User's Manual

Conductivity sensor

U-ZWLTDS-MYEN1

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

U-ZWLTDS-MYEN1

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	Conductivity 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 Introduction

The conductivity and salinity digital sensors designed by our company for aquaculture, river sewage, seawater salinity, environmental protection engineering and other industries are matched with aquaculture-specific four-pole alloy sensors, which can be used to measure (0~500) mS/cm range Changes in conductivity and salinity values in aqueous systems within the range.

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

Chapter 2 Features

- Isolated power supply design, data stability, strong anti-interference ability
- Stainless steel, corrosion-resistant alloy conductivity/salinity sensor
- Shell material: POM (liquid contact part material)
- Corrosion resistance, high stability, suitable for continuous monitoring of fresh water and sea water
- Built-in temperature sensor

Chapter 3 Parameters

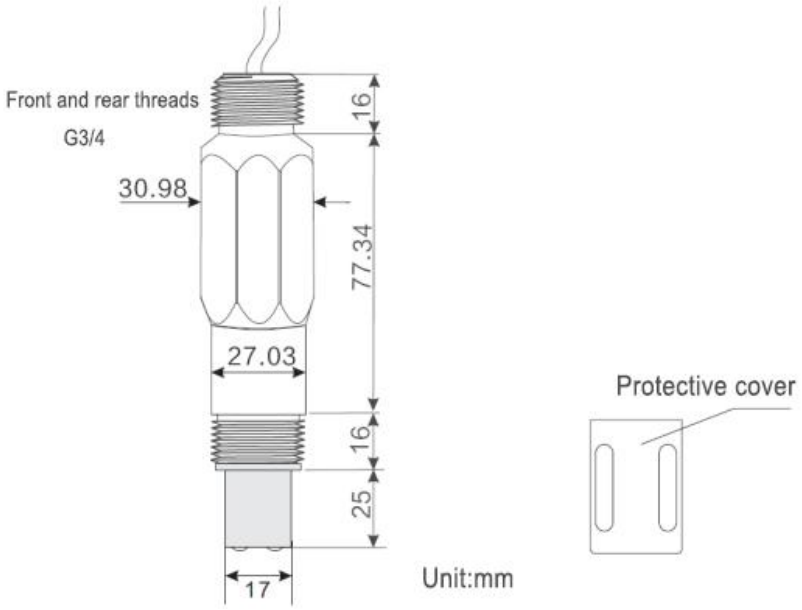
3.1 Sensor parameters

Sensor	
Principle	Quadrupole Conductivity Sensor
Measure 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	＞3 months
Shell material	POM (Wet part)
Cable	5M (Standard),others optional

Measurement	Salinity in water/Conductivity/TDS
Measure 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.
Temperature accuracy	±0.5℃
Temperature compensation	Automatic compensation coefficient 2%/℃, the coefficient is adjustable (default 25.0℃ compensation temperature)

Protocol	MODBUS-RTU
Communication	RS485
	Baud Rate 9600，8，1，N
	ID：1-255　Default ID：1 (0x01)
Calibration and parameter setting	RS485 Remote setting
Power supply	12 VDC
Power consumption	30mA @12 VDC

Chapter 4 Constructions



Chapter 5 Wiring and Installation

Sensor power	12VDC
Working current	25mA
Communication interface	RS485
Communication format	N8 1
Baud rate	9600
Protocol	Modbus-RTU

5.1 Wiring Definition

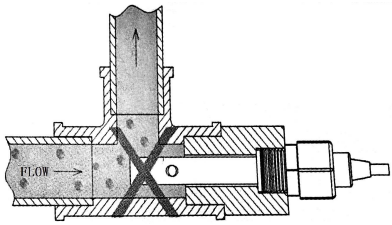
Color	Red	Black	Green	White
Description	V+	GND	485A	485B

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

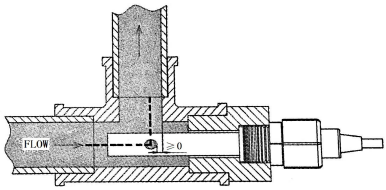
5.2 Installation

Installing the conductivity cell is a very important task. If the installation is abnormal, satisfactory measurement data cannot be obtained. Please choose the installation location carefully when installing the conductivity cell to avoid distortion of the measured quantity data.

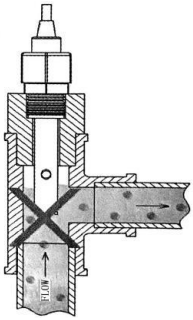
Wrong: Too long the conductivity cell installation seat, resulting in the conductivity cell extension part is too short, can not form active fluid renewal in the conductivity cell, resulting in measurement errors.



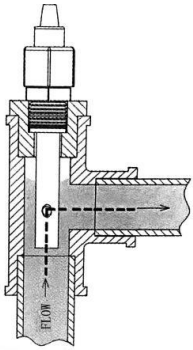
Right: part of the fluid in the pipeline flows through the conductivity cell and is constantly updated, so the measurement is accurate, and the opening of the sensor must face FLOW.



