



# JXBS-3001-ZFL-RS

## Evaporation Sensor User Manual

**RS485 Modbus**

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[www.jxct-iot.com](http://www.jxct-iot.com)

# I. Product Introduction

## 1.1 Product overview

JXBS-3001-ZFL water surface evaporation sensor is an instrument used to observe water surface evaporation. The product adopts a double-layer stainless steel structure design, which can prevent evaporation errors caused by direct sunlight and has a better measurement accuracy value.

The JXBS-3001-ZFL water surface evaporation sensor uses the pressure measurement principle to measure the change in the weight of the liquid in the evaporating dish, and then calculate the height of the page to measure the evaporation. Water surface evaporation measurement that can adapt to various environments is not affected by liquid icing, and overcomes the disadvantages of inaccurate measurement when the liquid level is measured using the ultrasonic principle, easy damage to the sensor when there is no water, and low measurement accuracy.

The equipment adopts imported pressure sensors, which have passed many certifications at home and abroad to ensure that the linearity of the sensors reaches a sufficient standard.

## 1.2 Product advantages

-The stainless steel design prevents evaporation errors caused by direct sunlight, at the same time it is corrosion-resistant, does not rust, and has a beautiful appearance to ensure the service life of the sensor;

-Apply the pressure measurement principle, measure the weight change of the liquid in the evaporating dish through the high-precision imported weighing principle, and then calculate the height of the liquid level, so as to measure the evaporation volume, the measurement is more accurate, and the data is more scientific;

-Adopt the wiring method of bottom outlet, reduce open wires, avoid line faults, convenient installation and simple operation;

-High-performance intelligent program design, strong adaptability, normal observation under wind, wave and rainy weather conditions without loss of accuracy;

-Anti-electromagnetic interference, even if the power is turned on after a power failure, the output data is still correct.

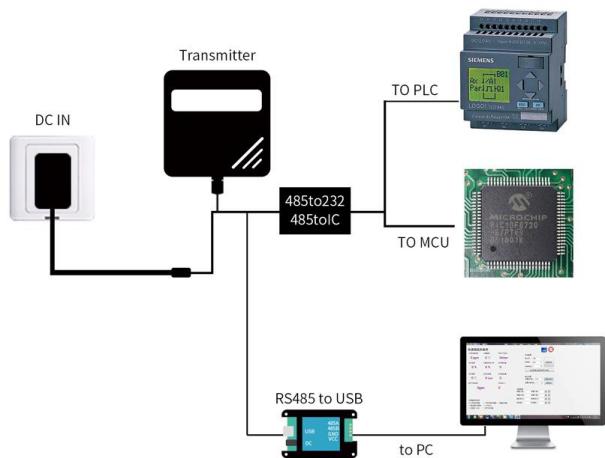
-It can be equipped with an automatic water adding device to achieve 365 days of maintenance-free.

### 1.3 Main Specs

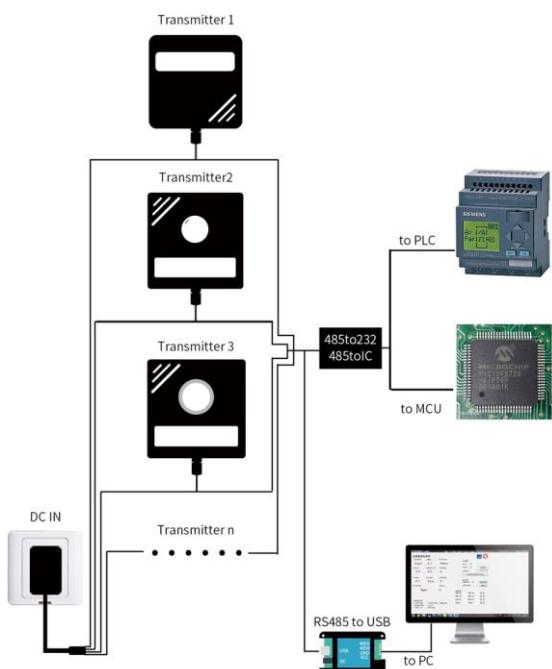
Parameter	Specs
Power Supply	9-24V DC
Power Consumption	≤0.15W (@12V DC, 25°C)
Detect Range	0-200mm
Accuracy	1%F.s
Resolution	≤0.01mm
Output Signal	RS485 Modbus
Working Condition	0-85°C 0-100%RH
Response Speed	≤1s
Max Weight	6500g (Overweight damage to equipment)
Inner Diameter	φ200mm

