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

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 in 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, benzine

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	EC sensor	1
2	Manual	1
3	Certificate	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.

Content

Chapter 1 Product Overview

The Cond salinity/conductivity sensor designed by our company for aquaculture, environmental protection water treatment, industrial processes and other industries, equipped with a two-pole graphite sensor, can be used to measure the conductivity and salinity value changes in the aqueous system within the range.

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

It is widely used in water quality testing, aquaculture, information data collection, Internet of Things water quality testing, industrial process testing.

Chapter 2 Features

- Isolated power supply design, data stability,
- strong anti-interference ability
- Two-pole graphite conductivity/salinity sensor
- Shell material: PPS
- Corrosion resistance, high stability,
- suitable for continuous monitoring of fresh water and sea water
- Built-in temperature sensor

Chapter 3 Technical Parameters

3.1 Sensor parameters

Table 1

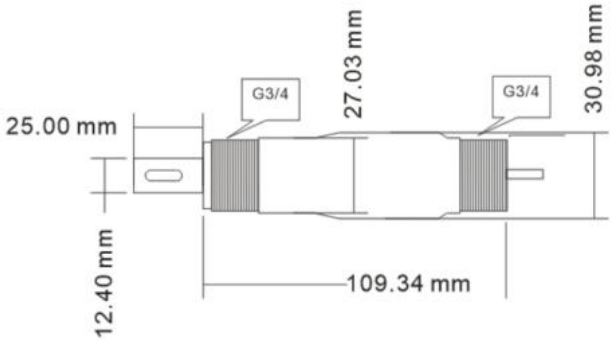
Principle	Two-pole graphite sensor
Measuring range	Conductivity： 0-9999uS/cm;
	10.00-100.00mS/cm;
	TDS: 0-9999ppm
	Salinity: 0-40.00ppt
Resolution	1uS/cm; 0.01mS/cm; 1ppm; 0.01ppt
Accuracy	±2.5%
Sensor life	2–3years
Calibration period	＞3 months
Shell material	PPS
Cable length	5 meter (standard), other lengths are optional

3.2 Smart module parameters

Table 2

Measure	Salinity/conductivity/TDS in water
Measuring range	Conductivity: 0-9999uS/cm;
	10.00-100.00mS/cm;
	TDS: 0-9999ppm
	Salinity: 0-40.00ppt
Resolution	1uS/cm; 0.01mS/cm; 1ppm; 0.01ppt
Temp range	0-60.0℃
Temp resolution	0.1℃
Sensor type	Two-pole graphite sensor
Accuracy	±2.5%；±0.5℃
Data compensation	Default 25.0℃ compensation temperature, 2%/℃
Communication method	RS485 interface*1
Communication protocol	Standard MODBUS-RTU protocol
Communication method	Baud rate 9600, 8, 1, N
	ID: 1-255 Default ID: 1 (0x01)
Calibration and parameter setting	RS485 remote setting
Power supply	7 - 30VDC
Power consumption	30mA @12 VDC

Chapter 4 Dimension



Chapter 5 Electrical connections

Table 3

Power supply	7-30VDC
Working current	25mA
Communication	RS485
Communication format	N81
Baud rate	9600
Communication protocol	Modbus-RTU

Wiring definition

Table 4

Color	Red	Black	Green	White
Description	V+	GND	485A	485B

Note: Please carefully check the color and wiring definition before wiring, if the wrong wiring may cause damage to the sensor

Chapter 6 Warranty and after-sales service

The company promises to customers that the hardware accessories provided when the instrument is supplied are free of defects in materials and manufacturing processes.

Calculated from the date of purchase of the instrument, if a user's notice about such defects is received during the warranty period, the company will implement unconditional free maintenance or free replacement for products that are indeed defective, and all non-customized products are guaranteed to be returned within 7 days.

Disclaimer

During the warranty period, product failure due to the following reasons does not belong to the scope of the three guarantees:

(1) Product failure caused by improper use by customers.

(2) The customer disassembles, repairs and refits the product on its own, causing product failure.

After-sales service commitment

(1) For customer's technical questions, we promise to respond and handle them within 2 hours after receiving user questions.

(2) For instruments returned to the factory for repair, we promise to issue test results within 3 working days after receiving the goods, and repair results within 7 working days.

