XFW01
Self cleaning suspended solids transmitter user 's manual

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1. Product introduction

Suspended solids in water refer to solid substances suspended in water, including inorganic substances, organic substances, sand, clay, microorganisms, etc. that are insoluble in water. The content of suspended solids in water is one of the indicators to measure the degree of water pollution. Suspended solids in water are the main cause of water turbidity.

This product is a device for measuring the concentration of suspended solids in solution. It uses the light absorption method without chemical reagents; The internal integrated self-cleaning system effectively prevents biological adhesion; Built in temperature transmitter with automatic temperature compensation function; Modulated optical signal is adopted to reduce visible light interference; It can be widely used in water treatment, aquaculture, environmental monitoring and other industries.

1.1 Functional features

- The measurement range of suspended solids concentration is 0~20000 mg/L, and the resolution is 0.1 mg/L.
- Modulated optical signal is used to reduce visible light interference, with temperature compensation function。
- The internal integrated self-cleaning system can effectively prevent biological adhesion.
- RS485 communication interface: MODBUS RTU communication protocol can be easily connected to the computer for monitoring and communication.
- ModBus communication address can be set and baud rate can be modified.
- The equipment adopts wide voltage power supply, DC 12~30V.
- Waterproof grade IP68。

1.2 Technical parameters of equipment

power supply	DC 12~30V
power waste	1.2W (normal); 4.5w (when the self-cleaning system is working)
communication interface	RS485； Standard MODBUS-RTU protocol; Communication baud rate: 4800 by default (1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 can be set)
measuring principle	Light absorption method
measuring range	0~20000mg/L

measurement error	±5%F.S.（Depends on sludge homogeneity）
Measurement resolution	0.1mg/L
response time	≤30sec
Equipment working conditions	0~40℃
Waterproof grade	IP68
Current Speed	<3m/s
Withstand voltage	＜0.1MPa
Electrode wire length	Default 5m, customizable
Shell material	Corrosion resistant plastic, stainless steel
Recommended maintenance and calibration frequency	3 months
Service life of self-cleaning system	18 months

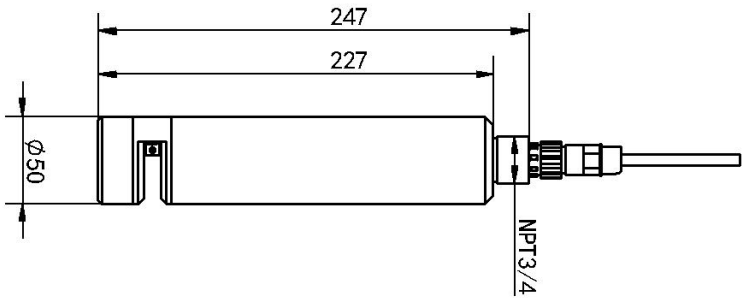
1.3 Product selection

XFW01-				Self cleaning suspended solids transmitter
	N01-			RS485 (Modbus RTU protocol)
		2-		Second generation Housing
			20000	Range 0~ 20000mg/L

1.4 product detailed list

◆Self cleaning suspended solids transmitter 1 set
◆5m cable
◆Protective net, certificate, warranty card, nylon protective net, etc

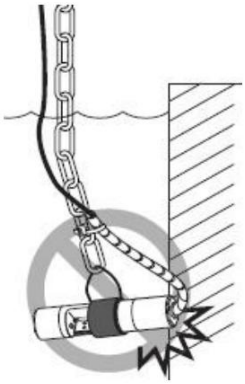
1.5 equipment size



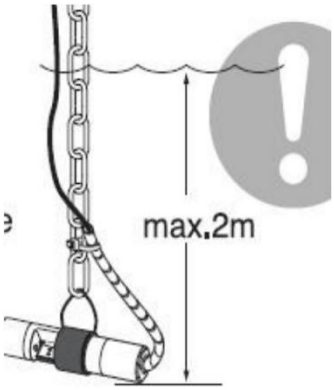
1.6 equipment installation

The equipment can be placed in any direction in the water, and the best placement direction is horizontal, which can reduce the impact of debris and foreign matter deposition in the water on the measurement.

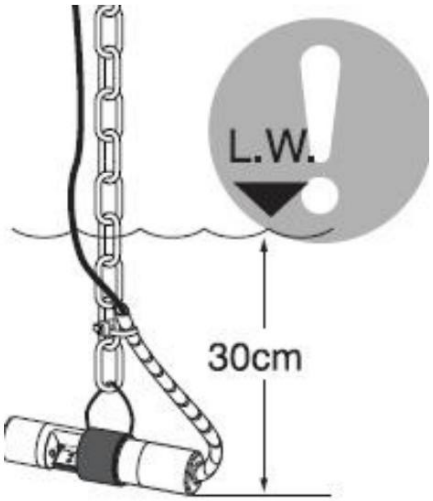
When hanging the sensor, avoid the sensor caused by water flow hitting the wall or other water conservancy facilities. If the water flow is very fast, please fix the sensor.