### 1.4 System framework diagram

This sensor can be connected and used alone. First, use a 12V DC power supply. The device can be directly connected to a PLC with a 485 interface, and it can be connected to a single-chip microcomputer through a 485 interface chip. The single-chip microcomputer and PLC can be programmed through the modbus protocol specified later to cooperate with the sensor. At the same time, use USB to 485 to connect to the computer, and use the sensor configuration tool provided by our company for configuration and testing.



This product can also be used by combining multiple sensors on a single 485 bus. Please follow the "485 bus field wiring rules" (see appendix) when performing 485 bus combination. In theory, one bus can be connected to more than 16 485 sensors. If you need to connect more 485 sensors, you can use a 485 repeater to expand more 485 devices, and the other end is connected to a PLC with a 485 interface through a 485 interface chip. Connect to the single-chip microcomputer, or use USB to 485 to connect to the computer, and use the sensor configuration tool provided by our company for configuration and testing.



## II. Hardware Connection

### 2.1 Interface description

Wide voltage power input is 12-24V. When wiring the 485 signal line, pay attention to the two lines A/B not to be reversed, and the addresses of multiple devices on the bus must not conflict.

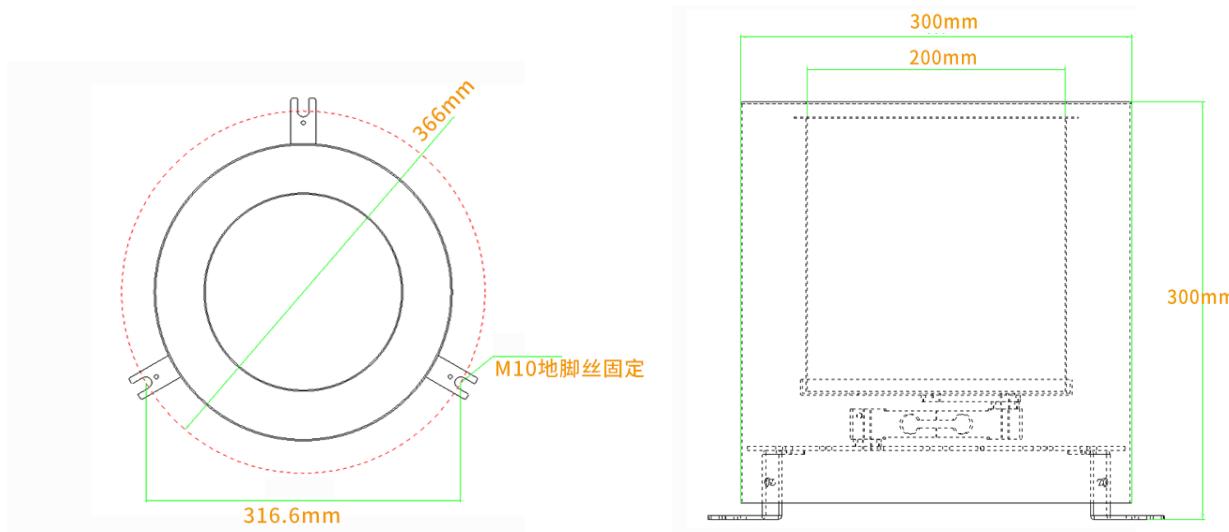
Function	Cable Color	Specs
Power	Brown	Power supply +
	Black	Power supply -
Communication	Yellow (grey)	485-A
	Blue	485-B

Note: Please be careful not to connect the wrong wiring sequence, the wrong wiring will cause the equipment to burn.