Chapter 7 Communication protocol

7.1 Introduction

1. Instructions support reading temperature, conductivity, salinity, TDS, resistance instructions support calibration of multiple standard solutions

2. Standard solution type: 84uS/cm, 1413uS/cm, 12.88mS/cm, 25ppt, custom salinity, conductivity standard solution calibration (sample real standard)

3. The instruction supports to modify the ID (1-255) instruction supports to restore the factory settings

4. System fault code

5. Communication interface RS485

6. Port setting 9600,N,8,1 (default)

7. Device address 0x01 (default)

8. Protocol specification Modbus RTU

9. Instruction support 0x03 read into register

10, 0x06 write register | 0x10 continuous write register

7.2 Information frame format

Table 5

0x03 Read data［HEX］

Address	Function code	Data first address	Data length	Check code
01	03	××××	××××	××××

0X03 Read data［HEX］

Address	Function code	Data first address	Data length	Check code
01	06	××××	××××	××××

0x10 Write data continuously [HEX]

Address	Function code	Data address	Number of registers	Number of bytes	Write data	Check code
01	10	×× ××	×× ××	× × × ×××××	××××	

Notes: The check code is 16CRC, with low byte first

7.3 Register data format

Table 6

Address	Data name	Conversion factor	Range / Description	Status
0x00	Temperature	0.1℃	Range：0-600	R
0x01	Conductivity.mS	0.01mS	Range：0-7000	R
0x02	Conductivity.uS	1uS	Range：0-9999	R
0x03	TDS	1ppm	Range：0-10000	R
0x04	Salinity	0.01ppt	Range：0-4000	R
0x05	Resistance.KΩ	1KΩ		R
0x06	Resistance.Ω	0.1Ω		R
0x07	User command	See the command list for details		R/W
0x09	Error code 01	-	See note	R

Notes: Each address data is a 16-bit signed integer with a length of 2 bytes, the actual result = register data * conversion coefficient

Chapter 8 Execute user commands

Command register address: 0x07

Use 0x06 to write instructions and perform corresponding operations

8.1 User command table

Table 7

User calibration	Command	HEX	Notes
Conductivity.84uS	30	0x1E	Use 84uS standard solution
Conductivity.1413uS	31	0x1F	Use 1413uS standard solution
Conductivity.1288uS	32	0x20	Use 12.88mS standard solution
Salinity.25ppt	33	0x21	Use 25ppt standard solution
Conductivity. Custom uS	34	0x22	Use custom uS standard solution
Conductivity. Custom uS	35	0x23	Use custom mS standard solution
Custom salinity.ppt	36	0x24	Use custom salinity ppt
Restore default	210	0xD2	Restore factory defaults

For example: calibration salinity. 25ppt

Address Function code Data address Write data Check code

Remote sending: 01 06 00 07 00 21 F8 13

Successful return: 01 06 00 07 00 21 F8 13

Address Return code Error code Check code

Error return: 01 86 02 C3 A1

User command error code returned

E.g:

	Address	Return code	Error code	Check code
Error return:	01	86	02	C3 A1

Table 8

Error code	Description
0x02	The content of this address cannot be written into data.,if it execute command, i means that the current sensor status cannot perform this operation.
0x03	The current input data is invalid and exceeds the input range

8.2 System error code

Table 9

Register	Err_04	ERR_03	ERR_02	ERR_01
0x09	None	None	EC_ERR	Temp_ERR

8.3 System fault code description

Table 10

0x00	0x01	0x02	0x03	0x04
No error	Over-range lower limit	Overrange upper limit	Calibration failed	No temperature sensor

8.4 Set parameter register

Table 11

Address	Name	Range / description
0x0B	RS485.ID	1-255
0x0E	Temperature drift	-50 ~ +50 [0.1℃]
0x0F	Temperature. Manual compensation	0-600 [0.1℃]
0x12	Sensor coefficient	850-1150 [0.001]
0x13	Custom conductivity.MS	100-7000 [0.01mS]
0x14	Custom conductivity.US	1-9999 [1uS]
0x15	Salinity custom	100-4000 [0.01ppt]
0x16	Temperature compensation coefficient	150 - 250 [0.01%/℃]
0x17	Compensation reference temperature	0-600 [0.1℃]
0x18	Salinity conversion factor	100 - 1000[0.01]
0x19	TDS conversion factor	100 - 1000[0.01]

8.5 Auxiliary instructions

- Calibrate the conductivity custom. MS, need to set the address 0x13 value, default: 12.88mS
- Calibrate the conductivity custom.US, you need to set the address 0x14, the default value: 1413uS
- Calibration salinity customization, address 0x15 needs to be set. Default value: 25.00ppt