1. Technical data

Measuring range	0...10NTU; 0...20NTU 0...100NTU,0...400NUT(customized)
Principle	90° scattered light, Laser principle
Resolution	0.001NTU
Accuracy	±2%FS
Temp measure range	0...60℃
Error	≤±2% or ±0.015NTU
Power supply	DC12V or DC24V
Output signal	4...20mA, RS485/MODBUS-RTU
Calibration method	Formazin standard solution
Shell material	ABS
Cable length	5m (default)
Inlet pressure	< 1bar, flow rate < 300mL/min
Installation	Flow through type
Protection grade	Ip68

M12 connector

RMD-ISSTLM12

2. Before use

2.1 Please read this instruction carefully before use.

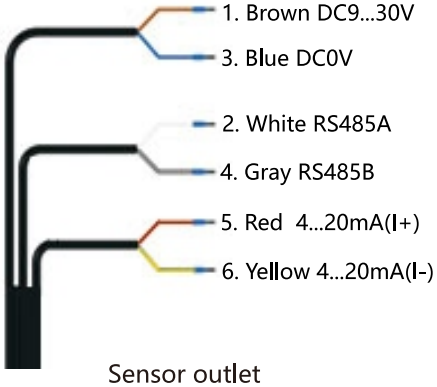
2.2 In the measurement process, if there is dirt, adhesive or encrust on the sensor , the measured value will be inaccurate or fluctuate. It should be cleaned and calibrated in time.

3. Sensor wiring

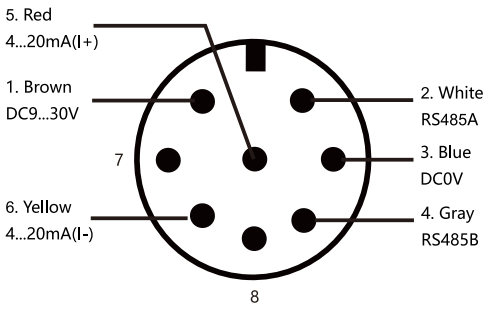
3.1 Please follow the instructions carefully, the wrong wiring will damage the product completely.

3.2 Please carefully check all the wiring in the system and confirm that the wiring is complete right before switch on the power.

3.3 Note: RS485A line and RS485B line are strictly forbidden to contact with the power supply line, otherwise the communication of the electrode will be permanently damaged.



Sensor outlet



M12 connector

4. Sensor calibration

4.1 The turbidity sensor calibration uses the formazin standard substance promulgated by the State Bureau of Technical Supervision, such as GBW12001 400 degree turbidity standard substance, the uncertainty is ±3%, and the effective use period is 1 year.

4.2 The standard solution of different turbidity are obtained by accurately diluting the turbidity standard substance in proportion with zero turbidity water and a qualified capacity instrument.

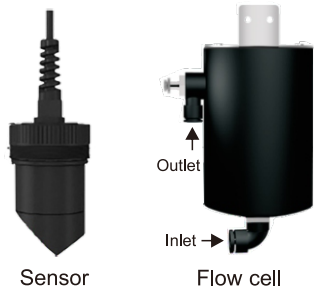
4.3 Standard substance above 400 NTU should be stored in the fresh cabinet of a refrigerator for (4-8 °C) . Store at low temperature and keep in dark place. The standard solution that has been diluted to low turbidity value is unstable and should not be stored. It should be diluted when needed.

4.4 When the standard solution is difficult to obtain, it can be configured according to the method specified in ISO7027 and strictly control the conditions and dosage of reagent. The methods are as follows:

Solution concentration (NTU)	Volume 50ml	Volume 50ml	Volume 100ml	Volume 100ml
	Injecting volume(ml) of stock solution 400NTU	Injecting volume(ml) of stock solution 4000NTU	Injecting volume(ml) of stock solution 400NTU	Injecting volume(ml) of stock solution 4000NTU
10	1.25	0.125	2.5	0.25
100	12.5	1.25	25	2.5
200	25	2.5	50	5
300	37.5	3.75	75	7.5
400	50	5	100	10
500	/	6.25	/	12.5
600	/	7.5	/	15
700	/	8.75	/	17.5
800	/	10	/	20
900	/	11.25	/	22.5
1000	/	12.5	/	25

5. Sensor installation

■ Flow cell install



1. Prepare 2 hoses, the outer diameter is 8mm, the inner diameter is 5.5mm, one is connected to the water inlet and the other is connected to the water outlet.
2. Tighten the sensor and the thread of the flow cell to avoid water overflow.
3. The flow rate range is 15...30L/H.

