Conductivity Quadrupole Digital 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-TDS-8002-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 Content

Number	Product Name	Quantity	Remarks
1	Conductivity Quadrupole Digital Sensor	1	
2	Manual	1	
3	Certificate	1	

Contents

1. Product Overview

Our company has designed four electrode conductivity and salinity digital sensors for industries such as aquaculture, river sewage, seawater salinity, and environmental engineering. These sensors are equipped with a dedicated four pole alloy sensor for aquaculture and can be used to measure changes in conductivity and salinity values in aqueous solution systems within a range of (0-500) mS/cm.
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
- 4-pole stainless steel, corrosion-resistant alloy conductivity/salinity sensor
- Shell material: POM (liquid contact part material)
- Corrosion resistant, high stability, suitable for continuous monitoring of freshwater and seawater
- Built in temperature sensor

3. Technical Parameter

3.1. Sensor Parameters

Table 1

Principle	Quadrupole Conductivity Sensor
Measurement Range	Conductivity：（100~60000）uS/cm; （0.1~500.00）mS/cm; TDS: （0~9999）ppm Salinity: （0~100.00）ppt
Resolution	1uS/cm; 0.01mS/cm; 1ppm; 0.01ppt
Accuracy	1.5%FS
Calibration Cycle	More than 3 months
Material	Liquid Connection Material: Graphite Shell: Engineering plastic
Cable Length	Comes standard with 5 meters, other lengths are optional.

3.2. Intelligent Module Parameters

Table 2

Measurement	Salinity/Conductivity/TDS
Measurement Range	Conductivity: (100~60000) uS/cm; (0.1~500.00) mS/cm; TDS: (0~9999) ppm Salinity: (0~100.00) ppt
Resolution	1uS/cm; 0.01mS/cm; 1ppm; 0.01ppt
Temperature Range	(0~60.0)℃
Temperature Resolution	0.1℃
Sensor Type	Quadrupole Conductivity Sensor
Measurement Accuracy	<1.5％F. S. Or 2% reading, whichever is smaller
Temperature	±0.5℃

Accuracy	
Temperature Compensation	Automatic compensation coefficient of 2%/℃, adjustable coefficient (default compensation temperature of 25.0 ℃)
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 Methods	RS485 Remote Setting
Power Supply Mode	12 VDC
Power Consumption	30mA @12 VDC

4. Sensor External Dimensions

Front and Rear Threads

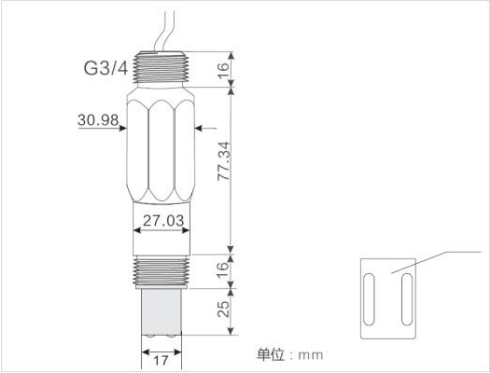

Fig. 1

5. Wiring and Installation

Table 3

Sensor Supply	12VDC
Working Current	25mA
Communication Interface	RS485
Communication Format	N8 1
Baud Rate	9600
Communication Protocol	Modbus-RTU

5.1. Wiring Definition

Table 4

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

Note: Please carefully check the color and wiring definition before wiring. Incorrect wiring may cause damage to the sensor.

5.2. Installation

Installing a conductivity cell is a very important task, and abnormal installation methods cannot obtain satisfactory measurement data. Please carefully select the installation location when installing the conductivity cell to avoid distortion of measurement data.

Error: The installation seat of the conductivity cell is too long, resulting in a short extension of the conductivity cell, which prevents the formation of active fluid renewal inside the conductivity cell and causes measurement errors.

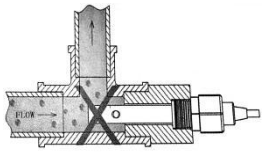

Fig. 2

Correct Method: Some fluid in the pipeline flows through the conductivity pool and is constantly updated, so the measurement is accurate, and the opening of the sensor must face the flow.

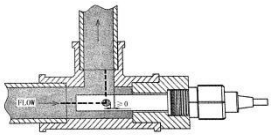

Fig. 3

Error: An air dead space is formed in the upper part of the pipeline, and although the opening of the conductivity pool affects the flow, there is still no fluid flowing through the conductivity pool, resulting in worthless and unstable measurement data.

