

# **Operating instructions for transmitter of chlamydoscope**

**JXBS-3001-ZRY**

**Ver1.0**

**威海精讯畅通电子科技有限公司**

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## Chapter 1 product introduction

### 1.1 Product Overview

Our independently developed chlamyroscope is a sensor based on the principle of dielectric constant, which can monitor the soil temperature and humidity of different soil layers quickly, accurately and comprehensively.

Soil temperature and humidity plays a very important role in the growth of crops. The use of our company's research and development of the chlamyroscope can accurately detect the soil temperature and humidity, improve the soil through the detection data, so as to make the crops in the best living environment, so as to improve the yield, and greatly facilitate the customer system to evaluate the soil condition.

The device supports a variety of communication modes, including not only the standard MODBUS 485 protocol, but also low-power modes such as 4G, Lora and nb-iot.

application environment

It is widely used in garden irrigation monitoring, soil moisture monitoring, agricultural guidance, water conservancy construction, mine monitoring, geological exploration, scientific experiments and grass planting and other environmental temperature and humidity monitoring.

### 1.2 product features

Real time monitoring of soil temperature and humidity at different levels

The plastic pipe moves up and down to realize the dynamic observation of soil moisture content in each soil layer.

The equipment adopts standard Modbus protocol

- 1.3 product advantages
- It adopts high sensitive probe and has fast response speed
- It is stable, reliable and accurate
- Low zero drift and good repeatability
- Product protection grade IP67, temperature and humidity resistance
- The product has passed a variety of environmental tests and has anti-interference capability
- Remote Cloud View Data

### 1.4 product parameter

PARAMETERS	CONTENT	PARAMETERS	CONTENT
POWER SUPPLY	12-24V DC	TEMPERATURE MEASUREMENT RANGE	-40℃-80℃
MOISTURE MEASUREMENT RANGE	0-100%	TEMPERATURE ACCURACY	±0.5℃
RANGE	-45℃-115℃	OUTPUT SIGNAL	RS485
RESPONSE TIME	<1s	PROTECTION LEVEL	IP68
POWER CONSUMPTION	≤0.15W ( @12V	WORKING RANGE	PRESSURE 0.9-1.1atm

## 1.1 communication parameters

### 1.1.1 485 version product parameters

Parameter name	parameter content
<b>DC power supply (default)</b>	12-24V DC
<b>Power consumption</b>	≤0.5W ( @12V DC , 25℃ )
<b>Output signal</b>	RS485(Mondbusprotocol)
<b>Working pressure range</b>	0.9-1.1atm

### 1.1.2 4G product parameters

Parameter name	parameter content
<b>DC power supply (default)</b>	12V-24V DC
<b>Power consumption</b>	<0.4W
<b>Transmission interface</b>	<b>4G wireless signal transmission</b>
<b>Frequency band system</b>	FDD-LTE、TDD-LTD、TD-SCDMA、UMTS、EV-DO、CDMA、GSM
<b>The operation supports</b>	4G, 3G and 2G network communication of China Mobile, China Unicom and China Telecom

### 1.1.3 Lora version product parameters

Parameter name	parameter content
<b>Power supply mode</b>	battery power supply
<b>Working</b>	433/470/868/915MHz

<b>frequency band</b>	
<b>Transmission distance</b>	<b>800m (default) ~ 4500m (theoretical limit)</b>
<b>Signal protocol</b>	<b>Lora Wan or private protoco</b>

#### 1.1.4 NB-IOT version product parameters

<b>Parameter name</b>	<b>parameter content</b>
<b>Power supply mode</b>	battery power supply
<b>传输接口</b>	NB-lot interface
<b>Frequency band format</b>	NB-lot/2G
<b>Operation support</b>	China Mobile, China Unicom, China Telecom NB IOT

#### 1.5 calculation method and meaning of soil moisture

The soil moisture calculated by this sensor is soil volume moisture content (also known as soil volume moisture content), which is commonly known as "soil moisture" and "soil moisture".

