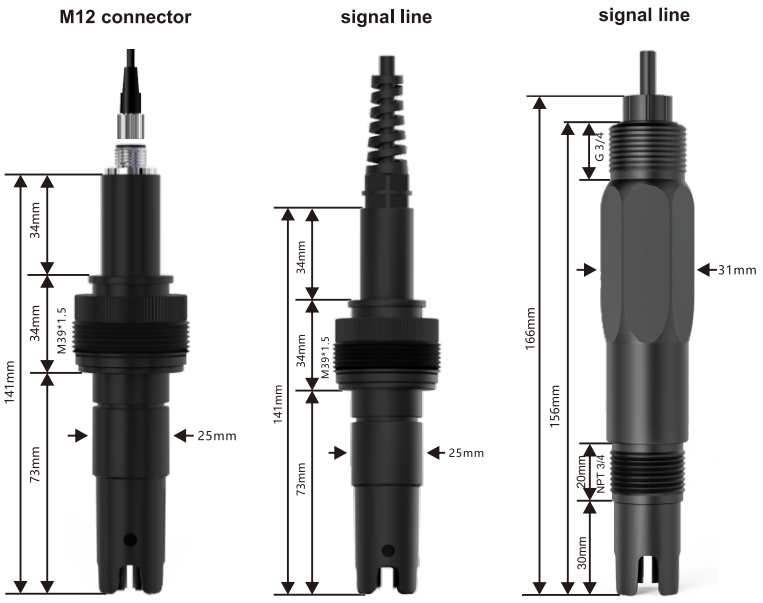
REMOND Water Quality Analysis

EC sensor instructions

1. Technical data

Measuring range	0...2000μS/cm;0...10000μS/cm
Constant	K=1.0
Accuracy	±2%FS
Resolution	1μS/cm
Detection limit	10μS/cm
Temp. measure range	0.0...60.0℃
Temp. compensation	Automatic/Manual
Output signal	RS485;4...20mA
Power supply	DC9-30V(Recommend 12V)
Pressure range	0...4bar
Shell material	ABS,PPS
Pipe thread	M39*1.5,G3/4,NPT3/4
Cable length	5m or customized
Protection grade	Ip68



RMD-ISEC2M12 RMD-ISEC205 RMD-ISEP105

2. Before use

2.1 Please read this instruction carefully before use.

2.2 The EC sensor needs to be dried before storage, do not store the sensor in distilled or deionized water.

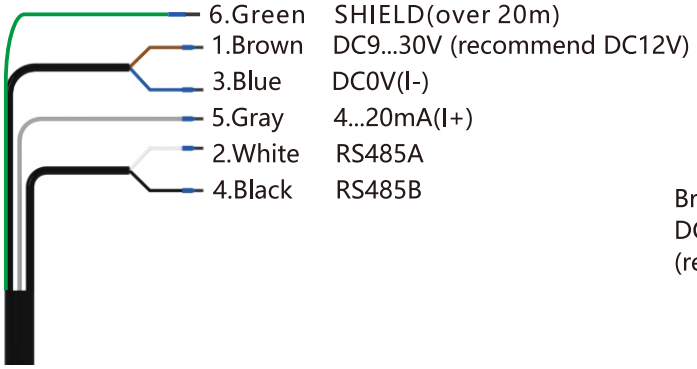
2.3 In the measurement process, if there is dirt, adhesive or encrust on the sensor, the measured value will be inaccurate or fluctuate, it should be cleaned and calibrated in time.

3. Sensor wiring

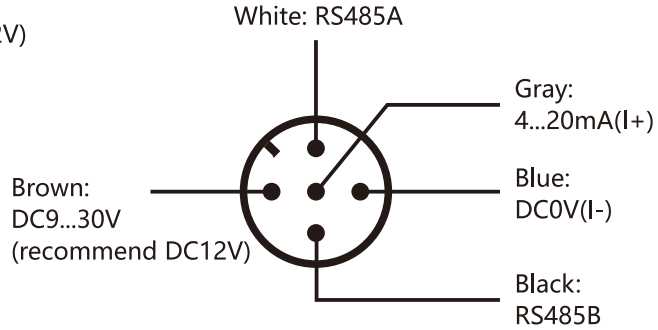
3.1 Please follow the instructions carefully, the wrong wiring will damage the product completely.

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



M12 connector

4. Sensor calibration

4.1 The sensor has been calibrated before shipment.

4.2 In order to ensure the measurement accuracy of the conductivity sensor, the conductivity constant is re-calibrated before use. In the next measurements, the conductivity constant should be calibrated regularly. If the error is large, the sensor should be replaced in time.