6. Sensor communication

6.0 Default communication instructions:

Note: 1. Data starting at 0x represents hexadecimal;

2. The check code is 16CRC, the low byte is in the front and the high byte is in the back;

3. Floating point number occupy four bytes;

6.1 Communication description (factory default):

Factory default	
baud rate	9600 (default)
data bit	8
stop bit	1
check bit	no
address	1 (default)

6.2 Host computer transmission format:

	Data type	Description	Remarks
Integer	16 bit integer	The high and low bytes of the word component are not reversed	Example: 0x 0032 to decimal number is 50
32 bit integer	CDAB (3412)	The high-low word of the double-byte component is reversed, but the high-low byte of the word is not reversed	Example: 2A F8 00 00 converted to integer, CDAB change order is ABCD, ie 00 00 2A F8 to floating point is 11000.
Floating point	CDAB (3412)	The high-low word of the double-byte component is reversed, but the high-low byte of the word is not reversed	Example: 00 00 41 CC converted to floating point number, CDAB change order is ABCD, ie 41 CC 0 00 converted to floating point is 25.5

6.3 Function code description

6.3.1 This product supports 03,06,16 and other common function codes

6.3.2 The output register uses 16 function codes when writing double word data or writing multiple data in batches

03	Read single or multiple registers
06	Write single register
16	Write multiple registers

6.4 Read floating point number

6.4.1 Host computer transmission format:

	ID address	Function code	Register start address		Qty of registers		CRC16	
			High byte	Low byte	High byte	Low byte	Low byte	High byte
Example 1 Read measured value	0x 01	0x 03	0x 00	0x 01	0x 00	0x 02	0x 95	0x CB

6.4.2 Slave computer response format:

	ID address	Function code	Qty of registers	Read register data in hexadecimal floating point number				CRC16	
				C	D	A	B	Low byte	High byte
Example 1 Measured value return	0x 01	0x 03	0x 04	0x 2C	0x 81	0x 40	0x 91	0x 52	0x E7

Note: 72 37 41 DB converted to floating point number, CDAB change order is ABCD, ie 41 DB 72 37 converted to floating point number 27.4

6.5 Read integer

6.5.1 Host computer transmission format:

	ID address	Function code	Register start address		Qty of registers		CRC16	
			High byte	Low byte	High byte	Low byte	Low byte	High byte
Example 1 Read baud rate	0x 01	0x 03	0x 00	0x 07	0x 00	0x 01	0x 35	0x CB

6.5.2 Slave computer response format:

	ID address	Function code	Qty of registers	Read register data in hexadecimal integer		CRC16	
				A	B	Low byte	High byte
Example 1 Baud rate return	0x 01	0x 03	0x 02	0x 00	0x 01	0x 79	0x 84

6.6 Write floating point number

6.6.1 Host computer transmission format:

	ID address	Function code	Register start address		Qty of registers		Qty of bytes	Write register data in hexadecimal floating point number				CRC16	
			High byte	Low byte	High byte	Low byte		C	D	A	B	Low byte	High byte
Example 1 Write Measured value offset	0x 01	0x 10	0x 00	0x 25	0x 00	0x 02	0x 04	0x 00	0x 00	0x 3F	0x 80	0x 21	0x D8

6.6.2 Slave computer response format:

	ID address	Function code	Register start address		Qty of registers		CRC16	
			High byte	Low byte	High byte	Low byte	Low byte	High byte
Example 1 Measured value offset return	0x 01	0x 10	0x 00	0x 25	0x 00	0x 02	0x 50	0x 03

Note: the measured value is offset by 1.00, floating point number 1.00 converts to hexadecimal 0X3F800000, transpose the high and low positions 0X00003F80 and write 0X0025.