The factory default provides 0.6 meters long wire, customers can extend the wire as needed or wire in order.

Note that there is no yellow line in the line sequence that may be provided in some factory batches. At this time, the gray line is equivalent to replace the yellow line.

## 2.2 Product size and installation instructions



- (1) Ensure that the mounting bracket is parallel to the ground;
- (2) Take out the equipment from the package, first unscrew the mounting bolts on the cylinder wall, remove the shell, remove the packaging materials, and then install the inner cylinder correctly, and install the outer cylinder in place
- (3) Use a drill to drill holes on the ground according to the installation size, and install the screws, and fix the sensor on the ground through the 3 mounting holes on the sensor;

## 2.3 Normal product maintenance and automatic water adding

This product is an evaporation sensor. It is necessary to ensure that there is enough water in the equipment at all times. Therefore, regular maintenance is required to ensure sufficient water in the evaporating dish.

This product can be equipped with an automatic water filling device. The automatic water filling device is an automatic control device. When it detects that the amount of water is small, it will automatically control the solenoid valve to open and add water to the equipment. When the system judges that the amount of water is sufficient, it will automatically turn off. Turn on the solenoid valve to stop adding water.

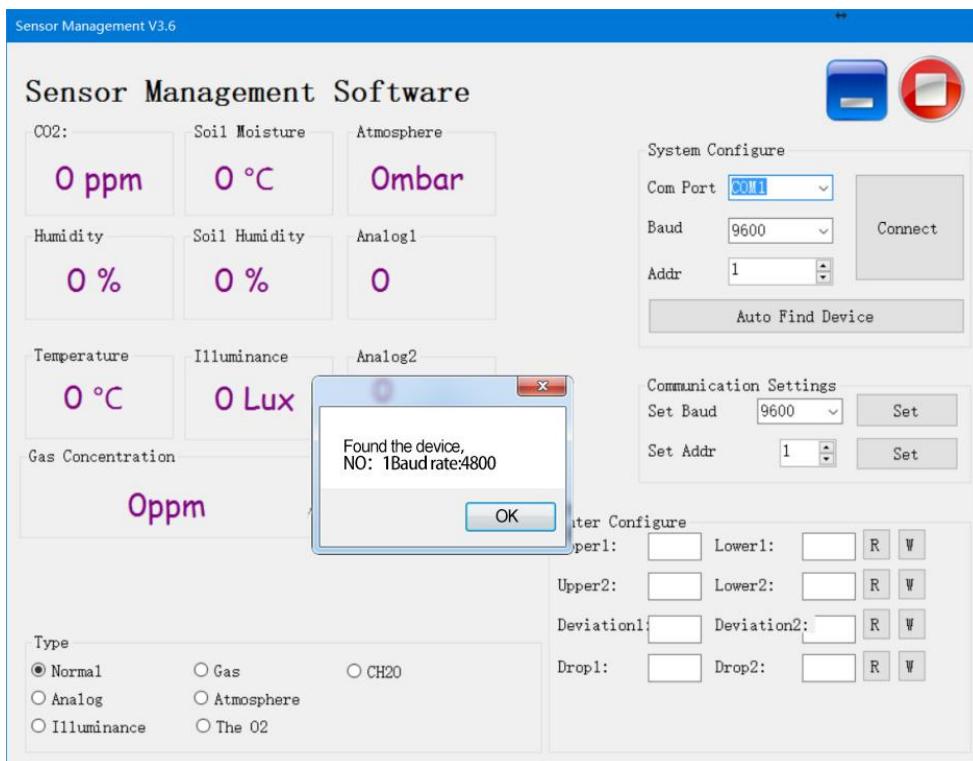
## III. Configuration Tool Installation and use

We provide **CONFIGURATION TOOL** , which can be easily used to test our sensor device.

### 3.1 Sensor Access Computer

Transmitter can be connected to PC with the RS485 to USB adapter. You can check the COM port number through Device Manager (right click My Computer).