The depth of the installation equipment from the water surface shall not exceed 2m。



Considering the fluctuation of water level, it is recommended to submerge the equipment below the minimum water level of 30cm。



The equipment shall be placed in water without bubbles.

2. Equipment instructions

2.1 Wiring instructions

The default is four core bare wire

	explain	explain
Power Supply	brown	V+（10~30V DC）
	black	V-
communi cation	yellow	485-A
	blue	485-B

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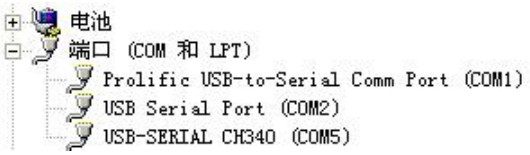
2.2 Parameter Configuration Description

Open the data package, select "Debugging software" - "485 parameter configuration software",find 

Open it。

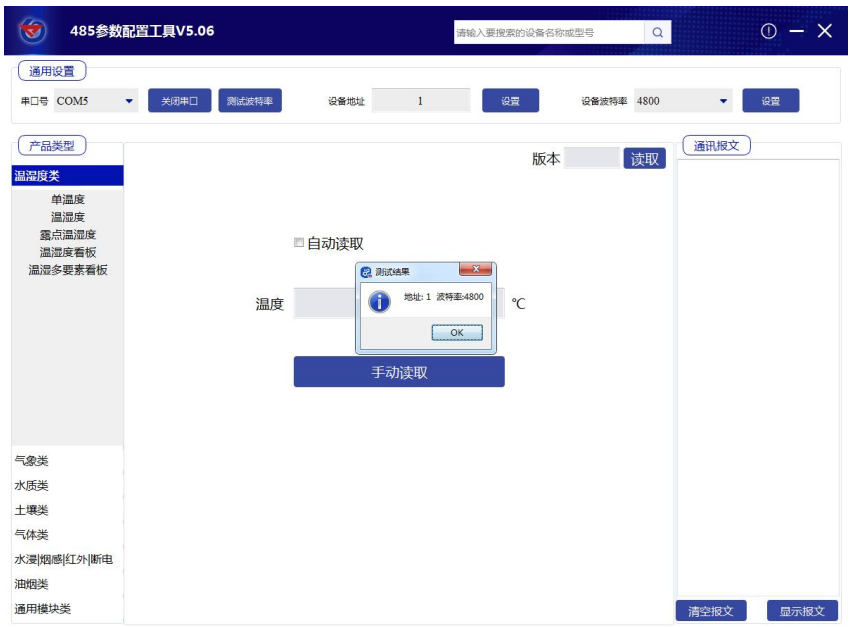
1) Select the correct COM port (view the COM port in "My Computer - Properties - Device Manager - Port"). The following figure lists the drive names of several different 485 converters.



2) Connect only one device and power it on. Click the test baud rate of the software, and the software will test the baud rate and address of the current device. The default baud rate is 4800bit/s, and the default address is 0x01.

3) Modify the address and baud rate as required, and query the current function status of the device.

4) If the test is not successful, please recheck the equipment wiring and 485 driver installation.



2.4 ModBus Communication and Register Details

2.4.1Basic parameters of equipment communication

code	8-bit binary
Data bits	8-bit
Parity bit	-
Stop bit	1-bit

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Error check	CRC（Redundant cyclic code）
Baud rate	The factory default is 4800bit/s

2.4.2Data frame format definition

Modbus RTU communication protocol is adopted, and the format is as follows:

Time of initial structure ≥ 4 bytes

Address code=1 byte

Function code=1 byte

Data area=N bytes

Error check=16 bit CRC code

Time to end structure ≥ 4 bytes

Address code: the address of the transmitter, which is unique in the communication network (factory default 0x01).

Function code: the instruction function indication sent by the host.

Data area: The data area is specific communication data. Note that the high byte of 16bits data comes first!

CRC code: two byte check code.

2.4.3Register address

Register address	Support function code	explain
0x0000、0x0001	0x03/0x04	Suspended solids concentration (mg/L; floating point big end)
0x0002、0x0003	0x03/0x04	Temperature (℃; floating point big end)
0x0050	0x03/0x04/0x06/0x10	Suspended solids offset value (mg/L; 16 bit signed integer, actual value * 10)
0x0051	0x03/0x04/0x06/0x10	Temperature offset value (℃; 16 bit signed integer, actual value * 10)
0x0060、0x0061	0x03/0x04/0x06/0x10	Slope of suspended solids (large end of floating point number)