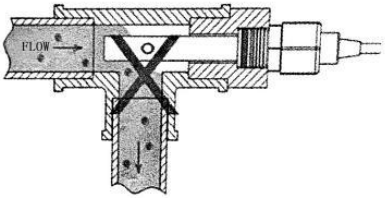
Wrong: An air dead space is formed in the upper part of the pipeline. Although the opening of the conductivity cell affects FLOW, there is still no fluid flowing through the conductivity cell, and the measurement data is worthless and unstable.



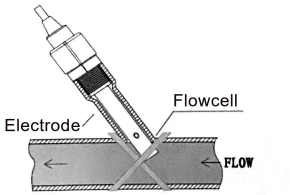
Right: The waist hole of the conductivity cell is located in the fluid, and part of the fluid flows through the conductivity cell to be continuously updated, and the measurement is accurate.



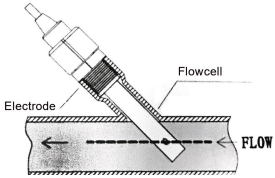
Wrong: The water flow in the pipeline cannot be guaranteed to be full, and the discharged water flow will form higher gas accumulation, the conductivity cell constant is an unknown number, and the data is invalid and unstable.



Wrong: The water flow of the conductivity cell installed in the angular direction cannot flow through the waist hole, and the gas inside the conductivity cell causes the measurement value to be invalid and very unstable.



Right: part of the flow flows through the waist hole of the conductivity cell and is constantly updated, and the measurement data is correct and stable and true.



Chapter 6 Warranty & After-sales Service

We promise to the customer that the hardware accessories provided during the supply of the instrument have no defects in material and manufacturing process. From the date of the purchase, if the user's notice of such defects is received during the warranty period, the company will unconditionally maintain or replace the defective products without charge, and all non customized products are guaranteed to be returned and replaced within 7 days.

Disclaimers:

- During the warranty period, product faults caused by the following reasons are not in the scope of Three Guarantees service
- Product faults caused by improper use by customers.
- Product faults caused by disassembling, repairing and refitting the product.

After-sales service commitment:

- We promise to deal with the customer's technical questions within 2 hours.
- For the instruments returned to the factory for maintenance, we promise to issue the test results within 3 working days and the maintenance results within 7 working days after receiving them.

Chapter 7 Communication protocol

7.1 Introduction to the protocol

- The command supports reading temperature, conductivity, salinity, TDS, resistance
- The instruction supports calibration of various standard solutions
- Standard solution type: 84uS/cm, 1413uS/cm, 12.88mS/cm, 25ppt, custom salinity, conductivity standard solution calibration (sample real standard)
- The instruction supports modifying the ID (1-255)
- Instruction support to restore factory settings
- System fault code
- Communication interface: RS485
- Port setting: 9600,N,8,1 (default)
- Device address: 0x01 (default)
- Protocol specification: Modbus RTU
- Instruction support: 0x03 read register; 0x06 write register | 0x10 continuous write register

7.2 Information Frame Format

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

0X03 Read data［HEX］				
01	06	××××	××××	××××
Address	Function code	Data address	Data input	Check code

0x10 Write data continuously［HEX］						
01	10	××××	××××	××	×××××	××××
Address	Function code	Data address	Register number	Number of bytes	Data input	Check code

Note: The check code is 16CRC, the low byte is first

7.3 Register Data Format

Address	Data name	Conversion factor	Range/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 the command list for details		R/W
0x09	Error code 01	-	See note	R

Note: 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 the command to perform the corresponding operation

8.1 User Instruction List

User calibration	Order	HEX	Note
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
Conductivity. Custom uS	34	0x22	Use custom uS standards
Conductivity. Custom uS	35	0x23	Use custom mS standards
custom salinity ppt	36	0x24	Using custom salinity ppt
Reset	210	0xD2	Restore factory defaults

Example: Calibrated salinity .25ppt

Address Function Code Data Address Write Data Check Code

Remote send: 01 06 00 07 00 21 F8 13

Successfully returned: 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

Error code	Explanation
0x02	The content of this address cannot write data, such as executing commands, It means that the current sensor state cannot perform this operation.
0x03	The current input data is invalid and exceeds the input range

8.2 System Error Codes

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

Fault code number [HEX]

0x00	0x01	0x02	0x03	0x04
No errors	Overrange lower limit	Overrange upper limit	Calibration failed	No temperature sensor

8.4 Set parameter register

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 factor	850 ~ 1150 [0.001]
0x13	Conductivity Custom.MS	100 ~ 7000 [0.01mS]
0x14	Conductivity Custom.US	1 ~ 9999 [1uS]
0x15	Salinity customization	100 ~ 4000 [0.01ppt]
0x16	Temperature compensation coefficient	150 ~250 [0.01%/℃]
0x17	Compensated 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 conductivity custom.MS, need to set address 0x13 Value default: 12.88mS
- Calibrate conductivity custom.US, need to set address 0x14 Value default: 1413uS
- Customize the calibration salinity, need to set the address 0x15 Value Default: 25.00ppt