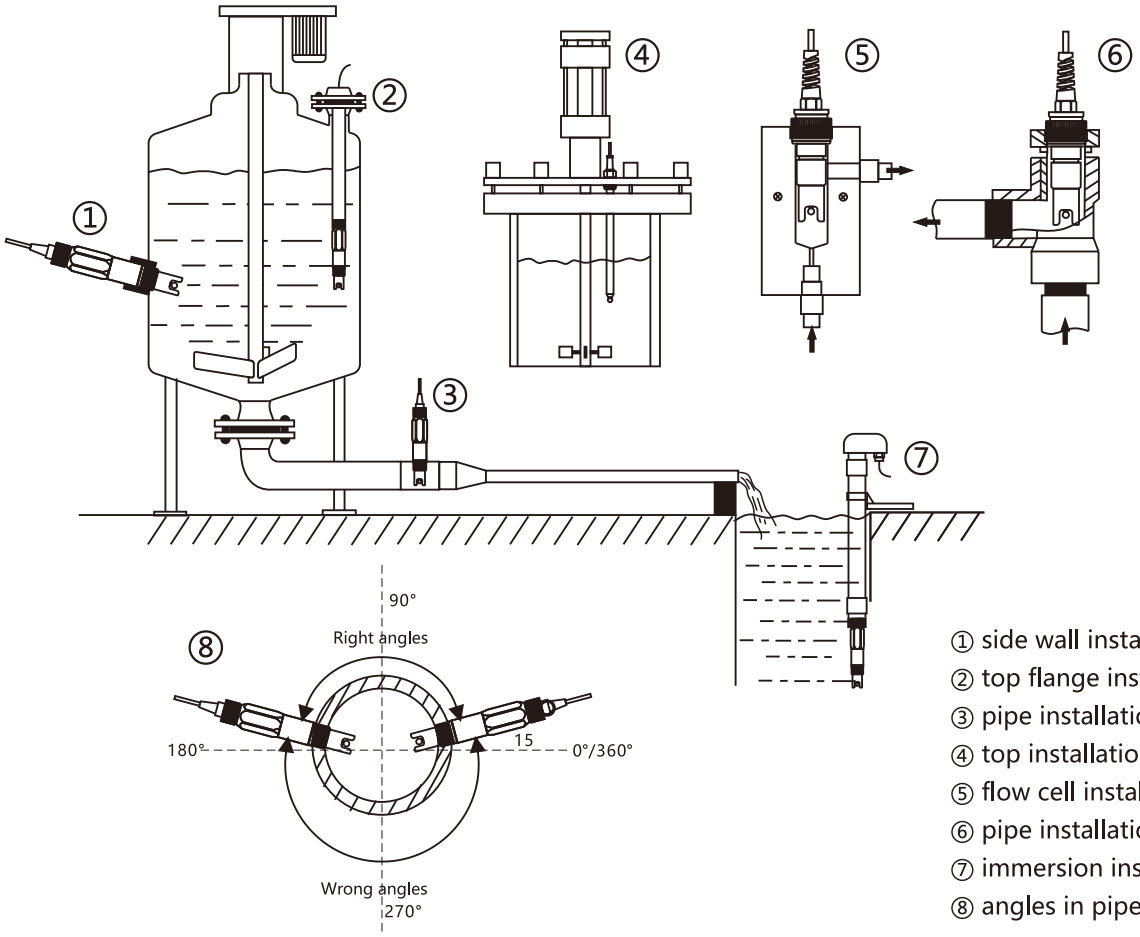
4.3 Users are recommended to calibrate the sensor every 1 to 2 months.

5. Sensor installation

5.1 Conductivity sensor is recommended to be installed in the flow cell for more stable and accurate measurement.

5.2 If installing sensor in the pipe, the right angle should be 15°~165°.

5.3 Installation method:



① side wall installation
② top flange installation
③ pipe installation
④ top installation
⑤ flow cell installation
⑥ pipe installation
⑦ immersion installation
⑧ angles in pipe installation

Pay attention to the immersion installation:

1. In this installation, there will be dirt on the sensor frequently, it needs to be cleaned regularly.
2. Measuring value is not stable.
3. Different insertion depths will affect the measured value.
4. The position of the sensor must be above the sediment.