### 3.2 HOW TO USE CONFIGURATION TOOL



Please note that this software can only test one device at the same time. After connecting the physical device, click the **CONNECT** button to read the information. In the UNCONNECT state, you can modify BAUD and ADDR in COMMUNICATION SETTINGS.

Under the software, different check boxes can be selected according to different situations. For example, you can choose the GAS option to test the RS485 OXYGEN SENSOR , you can choose the NORMAL option to test the RS485 TEMPERATURE AND HUMIDITY SENSOR .

# IV. Communication Protocol

## 4.1 Communication Basic Parameters

PARAMETERS	CONTENT
Protocol	Modbus RTU
Data bits	8 bit
Parity bit	No
Stop bit	1 bit
Error checking	CRC (redundant loop code)
Baud rate	2400 bps/ 4800 bps/ 9600 bps can be set factory defaults to 9600 bps

## 4.2 Data frame format definition

Adopt Modbus-RTU communication protocol, the format is as follows:

Time for initial structure  $\geq 4$  bytes

Address code = 1 byte

Function code = 1 byte

Data area = N bytes

Error check = 16-bit CRC code

Time to end structure  $\geq 4$  bytes

Address code: It is the function indicator of the transmitter. This transmitter only uses the function code 0x03 (read register data).

Data area: The data area is a specific address, which is unique in the communication network (factory default 0x01).

Function code: command communication data sent by the host, pay attention to the high byte of the 16bits data first!

CRC code: two-byte check code..

### Enquiry Frame

Address Code	Function Code	Register start address	Register length	Check code low bit	High bit of check code
1Byte	1Byte	2 Bytes	2 Bytes	1Byte	1Byte

### Answer Frame

Address Code	Function Code	Number of valid bytes	First data area	Second data area	Nth data area
1Byte	1Byte	2 Bytes	2 Bytes	2 Bytes	2 Bytes

### 4.3 Register address

Register address	PLC configuration address	Content	Operation
0006H	40007	Water weight (1g)	Read Only
0100H	40101	Device address (0-252)	Read Only
0101H	40102	Baud rate (2400/4800/9600)	Read & Write
0102H	40103	Tare Deduction	Write Only

### 4.4 Communication protocol example and explanation

Read the evaporation of the device address 0x01:

#### Enquiry Frame

Address Code	Function Code	Start Address	Data Length	Check code low bit	Check code high bit
0x01	0x03	0x00, 0x06	0x00, 0x01	0x64	0x0B

Answer Frame(For example, read that the weight of water is 71g)

Address Code	Function Code	Returned number of valid bytes	Data Area	Check code low bit	Check code high bit
0x01	0x03	0x02	0x00, 0x47	0xD8	0x15

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Water weight calculation instructions:

0047H(hexadecimal)=71=>evaporation=71 g

What is read out is the weight of the water. We first need to calculate the height of the liquid level based on the weight of the water:

According to the inner diameter of the evaporation barrel is 20cm, the radius is 10cm, and the bottom area is 314.1593cm<sup>2</sup>, the water surface height = water weight/bottom area.

At this time, the height of the liquid level=71g/314.1593cm=0.226cm=2.26mm

Evaluation Volume = Change of water surface height/time within a period of time. Assuming that the liquid surface height calculated 1 hour ago is 3.26mm, then the evaporation volume at this time should be: (3.26mm-2.26mm)/1h=1mm/h.

## 4.5 Tare weight command

After a long time of use, the bottom weight of the sensor may not be 0 without adding water. In this case, the bottom weight will automatically become zero after sending the command without adding water to the device.

Enquiry Frame

Address Code	Function Code	Start Address	Write Data	Check code low bit	Check code high bit
0x01	0x06	0x01, 0x02	0x00,0x01	0xe8	0x36

Answer Frame Return correctly)

Address Code	Function Code	Start Address	Write Date	Check code low bit	Check code high bit
0x01	0x06	0x01,0x02	0x00,0x01	0xe8	0x36