XC7233

Differential-gap Based Soil Moisture and Temperature Controller

User Manual

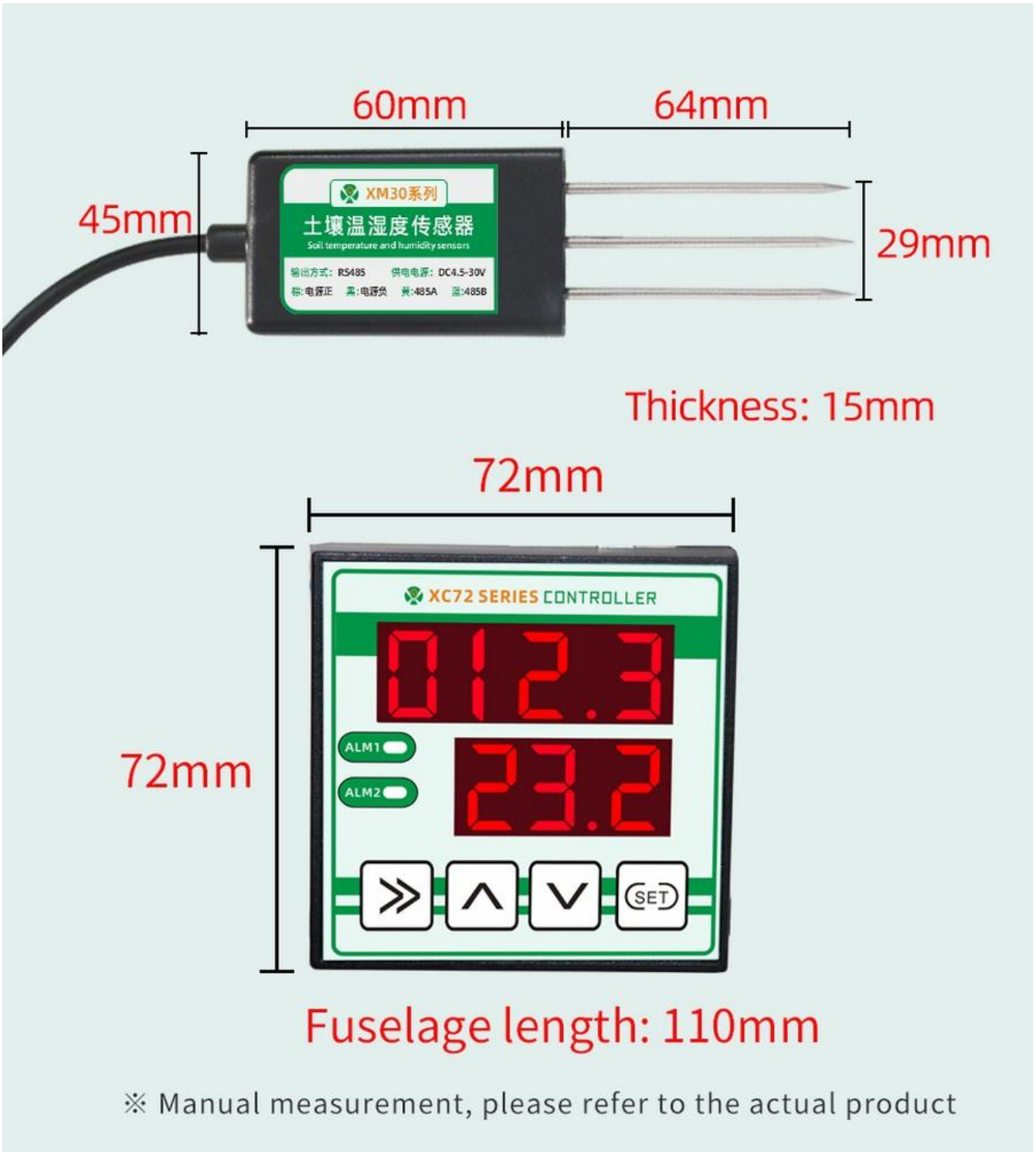
File Version: V26.5.14

XC7233 using the standard RS485 bus MODBUS-RTU protocol,easy access to PLC，DCS and other instruments or systems for monitoring soil Moisture,soil temperature state quantities.The internal use of high-precision sensing core and related devices to ensure high reliability and excellent long-term stability,can be customized RS232,RS485,CAN,4-20mA,DC0~5V\10V,ZIGBEE,Lora,WIFI,GPRS and other output methods.

