Set RS485.address

Original address: 0x01 needs to be modified as 0x02.

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

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

3) Check RS485 address (standalone Mode)

Device address unknown, can use address 0x00 to send 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 commands to the

0x07 address to complete the operation.

Calibrate the zero oxygen | [Send Tx]:01 06 00 07 00 00 38

0B

Calibrate the saturated oxygen | [Send Tx]:01 06 00 07 00

01 F9 CB

[Receive Rx] returns the same command as [Send Tx],

indicating successful calibration.

Instructions for calibrating zero Oxygen

Configure zero Oxygen: Please prepare a glass container and add appropriate amount of water into it, then add enough anhydrous sodium sulfite to analyze the pure reagent to make the aqueous solution oversaturated. Subsequently, put the electrode into the

zero oxygen solution and wait the signal to be stable before sending calibration.

Instructions for calibrating saturated oxygen

When calibrating, please put the electrode in the air for 20 minutes before the calibration. In case of abnormal return, please confirm whether the abnormal command is operated or the sensor status is abnormal.

8. Restore the factory default settings

Please use the user command set to write commands to 0x07 address so as to restore the factory default | TX: 01 06 00 07 00 B8 56

If [Receive Rx] returns the same command as [Send Tx], it means the factory default setting is restored.

Perform the user command

Register address: 0x07, use 0x06 to write commands to perform corresponding operations. When the Baud rate is modified, the settings will become valid at the next restart of the device.

No.	Overview of user command	Decimal	Hexadecimal
01	Calibrate zero oxygen	0	0x0000
02	Calibrate saturated oxygen	1	0x0001
03	Restore factory default setting	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

User command error code return

For example:Address return code error code check code error return: 01 86 02   C3 A1

Error code	Description
0x01	Invalid command or current command unavailable
0x02	The address content cannot be written into data, if performing the command, it means the current sensor cannot perform this operation.
0x03	The current data input is invalid due to it exceeds the input range.

Other notes:

Command 0x03, error return command: 0x83

Command 0x06 error return command: 0x86

Command 0x10 error return command: 0x90

Device status code

System status.01 Address:0x06, Content format: 4*4bit, 0xFFFF

[HEX]	Err _04	ERR _03	ERR _02	ERR _01
No.	3	2	1	0
Description	System reserve	DO calibration	DO	Temperature

Storage and maintenance of DO digital electrode

Electrode storage

If the electrode is not used for a long time, please pour off the solution in the film head and keep its cavity dry. Electrode film sleeve and rubber sleeve are used to protect the gas

permeable film on the top of the film head, please do not discard it.

Accessory replacement period

Electrode film sleeve:it's suggested to replace it every six months.

Electrolyte:it's suggested to replace it every three to six months.

Maintenance-Check the old electrode film sleeve

Unscrew the electrode film sleeve and observe the gas permeable film on the its top. Check its appearance for any defects. If it's damaged, replace it with a new electrode film sleeve.

Pour off the old electrolyte and clean the electrode rod with water. Dry them for use.

Maintenance-Clean the sensor metal reaction electrode.

Observe the metal part of the electrode head. If it turns black or oxidized for most parts and has spots, please add new electrolyte into the film head, screw it and place it vertically. According to the reacted products on the surface, wait for 10~30 minutes. Unscrew the film sleeve and rub it with paper until it brightens. If any residue remains, repeat the above operations.

Maintenance-Add electrolyte to approximately 3/4 of the electrode film sleeve. In order to avoid the influence caused by bubble, please slowly screw in and tap gently to release the bubble. (If the bubble remains, repeat the above operation.) After keeping it still for 20 minutes or more, calibration can be performed.

Wiring definition for DO digital sensor

Please pay attention to the color and wiring definition carefully before wiring. Wrong wiring may cause damage to the sensor.

Sensor power supply	12VDC
Working current	25 mA
Communication interface	RS485
Communication format	N 8 1
Baud rate	9600
Communication protocol	Modbus-RTU

Wiring definition

Color	Red	Black	Green	White
Notes	12V+	GND	485A	485B