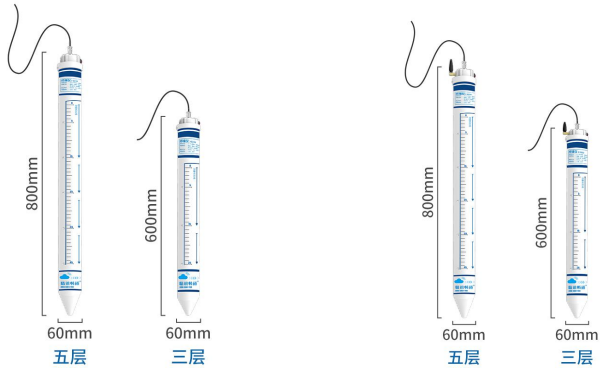
The calculation method of soil volume moisture content is the ratio of soil water volume to total soil volume. 0% represents completely dry soil without any moisture, and 100% represents completely water without any soil.

## Chapter 2 hardware connection

### 2.1 product appearance

The following two pictures show the appearance and dimension of 485 version and networking version respectively,

as shown in the figure:

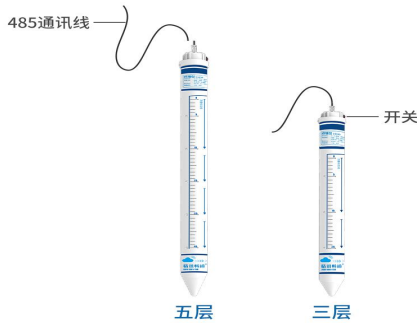


## 2.2 description of product components

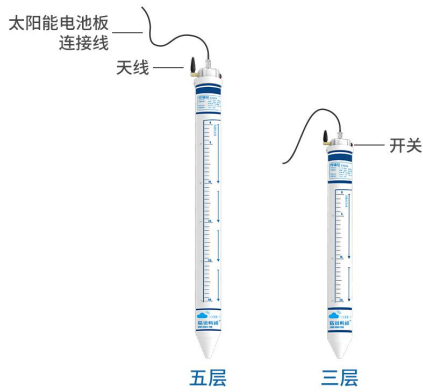
### 2.2.1 Product external

The following figure shows the details of the external parts of the product, as shown in the figure:

#### (1) 485 version

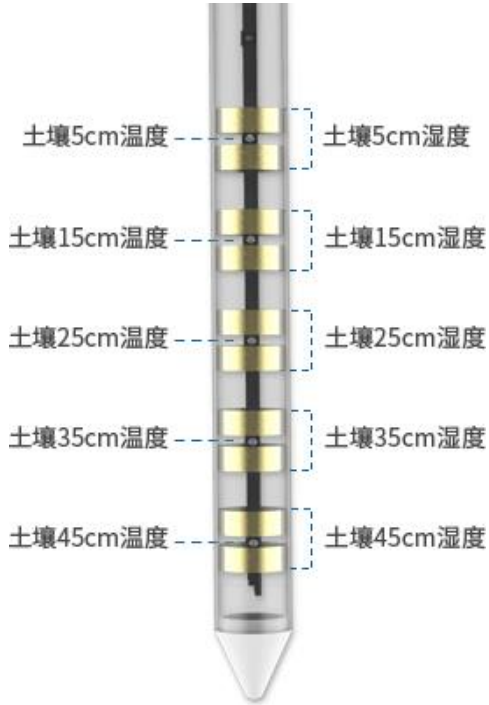


#### (2) 4G/LoRa/NB-IOT version



### 2.2.2 Inside the product

The following figure shows the internal details of the product, as shown in the figure:



### 2.2.3 product list

Please check the equipment list before installing the equipment

Name	quantity
high precision sensor	1
solar panel (optional)	1
bracket (optional)	1
Warranty card / certificate	1



## 2.3 wiring instructions

### (1) 485 version

12V DC power supply is adopted for the power supply of the equipment. When connecting the 485 signal line, it should be noted that the A / B two lines can not be reversed, as shown in



电源：棕色 电源正 (12-24V)  
 黑色 电源负  
 通信：黄色 485-A  
 蓝色 485-B

the figure (table)

	Line color	description
Power supply	Brown	power positive (12-24 V DC)
	Black	power negative
Communication	yellow (gray)	485-A
	Blue	485-B

### (1) 4G / Lora / nb-iot version

The networked version of the sensor can be charged with solar panels, and the line sequence is shown in the figure



棕色-太阳能电源正

黑色-太阳能电源负

(table)

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	Line	description
	color	
Solar	Brown	power positive
power	Black	power negative

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Note: please pay attention not to connect the solar power interface line in the wrong sequence, the wrong wiring will cause the equipment to burn down.

Factory default to provide 1.25 meters long wire, customers can according to the need to extend the wire or sequential wiring.