Technical Parameters

Technical parameter	Parameter value
Brand	XUNCHIP
Moisture measuring range	0~100%
Moisture measuring accuracy	±3% @25℃
Moisture Temperature range	-30℃~80℃
Moisture Temperature accuracy	±0.5℃ @25℃
Communication Interface	RS485
Default baud rate	9600 8 n 1
Power	AC185~265V 1A
Dimensions	77mm×77mm×110mm
Running temperature	-30~80℃
Working humidity	5%RH~90%RH

Product Size



software to test

Detailed explanation of the buttons to get started quickly

Standard MODBUS-RTU protocol, default baud rate 9600, invalid check, 8-bit data bits, software can change thresholds and other parameters, real-time query of illuminance data through RS485.

» : Use the position selection key when setting

^ : Adjust the up key

v : Downward adjustment key

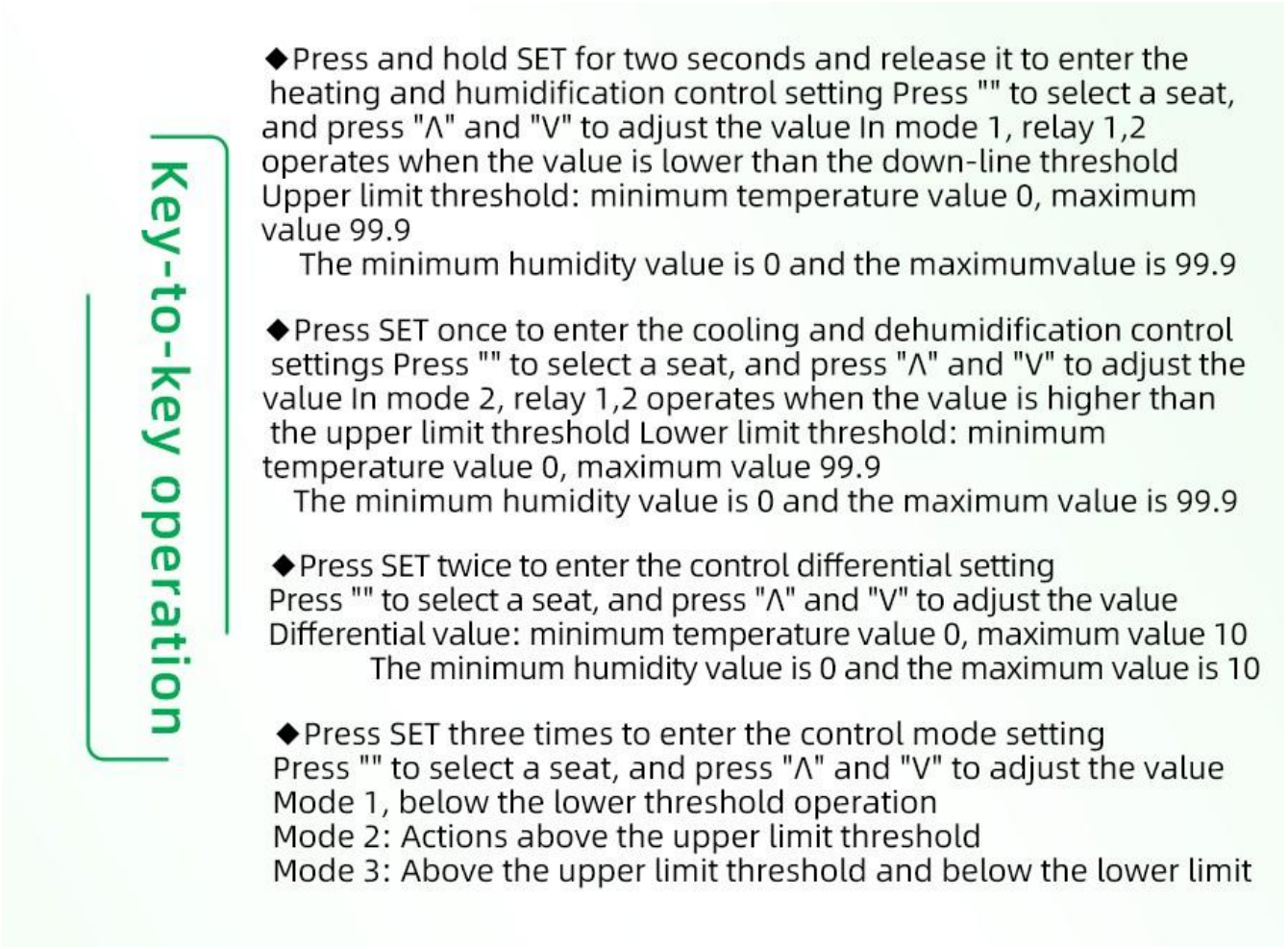
SET : Set the key

The fourth page is for the mode settings

Mode 1: Heating and humidification control

Mode 2: Cooling and humidity control

※The upper temperature is displayed, and the lower is the humidity display



Wiring instructions

In the case of broken wires, wire the wires as shown in the figure. If the product itself has no leads, the core color is for reference.