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 floating point number, CDAB change order is ABCD, ie 41 DB 72 37 transfer 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 conductivity value	0X 01	0X 03	0X 00	0X 00	0X 00	0X 02	0X C4	0X 0B
Example 2 Read resistivity value	0X 01	0X 03	0X 00	0X 02	0X 00	0X 02	0X 65	0X CB
Example 3 Read temperature value	0X 01	0X 03	0X 00	0X 04	0X 00	0X 02	0X 85	0X CA
Example 4 Read TDS value	0X 01	0X 03	0X 00	0X 06	0X 00	0X 02	0X 24	0X 0A
Example 5 Read salinity value	0X 01	0X 03	0X 00	0X 08	0X 00	0X 02	0X 45	0X C9

6.4.2 Slave computer response format:

	ID address	Function code	Qty of bytes	Data content				CRC16	
				C	D	A	B	Low byte	High byte
Example 1 Conductivity value return	0X 01	0X 03	0X 04	0X 89	0X C7	0X 3E	0X 95	0X B1	0X 9D
Example 2 Resistivity value return	0X 01	0X 03	0X 04	0X 35	0X 1D	0X 45	0X 7B	0X 17	0X 4A
Example 3 Temperature value return	0X 01	0X 03	0X 04	0X BD	0X E0	0X 41	0X 8C	0X EE	0X 5C
Example 4 TDS value return	0X 01	0X 03	0X 04	0X 08	0X 8C	0X 43	0X 12	0X 88	0X 85
Example 5 Salinity value return	0X 01	0X 03	0X 04	0X 08	0X 8C	0X 43	0X 12	0X 88	0X 85

Note: BD E0 41 8C transfer to floating point number, CDAB change order is ABCD, ie 41 8C BD E0 transfer to floating point is 17.59.

6.5 Write floating point number

6.5.1 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 conductivity constant	0x 01	0x 10	0x 00	0x 0A	0x 00	0x 02	0x 04	0x 00	0x 00	0x 3F	0x 80	0x 63	0x 80

6.5.2 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 Conductivity constant return	0x 01	0x 10	0x 00	0x 0A	0x 00	0x 02	0x 61	0x CA

Note: The conductivity constant is changed to 1.00, transfer to hexadecimal is 0x 3F 80 00 00, written in the 0x 0A register.

6.6 Write integer

6.6.1 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 14	0x 00	0x 02	0x 48	0x 0F

6.6.2 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 14	0x 00	0x 02	0x 48	0x 0F

Note: change the local computer address 1 to address 2 and write the hexadecimal number 0x 00 02 into register 0x 00 14.

6.7 Calibration instructions: (take the sensor device address 1 as an example)

Start calibration
The first step:
Change the sensor constant to 1;
Write data 1 to register 0x0A (1 is a floating point number, converted to hexadecimal number is 3F 80 00 00, the order is ABCD, converted to CDAB, ie 00 00 3F 80);
Send command: 01 10 00 0A 00 02 04 00 00 3F 80 63 80;
Return data: 01 10 00 0A 00 02 61 CA.

The second step:
Clean and dry the sensor, put it in the standard solution;
Send command: 01 03 00 00 00 02 C4 0B (read measurement value);
For example: Return data: 01 03 04 99 9A 3F B9 24 C2;
99 9A 3F B9 is the measured value, the order is CDAB, converted to ABCD, ie 3F B9 99 9A, the floating point number is 1.45, then the current measured value is 1.45mS/cm;
After reading the measured value to be stabilized, calculate the conductivity constant;
conductivity constant = standard solution value / current measured value;
For example: put the sensor into 1.413mS/cm standard solution and read the current measurement value of the sensor is 1.450mS/cm, then the constant=1.413/1.450=0.97448;
Write data 0.97448 to the 0x0A register (0.97448 is a floating point number, converted to a hexadecimal number is 3F 79 77 85, the order is ABCD, converted to CDAB, ie 77 85 3F 79);
Send command: 01 10 00 0A 00 02 04 77 85 3F 79 A9 9F;
Return data: 01 10 00 0A 00 02 61 CA;
End of calibration

6.8 Order description for floating point number hexadecimal

Change the floating point number in hexadecimal order;
The 0x32 register writes data 0, and the floating point order is 1234 (ie ABCD);
The 0x32 register writes data 1, and the floating point order is 3412 (CDAB);
For example: change the sensor floating point order to 1234, the command is : 01 06 00 32 00 00 28 05;
Note: When the floating point number is changed to 3412 in hexadecimal order, the read and write is also 3412;
Change the sensor floating point order to 3412, the command is : 01 06 00 32 00 01 E9 C5;
Note: When the floating point number is changed to 1234 in hexadecimal order, the read and write is also 1234.