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0x0100	0x10	Suspended solids calibration (Use 5-point calibration, write 0x0001~0005 to 0x0100, calibrate zero, 1000, 5000, 10000, 20000 mg/L respectively)
0x1200	0x03/0x04/0x06/0x10	Cleaning interval (min; 6-6000 can be set, 30 by default)
0x1201	0x03/0x04/0x06/0x10	Number of cleaning cycles (1 cycle for each round trip, 3 cycles by default)
0x07D0	0x03/0x04/0x06/0x10	1~254 (16 bit unsigned integer, factory default 1)
0x07D1	0x03/0x04/0x06/0x10	0 stands for 2400 1 stands for 4800 2 for 9600 3 for 19200 4 stands for 38400 5 stands for 57600 6 represents 115200 7 for 1200

2.4.4Example and explanation of communication protocol

Example 1: Read the current suspended solids concentration value and temperature of the equipment with address 01。

Issuing frame:

Address code	Function code	Register address	Register contents	Register contents	Check code high
0x01	0x03	0x00 0x00	0x00 0x04	0x44	0x09

Answer frame:

Address code	Function code	Number of valid bytes	Register contents	Register contents	Check code high

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0x01	0x03	0x08	0x42 0x0e 0xaf 0xb5 0x41 0x a2 0xf5 0x1d	0x58	0xfc

The floating-point number 420eafb5 is converted to decimal 35.671589, indicating that the concentration of suspended solids is 35.7mg/L

The floating-point number big end 41a2f51d is converted to decimal 20.369,684, indicating that the temperature is 20.4 ℃

Example 2: Set the deviation value

Take setting the temperature deviation value as an example:

Send a frame: set the deviation value of 1 ℃ to the device with address code 1

Write 10 to 0x0051 register and convert it to hex 000a

Address code	Function code	Register address	Register contents	Register contents	Check code high
0x01	0x06	0x00 0x51	0x00 0x0a	0x58	0x1c

Response frame: (according to MODBUS standard, the response is the image message of the issued frame)

Address code	Function code	Register address	Register contents	Register contents	Check code high
0x01	0x06	0x10 0x22	0x27 0x97	0x77	0x5e

Example 3: Setting the slope of suspended solids

Output data value=(actual data - deviation value) * slope

If the value measured by the standard solution of 200mg/L is 150.0mg/L after the set deviation value is measured, then write 200/150=1.3333 to the 0x0060 and 0x0061 registers... convert the floating point big end to 3faaaaab

Send Frame：

Address code	Function code	Register address	Register length	Byte length	Register contents	Check code low bit	Check code high
0x01	0x10	0x00 0x60	0x00 0x02	0x04	0x3f 0xaa 0xaa 0xab	0xe6	0xac

Response frame: (according to MODBUS standard, the response is the image message of the issued frame)

Address code	Function code	Register address	Register length	Check code low bit	Check code high
0x01	0x10	0x00 0x60	0x00 0x02	0x88	0x19

Example 4: Suspended solids calibration

Use deionized water as the first point, i.e. zero calibration standard solution, and prepare 1000, 5000, 10000, and 20000 mg/L kaolin solutions as the other four point calibration standard solutions in turn. Make sure that the solutions are uniformly mixed during calibration.

After the value of the sensor is stable in the standard solution of the corresponding calibration point, use the 0x10 function code to write 0x0001~0005 to the 0x0100 register to calibrate the corresponding point.

Take the first point as an example。

Send Frame：

Address code	Function code	Register address	Register length	Byte length	Register contents	Check code low bit	Check code high
0x01	0x10	0x01 0x00	0x00 0x01	0x02	0x00 0x01	0x77	0x50

Response frame: (according to MODBUS standard, the response is the image message of the issued frame)

Address code	Function code	Register address	Register length	Check code low bit	Check code high
0x01	0x10	0x01 0x00	0x00 0x02	0x00	0x35

3. Precautions and maintenance

- In case of obvious failure of the equipment, please do not open it for self repair, and contact us as soon as possible!
- The equipment contains sensitive optical elements and electronic components to ensure that the equipment is not subject to severe mechanical impact。
- During equipment installation, try to avoid cables being too tight or stressed.Prevent equipment from being exposed to sunlight。
- Please do not touch the measuring window。
- Avoid damage to the measuring window。
- Avoid bubbles on the surface of the equipment, especially the measuring window, when measuring and calibrating the equipment.
- Avoid directly applying any mechanical stress to the equipment during use。
- Do not force the self-cleaning brush shaft to rotate.

- Regularly check the measuring window for attachments and scaling; It can be cleaned with tap water and wiped with a wet soft cloth. For some stubborn dirt, it can be cleaned by adding some household detergent in tap water. Do not scratch the measuring window.
- Regularly check whether the self-cleaning brush works normally and is damaged.
- If the measured value is too high, too low or the value is continuously unstable, please check whether the measuring window of the transmitter is clean.
- The self-cleaning device has been used continuously for 18 months, and it is necessary to return to the factory to replace the dynamic sealing device (the actual time can be increased or decreased according to the actual self-cleaning frequency).
- Before each use, the equipment should be calibrated. For long-term use, it is recommended to calibrate every 3 months. The calibration frequency should be properly adjusted according to different application conditions (the degree of dirt in the application, the deposition of chemical substances, etc.).