6.7 Write integer

6.7.1 Host computer transmission format:

	ID address	Function code	Register start address		Write register data in hexadecimal integer		CRC16	
			High byte	Low byte	A	B	Low byte	High byte
Example 1 Write device address	0x 01	0x 06	0x 00	0x 00	0x 00	0x 02	0x 08	0x 0B

6.7.2 Slave computer response format:

	ID address	Function code	Register start address		Write register data in hexadecimal integer		CRC16	
			High byte	Low byte	A	B	Low byte	High byte
Example 1 Write device address	0x 01	0x 06	0x 00	0x 00	0x 00	0x 02	0x 08	0x 0B

Note: change the local computer address 1 to address 2 and write the hexadecimal number 0x 00 02 into register 0x 00 00.

6.8 Calibrating instructions

6.8.1 Before calibration

Write the calibration values of the 1st point, 2nd point , 3rd point and 4th point respectively to the sensor before calibration
If the value of the first point calibration is 1.000, write data 0x 3F 80 00 00 to the 0x29 register
Send command: 01 10 00 29 00 02 04 00 00 3F 80 21 8D
If the value of the second point calibration is 10.000, write data 0x 41 20 00 00 to the 0x2D register
Send command: 01 10 00 2D 00 02 04 00 00 41 20 01 A6
If the value of the third point calibration is 20.000, write data 0x 41 A0 00 00 to the 0x31 register
Send command: 01 10 00 31 00 02 04 00 00 41 A0 01 5F
If the value of the fourth point calibration is 30.000, write data 0x 41 F0 00 00 to the 0x35 register
Send command: 01 10 00 35 00 02 04 00 00 41 F0 00 90

6.8.2 Start calibration

The first step:
The sensor is cleaned ,dried and put into the first point of calibration solution , send command: 01 03 00 18 00 02 44 0C,
After the measured AD value is stable, read the AD value in the 0x00 18 register,
Write the current AD value to the 0x00 2B register. For example, the current AD value is 100,
Send command: 01 10 00 2B 00 02 04 00 64 00 00 F1 DB.

The second step:
The sensor is cleaned and dried in the second point calibration solution, send command: 01 03 00 18 00 02 44 0C,
Read the AD value in the 0x00 18 register, after the measured AD value is stable,
Write the current AD value to the 0x00 2F register. For example, the current AD value is 1000,
Send command: 01 10 00 2F 00 02 04 03 E8 00 00 31 87.

The third step:
The sensor is cleaned and dried in the third point calibration solution, send command: 01 03 00 18 00 02 44 0C,
Read the AD value in the 0x00 18 register, after the measured AD value is stable,
Write the current AD value to the 0x00 33 register. For example, the current AD value is 2000,
Send command: 01 10 00 33 00 02 04 07 D0 00 00 B0 23.

The fourth step:
The sensor is cleaned and dried in the fourth point calibration solution, send command: 01 03 00 18 00 02 44 0C,
Read the AD value in the 0x00 18 register, after the measured AD value is stable,
Write the current AD value to the 0x00 37 register. For example, the current AD value is 3000,
Send command: 01 10 00 37 00 02 04 0B B8 00 00 33 5C.

