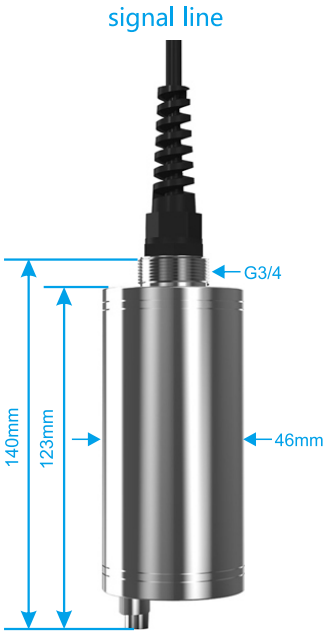
1. Technical data

Model	RMD-ISST105
Measuring range	10...4000NTU
Principle	90° scattered light
Temp measure range	0.0...60.0℃
Temperature compensation	No
Shell material	Stainless steel
Cable length	5m or customize
Accuracy	±5.0%FS
Protection grade	Ip68
Pressure range	< 3bar
Lowest detection point	10NTU
Installation	Immersion type
Electrical connection	Pin type wiring
Power supply	DC9-30V(Recommend 12V)
Output	Rs485, 4...20mA



2. Before use

2.1 Please read this instruction carefully before use.

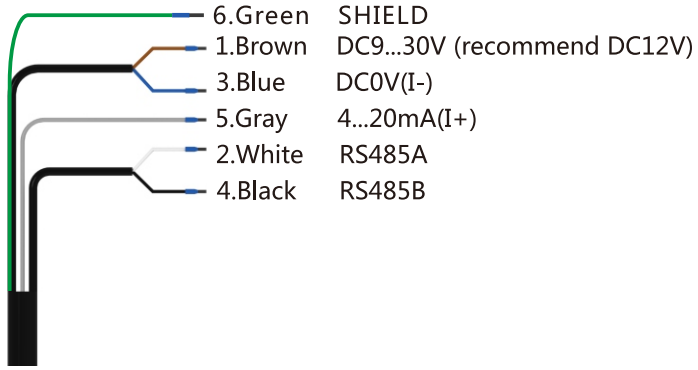
2.2 In the measurement process, if there is dirt, adhesive or encrust on the sensor , the measured value will be inaccurate or fluctuate. It should be cleaned and calibrated in time.

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 sensor will be permanently damaged.



Sensor outlet

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 with different turbidity is obtained by using zero turbidity water, qualified capacity equipment and accurately prorata diluting the turbidity standard substance.

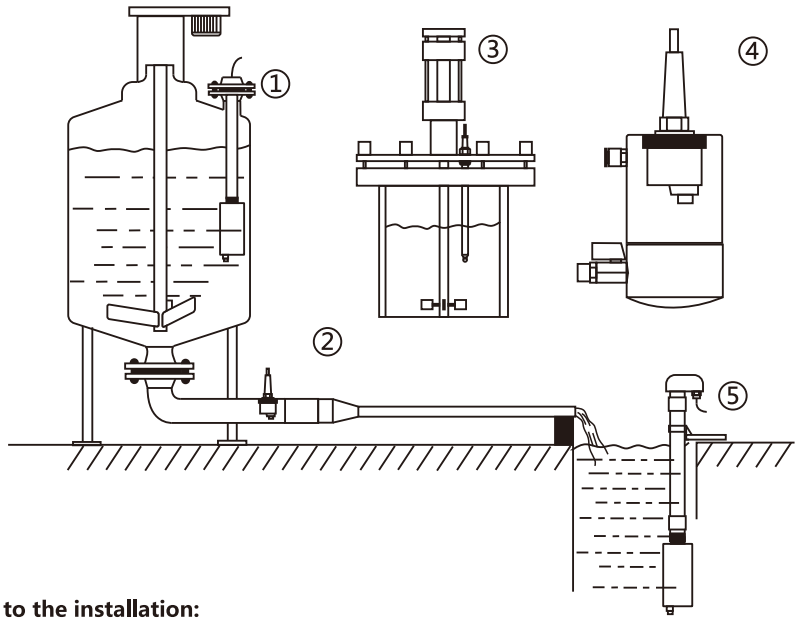
4.3 Standard substance above 400 NTU should be stored in the fresh cabinet of a refrigerator for (4-8 °C) . Store at low temperature and keep in dark place. The standard solution that has been diluted to low turbidity value is unstable and should not be stored. It should be diluted when needed.