How to use software?

Detailed explanation of the buttons to get started quickly

Standard MODBUS-RTU protocol, default baud rate 9600, invalid check, 8-bit data bits, software can change thresholds and other parameters, real-time query of illuminance data through RS485.

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Mode 1: Heating and humidification control

Mode 2: Cooling and humidity control

※The upper temperature is displayed, and the lower is the humidity display

Key-to-key operation

◆Press and hold SET for two seconds and release it to enter the heating and humidification control setting Press "" to select a seat, and press "Λ" and "V" to adjust the value In mode 1, relay 1,2 operates when the value is lower than the down-line threshold Upper limit threshold: minimum temperature value 0, maximum value 99.9
The minimum humidity value is 0 and the maximumvalue is 99.9

◆Press SET once to enter the cooling and dehumidification control settings Press "" to select a seat, and press "Λ" and "V" to adjust the value In mode 2, relay 1,2 operates when the value is higher than the upper limit threshold Lower limit threshold: minimum temperature value 0, maximum value 99.9
The minimum humidity value is 0 and the maximum value is 99.9

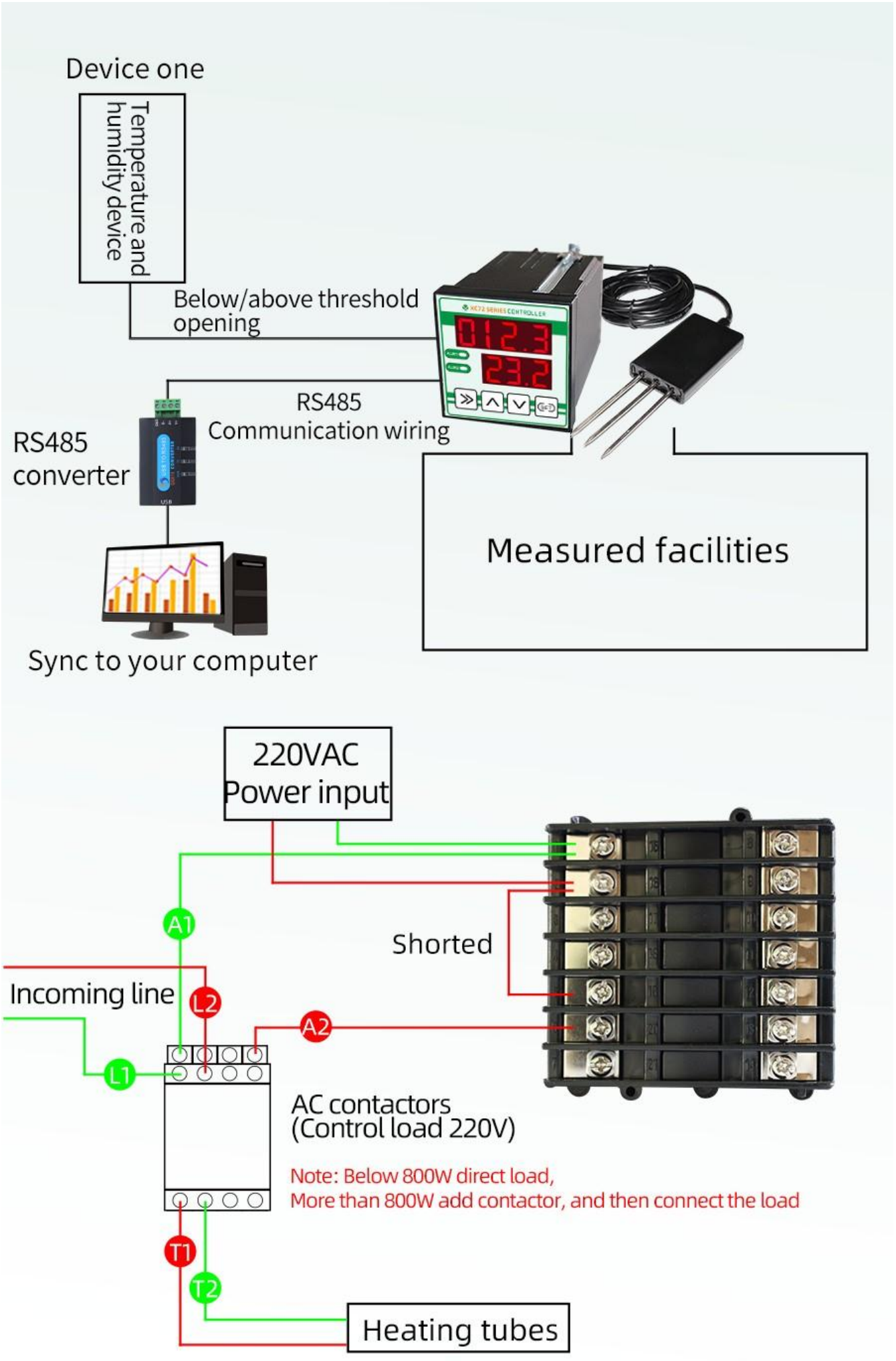
◆Press SET twice to enter the control differential setting
Press "" to select a seat, and press "Λ" and "V" to adjust the value
Differential value: minimum temperature value 0, maximum value 10
The minimum humidity value is 0 and the maximum value is 10