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 replacing the yellow line.

### (1) Drilling

First of all, the drill bit, handle and support rod of the soil drill shall be vertical to the ground after completion, hold the handle tightly with both hands, press down clockwise and rotate slowly. (Note: don't use too much force, make sure to rotate a few more circles slowly to prevent the drill bit from drifting to the hole slanting)

Secondly, take out the soil drill from the hole and put it into the basin. Use tools to collect the drilled soil into the basin to mix with mud. If there is too much sand and gravel, the fine soil should be selected. (Note: firstly, there are too many impurities in the drilled soil, so it is not collected.)

Finally, repeatedly drill and take soil, and in this process, try to put the sensor into the hole gently (do not touch the bottom of the equipment with force) to test whether the depth of the hole is appropriate; if there is jamming, use a soil drill to correct to ensure that the sensor is put in and taken out smoothly; until the hole depth is flush with the installation position marked by the sensor, the drilling is completed.

First of all, pick out the soil impurities in the basin, stones, roots, soil blocks that are not easy to dissolve. Rub the soil down to make it mix with the mud.

Secondly, pour in appropriate amount of water, fully stir until sticky; loam mud generally can not be thicker than "sesame paste"; and mud is completed.

#### Grouting installation

First of all, slowly pour the mud into the hole, about 1 / 2 of the hole; it can be increased or decreased according to the actual situation.

Secondly, the sensor is slowly put into the hole, slowly rotate in one direction and press down. If the speed is too fast, the bubbles may not be completely discharged. (Note: it is not allowed to pull up the sensor during the process of re rotating and pressing to prevent the gas from being sucked into the hole again).

Finally, when the sensor is installed to the correct depth, some mud will overflow around the equipment and the grouting is completed; at this time, the installation depth of the

sensor is flush with the hole. (Note: remove the excess mud outside 3cm around the sensor to prevent caking and affecting water infiltration).

### **Installation is complete**

After pulling out the top cover of the equipment upward, press the switch key, and the equipment can work normally. It is suggested that the normal operation should be carried out after the mud returns to normal state.

### **2.4 solar panel installation**

Users who do not use solar panels do not need to do this step

#### **(1) Solar panel site selection**

The installation position of solar panel should be far away from the sensor as far as possible. Generally, it is more suitable to be more than 50cm away from the sensor, but it should not exceed the length of the power line. The panel of the solar power supply panel should face the direction of the sun, i.e. in the south, there should be no shelter in the front as far as possible, and the solar panel bracket can be inserted in the selected position.

#### **(2) Fixed solar panel**

Install and fix the solar panel on the bracket, align the four holes on the back of the metal frame of the solar panel with the four holes on the bracket, and then tighten them with screws and nuts to complete the installation.

#### **(3) Connect the solar power supply panel with the measuring instrument**

First, connect the panel with the terminal on the bracket and screw it together;

Secondly, the other end of the power line of the bracket is aligned with the sensor interface, and the bolt is tightened to complete the installation of the solar panel.

Finally, after the installation is completed, press the on key, and the equipment can work normally. It is recommended to carry out normal operation after the mud returns to normal state, as shown in the figure:



## 2.5 measurement method

Select a suitable measuring place, according to the depth to be measured, and according to the size of the measuring instrument, conduct the hole drilling test, fill the pit tightly, press the power switch button of the measuring instrument, and the measuring instrument starts to work. After it is stable

for a period of time, it can measure and record continuously for several days, months or even longer. The acquisition mode is shown in the figure



## 2.6 precautions

The measuring instrument must be vertically inserted into the test environment

When the equipment is embedded in the test environment, do not press too hard

It is not applicable to the absolute moisture measurement of saline alkali land, sandy land or other powdery objects

It should not be used in the environment of soil impurities, stones, roots and not easy to dissolve

The measuring instrument can not be completely embedded in the soil, and the equipment has identification

## Chapter 3 use and installation of 485 software

3.1 Our company provides a supporting "sensor monitoring software", which can easily use the computer to read the parameters of the sensor, and flexibly modify the device ID and address of the sensor.

### Sensor access to computer

After connecting the sensor to the computer through USB to 485 and providing power supply, you can see the correct COM port in the computer (view COM port in my computer properties device manager port).



As shown in the figure above, your serial port number is com10. Please remember this serial port. You need to fill in the serial port number in the sensor monitoring software.