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. Senosr installation

5.1 Installation method



① Top flange installation
② Pipe installation
③ Top installation
④ Flow cell installation
⑤ Immersion installation

Pay attention to the installation:

Turbidity sensor must avoid light, otherwise it will affect the measurement.

1.Turbidity sensor should be more than 30mm away from bottom and wall in closed container.

2.If it is installed in open space, the sensor should be placed at least 1 meter under water, because light will interfere with turbidity measurement.

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
Floating point number	(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: 72 37 41 DB transfer to floating point number, CDAB change order is ABCD, ie 41 DB 72 37 transfer to floating point is 27.4

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 transfer to floating point number, CDAB change order is ABCD, ie 41 DB 72 37 transfer to floating point is 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 warning status	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 Warning status return	0x 01	0x 03	0x 02	0x 00	0x 00	0x B8	0x 44

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 12	0x 00	0x 02	0x 04	0x 00	0x 00	0x 3F	0x 80	0x 63	0x 2A

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 12	0x 00	0x 02	0x E1	0x CD

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 0X0012.

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 19	0x 00	0x 02	0x D9	0x CC

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 Device address return	0x 01	0x 06	0x 00	0x 19	0x 00	0x 02	0x D9	0x CC

Note: change the local computer address 1 to address 2 and write the hexadecimal number 0x 00 02 into register 0x 00 19.

6.8 Calibrating instructions

6.8.1 Before calibration

Write the values of the first point, the second point, the third point and the fourth 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 register 0x20,

Send command: 01 10 00 20 00 02 04 00 00 3F 80 E1 E7;

If the value of the second point calibration is 10.000, write data 0x 41 20 00 00 to register 0x24,

Send command: 01 10 00 24 00 02 04 00 00 41 20 C1 CC;

If the value of the third point calibration is 20.000, write data 0x 41 A0 00 00 to register 0x28,

Send command: 01 10 00 28 00 02 04 00 00 41 A0 C0 39;

If the fourth point calibration value is 30.000, write data 0x 41 F0 00 00 to register 0x2C,

Send command: 01 10 00 2C 00 02 04 00 00 41 F0 C1 F6.

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 66 00 01 64 15,

After the measured ADC value is stable, read the ADC value in the 0x66 register,

Write the current ADC value to the 0x22 register. For example, the current ADC value is 100,

Send command: 01 10 00 22 00 02 04 00 00 42 C8 41 58.

The second step:

The sensor is cleaned and dried in the second point calibration solution, send command: 01 03 00 66 00 01 64 15,

Read the ADC value in the 0x66 register, after the measured ADC value is stable,

Write the current ADC value to the 0x26 register. For example, the current ADC value is 1000,

Send command: 01 10 00 26 00 02 04 00 00 44 7A C3 7E.

The third step:

The sensor is cleaned and dried in the third point calibration solution, send command: 01 03 00 66 00 01 64 15,

Read the ADC value in the 0x66 register, after the measured ADC value is stable,

Write the current ADC value to the 0x 2A register. For example, the current ADC value is 2000,

Send command: 01 10 00 2A 00 02 04 00 00 44 FA C2 8B.

The fourth step:

The sensor is cleaned and dried in the fourth point calibration solution, send command: 01 03 00 66 00 01 64 15,

Read the ADC value in the 0x66 register, after the measured ADC value is stable,

Write the current ADC value to the 0x 2E register. For example, the current ADC value is 3000,

Send command: 01 10 00 2E 00 02 04 00 00 45 3B 2A B8.