6.9 Address description

Name	Data address	Data type	Length	Read/write	Description
Conductivity value	0X 00 00	Floating point	2	read	The default unit is mS/cm. If it needs to be converted to uS/cm, multiply by 1000
Resistivity value	0X 00 02	Floating point	2	read	Ω·cm
Temperature	0X 00 04	Floating point	2	read	℃
TDS	0X 00 06	Floating point	2	read	ppm or mg/L
Salinity	0X 00 08	Floating point	2	read	ppm or mg/L
Conductivity constant	0X 00 0A	Floating point	2	read/write	
Compensation coefficient	0X 00 0C	Floating point	2	read/write	
Manual compensation temperature	0X 00 0E	Floating point	2	read/write	
Temperature offset	0X 00 10	Floating point	2	read/write	
Baud rate	0X 00 12	Floating point	2	read	
Slave address	0X 00 14	Floating point	2	read	
Filtered seconds	0X 00 16	Floating point	2	read	
Sensor sensitivity	0X 00 18	Floating point	2	read	
Compensation mode	0X 00 1A	Floating point	2	read	
Model. Compensation type	0X 00 1C	Floating point	2	read	50.0-PT1000, 50.1-NTC10K
4-20mA high point value	0X 00 20	Floating point	2	read	
Modify baud rate	0X 00 12	Integer	1	write	2400,4800,9600,19200 38400,43000,57600
Modify slave address	0X 00 14	Integer	1	write	1-254
Modify filter seconds	0X 00 16	Integer	1	write	Second value
Modify compensation mode	0X 00 1A	Integer	1	write	0: automatic, 1: manual
Adjust float order	0X 00 32	Integer	1	write	0 : positive, 1: negative
Modify temperature compensation type	0X 00 33	Integer	1	write	0: PT1000, 1: NTC10K
Restore default	0X 00 64	Integer	1	write	1
Restore baud rate and address	0X 27 0F	Integer	1	write	1
Modify 4-20mA high point value	0X 00 12	Floating point	2	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 conductivity value	010300000002C40B	01030489C73E95B19D	Convert 3E9589C7 to floating point 0.292
2	Read resistivity value	01030002000265CB	010304351D457B174A	Convert 457B351D to floating point 4019.3
3	Read temperature	01030004000285CA	010304BDE0418CEE5C	Convert 418CBDE0 to floating point 17.59
4	Read TDS	010300060002240A	010304088C43128885	Convert 4312088C to floating point 146.03
5	Read salinity	01030008000245C9	010304088C43128885	Convert 4312088 to floating point 146.03
6	Write conductivity constant	0110000A000204CCCD3F8CCD2A	0110000A000261CA	Convert 3F8CCCCD to floating point 1.100
7	Write compensation coefficient	0110000C000204D70A3CA3BB35	0110000C000281CB	Convert 3CA3D70A to floating point 0.02
8	Write manual compensation temperature	0110000E000204000041A0420B	0110000E0002200B	Convert 41A00000 to floating point 20.0
9	Write temperature offset	01100010000204000003F80E2F3	011000100002400D	Convert 3F800000 to floating point 1
10	Read baud rate	010300120002640E	01030400004616499D	Convert 46160000 to floating point 9600
11	Read slave address	010300140002840F	01030400003F80EA63	Convert 3F800000 to floating point 1
12	Read Compensation mode	0103001A0002E5CC	01030400003F80EA63	Convert 3F800000 to floating point 1 is manual
13	Read model. Compensation type	0103001C000205CD	010304666642483432	Convert 42486666 to floating point 50.1
14	Read 4-20mA high point value	010300200002C5C1	0103044000459CDD0A	Convert 459C4000 to floating point 5000
15	Write baud rate	0106001209602FB7	0106001209602FB7	Modified to 2400
16	Write slave address	010600140002480F	010600140002480F	Modified to 2
17	Write compensation mode	0106001A0000A80D	0106001A0000A80D	Modified to automatic
18	Write adjust float order	010600320001E9C5	010600320001E9C5	Modified to CDAB (ie 3412)
19	Write restore default	01060064000109D5	01060064000109D5	Write 1 to confirm
20	Write restore baud rate and address	0106270F000172BD	0106270F000172BD	Write 1 to confirm
21	Write modify 4-20mA high point value	011000120002040000412042F2	011000120002E1CD	Modified to 10

7. Maintenance and storage

7.1 The organic dirt on the sensor can be cleaned with warm water containing detergent or alcohol. After cleaning the sensor, it should be dried by soft tissue.

7.2 When the sensor is stored, it shall be dried and stored.

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

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.

7.5 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 The failure rate of the sensor is low, when the measurement is inaccurate, mainly because the conductivity sensor has changed, so it is necessary to check whether the conductivity sensor is in good condition.

8.2 If the value of the sensor is too large, too small or no change, please check whether the sensor is in good connection.

8.3 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
	Rs232 or 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.