6.9 Address description

Name	Register No.	Data type	Length	Read/write	Description
Device address	0X 00 00	UINT16	1	read/write	address 0 is the broadcast address setting range: 1-255
Measurements	0X 00 01	FLOAT	2	read	unit: NTU
Temperature measurement	0X 00 03	FLOAT	2	read	unit: ℃
Current output	0X 00 05	FLOAT	2	read	unit: mA
Baud rate	0X 00 07	UINT16	1	read/write	1=2400,2=4800,3=9600,4=19200 5=38400,6=57600,7=115200
Restore default	0X 00 08	UINT16	1	write	restore the factory when the data is 1
Measurement alarm	0X 00 0B	UINT16	1	read	0x00: Normal 0x01: Upper limit alarm 0x02: Lower limit alarm
Temperature alarm	0X 00 0C	UINT16	1	read	0x00: Normal 0x01: Upper limit alarm 0x02: Lower limit alarm
Measure AD value	0X 00 18	FLOAT	2	read	
Measure offset	0X 00 25	FLOAT	2	read/write	set this value to 0 before calibration
Temperature offset	0X 00 27	FLOAT	2	read/write	
First calibration value	0X 00 29	FLOAT	2	read/write	
First AD value	0X 00 2B	UINT32	2	read/write	
Second calibration value	0X 00 2D	FLOAT	2	read/write	
Second AD value	0X 00 2F	UINT32	2	read/write	
Third calibration value	0X 00 31	FLOAT	2	read/write	
Third AD value	0X 00 33	UINT32	2	read/write	
Fourth calibration value	0X 00 35	FLOAT	2	read/write	
Fourth AD value	0X 00 37	UINT32	2	read/write	
Upper limit of measurement alarm	0X 00 49	FLOAT	2	read/write	
Lower limit of measurement alarm	0X 00 4B	FLOAT	2	read/write	
Upper limit of temperature alarm	0X 00 4D	FLOAT	2	read/write	
Lower limit of temperature alarm	0X 00 4F	FLOAT	2	read/write	
4mA corresponding measured value	0X 00 5D	FLOAT	2	read/write	
20mA corresponding measured value	0X 00 5F	FLOAT	2	read/write	

Note: When reading register data, do not continuously read more than 20 registers, the address register that does not list prohibits read and write data.

6.10 Common instruction examples

	Function	Send command	Return command	Remarks
1	Read measured value	01 03 00 01 00 02 95 CB	01 03 04 2C 81 40 91 52 E7	The 2C814091 change order to 40912C81 and its floating point is 4.53
2	Read temperature measurement	01 03 00 03 00 02 34 0B	01 03 04 00 00 41 CC CA 36	The 000041CC change order to 41CC0000 and its floating point is 25.5
3	Read current output value	01 03 00 05 00 02 D4 0A	01 03 04 00 00 41 40 CB 93	The 00004140 change order to 41400000 and its floating point is 12.00

7. Maintenance and storage

7.1 After cleaning the sensor or long-term storage, it needs to be calibrated before it can be used again.

7.2 Cable connector must be kept clean and free from moisture or water.

7.3 Maintenance rate: it is recommended to clean and check the sensor once a month.

7.4 Electrochemical sensors will naturally age and fail after long-term storage, it is recommended to use it as soon as possible after purchasing.

8. Troubleshooting

Modbus troubleshooting:

Problem	Possible reason	Solution
Modbus no response	The baud rate or stop bit does not match the Modbus master settings	Verify that the Settings match the Modbus master device Settings, and verify that the Modbus master device parity check is set to None
	Rs485 cable is faulty	Replace/repair cables
	No network offsets and terminations, or network offsets and terminations are not suitable	Check the termination or offset Settings for all network devices.Only the endpoints of the network should be turned on and terminated, and there should be only a point on the network to provide an offset
	The slave address is incorrect, or the slave address is the same as the address of another bus device	Verify that all addresses are unique and are between 1 and 247
Modbus abnormal response	Register not supported	Verify that the register is supported
	Incorrect data type	Verify that the requested register data type matches the Modbus master device request; for example, you cannot access a floating point data using 2-byte integer data. When a floating point data (2 registers / 4 bytes) is requested, two registers must be requested at the same time

9. Warranty

The sensor has a one year warranty period. As long as the damage is caused by improper use of non-human within the warranty period, please prepaid freight, pack the sensor and ship it back, we will repair it for you free of charge. We will analyze the reasons for the damage of the sensor, if the damage exceeds the warranty conditions, we need to charge the repair fee.