6.9 Address description

Name	Hosting number	Data type	Length	Read/write	Description
Measurements	0X 00 01	floating point	2	read	Storage location for measured value
Temperature measurement	0X 00 03	floating point	2	read	Storage location for measured temperature
Current output value	0X 00 05	floating point	2	read	Output current based on turbidity measurements
Warning	0X 00 07	Integer	1	read	01: Measurement exceeds the upper limit; 02: Measurement exceeds the lower limit 03: Temperature exceeds the upper limit; 04: Temperature exceeds the lower limit
Upper limit of measurement	0X 00 0A	floating point	2	read/write	Upper limit of measured value (20mA corresponding value)
Lower limit of measurement	0X 00 0C	floating point	2	read/write	Lower limit of measurement value (4mA corresponding value)
Upper temperature limit	0X 00 0E	floating point	2	read/write	Upper temperature limit
Lower temperature limit	0X 00 10	floating point	2	read/write	Lower temperature limit
Measured value offset	0X 00 12	floating point	2	read/write	Adjust measurement value
Temperature offset	0X 00 14	floating point	2	read/write	Adjust temperature value
Damping coefficient	0X 00 16	Integer	1	read/write	0-10
Device address	0X 00 19	Integer	1	read/write	1-255
Baud rate	0X 00 1A	Integer	1	read/write	0=2400 , 1=4800 , 2=9600 3=19200 , 4=38400
Restore default	0X 00 1B	Integer	1	write	
First calibration value	0X 00 20	floating point	2	read/write	
First ADC value	0X 00 22	floating point	2	read/write	
Second calibration value	0X 00 24	floating point	2	read/write	
Second ADC value	0X 00 26	floating point	2	read/write	
Third calibration value	0X 00 28	floating point	2	read/write	
Third ADC value	0X 00 2A	floating point	2	read/write	
Fourth calibration value	0X 00 2C	floating point	2	read/write	
Fourth ADC value	0X 00 2E	floating point	2	read/write	
1-2 Slope	0X 00 30	floating point	2	read/write	
1-3 Slope	0X 00 32	floating point	2	read/write	
1-4 Slope	0X 00 34	floating point	2	read/write	

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 72 37 41 DB 20 8E	The 723741DB change order to 41DB7237and its floating point is 27.4
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
4	Read warning	01 03 00 07 00 01 35 CB	01 03 02 00 00 B8 44	0000 is the current state
5	Write upper limit of measurement	01 10 00 0A 00 02 04 00 00 41 20 42 58	01 10 00 0A 00 02 61 CA	The upper measurement limit is set to 10.00
6	Write lower limit of measurement	01 10 00 0C 00 02 04 00 00 3F 80 E3 AA	01 10 00 0C 00 02 81 CB	The lower measurement limit is set to 1.00
7	Write upper temperature limit	01 10 00 0E 00 02 04 00 00 42 C8 43 15	01 10 00 0E 00 02 20 0B	The upper temperature limit is set to 100.00
8	Write lower temperature limit	01 10 00 10 00 02 04 00 00 40 A0 C3 1B	01 10 00 10 00 02 40 0D	The lower temperature limit is set to 5.00
9	Write measured value offset	01 10 00 12 00 02 04 00 00 3F 80 63 2A	01 10 00 12 00 02 E1 CD	Set to 1.00
10	Write temperature offset	01 10 00 14 00 02 04 00 00 3F 80 E3 00	01 10 00 14 00 02 01 CC	Set to 1.00
11	Write damping coefficient	01 06 00 16 00 01 A9 CE	01 06 00 16 00 01 A9 CE	Set to 1
12	Write device address	01 06 00 19 00 02 D9 CC	01 06 00 19 00 02 D9 CC	Set to 2
13	Write baud rate	01 06 00 1A 00 00 A8 0D	01 06 00 1A 00 00 A8 0D	Set to 2400
14	Write restore default	01 06 00 1B 00 FF B9 8D	01 06 00 1B 00 FF B9 8D	Factory default values are restored after sent
15	First calibration value	01 10 00 20 00 02 04 00 00 3F 80 E1 E7	01 10 00 20 00 02 40 02	Set to 1.000
16	First ADC value	01 10 00 22 00 02 04 00 00 42 C8 41 58	01 10 00 22 00 02 E1 C2	Set to 100
17	Second calibration value	01 10 00 24 00 02 04 00 00 41 20 C1 CC	01 10 00 24 00 02 01 C3	Set to 10.000
18	Second ADC value	01 10 00 26 00 02 04 00 00 44 7A C3 7E	01 10 00 26 00 02 A0 03	Set to 1000
19	Third calibration value	01 10 00 28 00 02 04 00 00 41 A0 C0 39	01 10 00 28 00 02 C1 C0	Set to 20.000
20	Third ADC value	01 10 00 2A 00 02 04 00 00 44 FA C2 8B	01 10 00 2A 00 02 60 00	Set to 2000
21	Fourth calibration value	01 10 00 2C 00 02 04 00 00 41 F0 C1 F6	01 10 00 2C 00 02 80 01	Set to 30.000
22	Fourth ADC value	01 10 00 2E 00 02 04 80 00 45 3B 2A B8	01 10 00 2E 00 02 21 C1	Set to 3000

7. Maintenance and storage

7.1 After cleaning the sensor or long-term storage, it needs to be polarized and 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:

Maintenance task	Recommended maintenance rate
Clean sensor	Clean every 30 days
Check if the sensor is damaged	Check every 30 days

8. Troubleshooting

8.1 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.