If the COM port is not found in the device manager, it means that you have not inserted USB to 485 or the driver is not installed correctly. Please contact the technician for help.

## Application of sensor monitoring software

The software interface is shown in the figure:





After opening the software, first select the "sensor type" at the top of the software, then obtain the serial port number and select the correct serial port according to the method in Chapter 3.1, and then click "automatically obtain the current baud rate and address" to automatically detect all devices and baud rate on the current 485 bus. Please note that there is only one sensor on the 485 bus when using software automatic acquisition. Then click "connect device" to obtain sensor data information in real time.

#### Modify baud rate and device address

When the "device connection" is disconnected, click "modify baud rate and modify slave station number" in "configure sensor communication parameters" to complete the relevant settings. Please note that after setting, please restart the device, and then "automatically obtain the current baud rate and address" to show that the address and baud rate have been changed to the address and baud rate you need.

## Chapter 3 communication protocol

### Basic communication 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

#### Data frame format definition

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

Time of initial structure  $\geq 4$  bytes

Address code = 1 byte

Function code = 1 byte

Data area = n bytes

Error check = 16 bit CRC code

Time of ending structure  $\geq 4$  bytes

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

Function code: the instruction and function indication sent by the host computer. The transmitter only uses function code 0x03 (reading register data).

Data area: the data area is the specific communication data. Note that the high byte of 16bits data is in front!

CRC code: two byte check code.

Inquiry frame

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

Reply frame

Address code	Function code	Number of valid bytes	Data area 1	Second data area	Data area n	Check code
1bit	1bit	1bit	2bit	2bit	2bit	2bit

## 1.2 register address

Register Address	Plc Configuration Address	Content	Operation
0002H	40003	Soil humidity(unit 0.1%RH)	Read-Only
0003H	40004	Soil temperature(unit 0.1℃)	Read-Only
0100H	40101	Device Address (0-252)	R/W
0101H	40102	Baud Rate (2400/4800/9600)	R/W

Communication protocol example and explanation

Read the soil temperature and humidity value of equipment address 0x01

Answer frame

Address Code	Function Code	Start Address	Data Length	CRC_L	CRC_H
0x01	0x03	0x00	0x00	0X25	0xCA
		0x02	0x02		

Soil temperature:

009bh (HEX) = 155 => soil temperature = 15.5 °C

Soil moisture:

0292h (HEX) = 658 => soil moisture = 65.8% RH

## Chapter 2 sensor connection

The 4G / Lora / nb-iot version has the functions of connecting the jingxun cloud, data reporting and query.

### **introduction to jingxun cloud**

Jingxun cloud is a universal Internet of things cloud platform developed by jingxun. Based on industry solutions, it solves the problem that traditional cloud platforms attach more importance to link than experience. It upgrades the display effect and style of the front section on the basis of links, and integrates more than ten industry interface templates. It is a set of IOT integrating solutions, data collection, early warning release, remote control and data analysis Net system. Jingxun cloud provides data recording, query, export, comparison and other functions, mainly to provide customers with one-stop joining service in the application layer.

### **1.3 advantages of jingxun cloud**

(1) Stability: high stability, the overall availability of the system is greater than 99.7%, and the database application availability is greater than 99.8%, and will be maintained regularly.

(2) Easy operation: provide friendly user management and user interface

(3) Reliability: to ensure the reliability of the system by selecting excellent products and adopting necessary technical means

(4) Compatibility: according to the server agreement of our company, the data of other company's products can also be seen on our platform

(5) "Thousands of people and thousands of faces": it has privatization deployment, and provides two entrances, normal entrance and neutral entrance. After entering from the neutral entrance, the interface information that customers see is the information set by customers themselves

(6) Wechat, mobile phone and other devices can be easily bound.

#### Sensor data query

When you purchase a sensor with reporting function, you can view data remotely through jingxun cloud server, which is convenient and fast.

The sensor equipment establishes a connection with the jingxun cloud server through the 4G / nb-iot network module, and reports the data to the cloud server according to the

default frequency (adjustable frequency)Server.

After logging into the server with the registered jingxun cloud account, you can query the data of the device by using the unique "identity ID" of each host.

At the same time, the platform also has alarm function. You only need to set the alarm value through the platform. If the monitoring data exceeds the alarm value, the platform will inform you through SMS or QQ email, so that you can monitor the data more conveniently and quickly.

Note: you can contact our after-sales staff to understand the specific functions of the platform