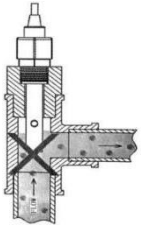

Fig. 4

Correct Method: The waist hole of the conductivity cell is located in the fluid, and part of the fluid flows through the conductivity cell to be continuously updated, ensuring accurate measurement.

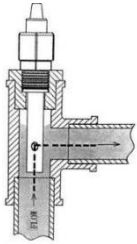

Fig. 5

Error: The water flow in the pipeline cannot be guaranteed to be full, and the discharged water flow will form excess gas. The conductivity pool constant is an unknown variable, and the data is invalid and unstable.

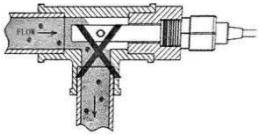

Fig. 6

Error: The water flow in the angled installation of the conductivity cell cannot pass through the measuring waist hole, and the accumulation of air inside the conductivity cell causes the measurement value to be invalid and unstable.

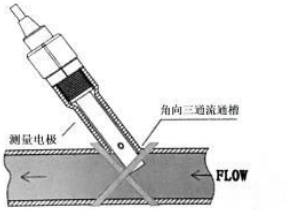

Fig. 7

Correct Method: Part of the FLOW flows through the waist hole of the conductivity cell and is continuously updated, with accurate and stable measurement data.

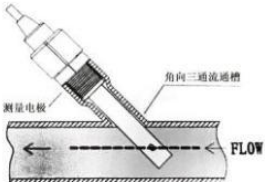

Fig. 8

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

7.1. Protocol Introduction

- The instruction supports reading temperature, conductivity, salinity TDS and resistance.
- Instructions support calibration of multiple standard solutions.
- Standard solution type: 84uS/cm, 1413uS/cm, 12.88mS/cm, 25ppt, custom salinity and conductivity standard solution calibration (sample actual standard)
- Instruction supports modifying ID (1-255)
- Command supports restoring factory settings.
- System Fault Code
- Communication Interface: RS485
- Port Settings: 9600,N,8,1 (Default)
- Device Address: 0x01 (Default)
- Protocol Specifications: Modbus RTU
- Instruction support: 0x03 read register; 0x06 Write to Register | 0x10 Continuously Write to Register

7.2. Information Frame Format

Table 5

0x03 Read Data［HEX］				
01	03	××××	××××	××××
Address	Function Code	Initial Data Address	Data Length	Check Code

Table 6

0X03 Read Data［HEX］				
01	06	××××	××××	××××
Address	Function Code	Data Address	Write Data	Check Code

Table 7

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

7.3. Register Data Format

Table 8

Address	Data Name	Conversion Coefficient	Scope/Description	State
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	Resistivity. KΩ/cm	-	Floating Point Number: ABCD	R
0x06				R
0x07	User Command	See command list for details		R/W
0x09	Error Code 01	-	See remarks	R

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

The actual result is equal to the register data multiplied by the conversion coefficient.

8. Execute User Commands

Command Register Address：0x07

Use 0x06 to write instructions and perform corresponding operations

8.1. User Instruction List

Table 9

User Calibration	Command	HEX	Remarks
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. Customize uS	34	0x22	Use custom uS standard solution
Conductivity. Customize 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：Calibrate salinity.25ppt

Table 10

	Address	Function Code	Data Address		Write Data		Check Code	
Remote Sending	01	06	00	07	00	21	F8	13
Successfully Returned	01	06	00	07	00	21	F8	13

Table 11

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

User command error code returned

For example：

Table 12

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

Table 13

Error Code	Description
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.

8.2. System Error Codes

Table 14 Content Format 4*4bit,0xFFFF

Register	Err_04	ERR_03	ERR_02	ERR_01
0x09	None	None	EC_ERR	Temperature ERR

8.3. System Fault Code Description

Table 15 Fault Code Number[HEX]

0x00	0x01	0x02	0x03	0x04
No Errors	Exceeding the lower limit of the measuring range	Exceeding the upper range limit	Calibration Failed	No Temperature Sensor

8.4. Set Parameter Register

Table 16

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 Customization	100 ~ 4000 [0.01ppt]
0x16	Temperature Compensation Coefficient	150 ~250 [0.01%/℃]
0x17	Compensation Reference Temperature	0 ~ 600 [0.1℃]
0x18	Salinity Conversion Coefficient	100~1000[0.01]
0x19	TDS Conversion Coefficient	100 ~ 1000[0.01]

8.5. Supplementary explanation

- Customize calibration conductivity MS, Address 0x13 needs to be set
  Numerical Default：12.88mS
- Customize calibration conductivity US, Address 0x14 needs to be set
  Numerical Default：1413uS
- Custom salinity calibration requires setting address 0x15
  Numerical Default：25.00ppt