◆Press SET three times to enter the control mode setting
Press "" to select a seat, and press "Λ" and "V" to adjust the value
Mode 1, below the lower threshold operation
Mode 2: Actions above the upper limit threshold
Mode 3: Above the upper limit threshold and below the lower limit

How to use?

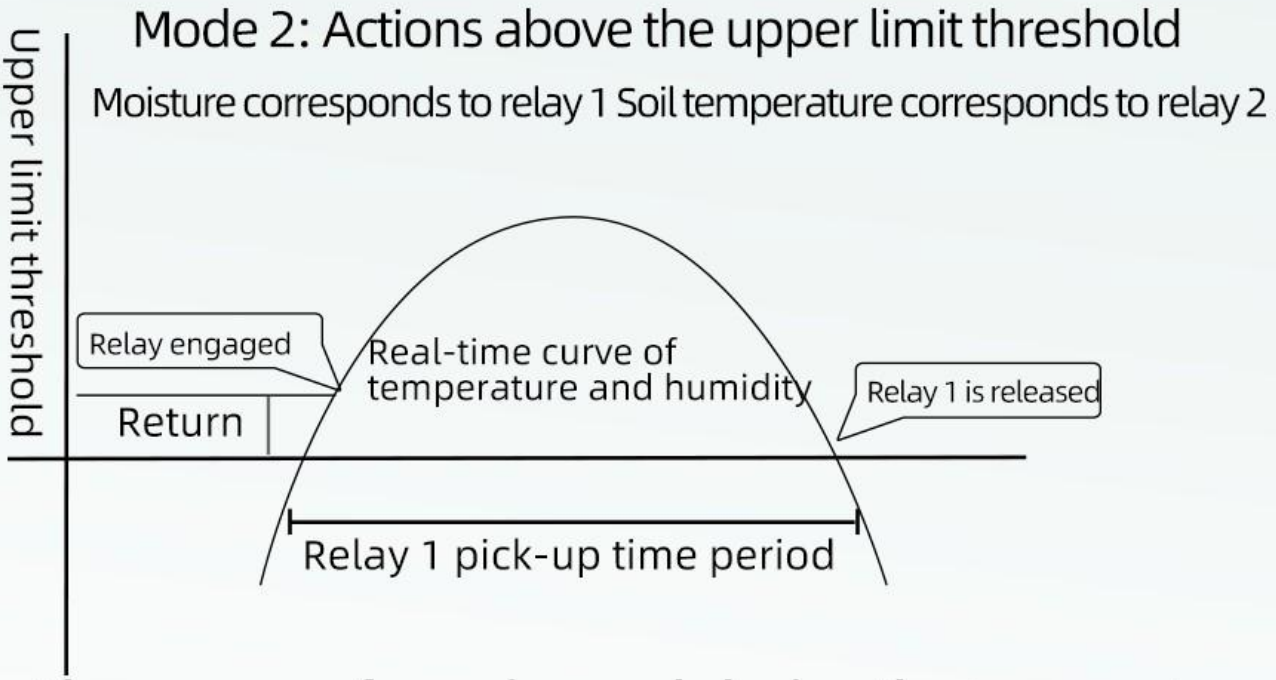
Soil temperature and humidity sensor is suitable for scientific experiments, water-saving irrigation, greenhouses, flowers and vegetables, grassland pastures, soil rapid measurement, plant culture, sewage treatment and measurement of water content of various particulate matter.

Application solution


Device one
Temperature and humidity device
Below/above threshold opening
RS485 Communication wiring
RS485 converter
Measured facilities
Sync to your computer
220VAC Power input
A1
Shorted
Incoming line
L2
A2
L1
AC contactors (Control load 220V)
Note: Below 800W direct load,
More than 800W add contactor, and then connect the load
T1
T2
Heating tubes

Control mode and process

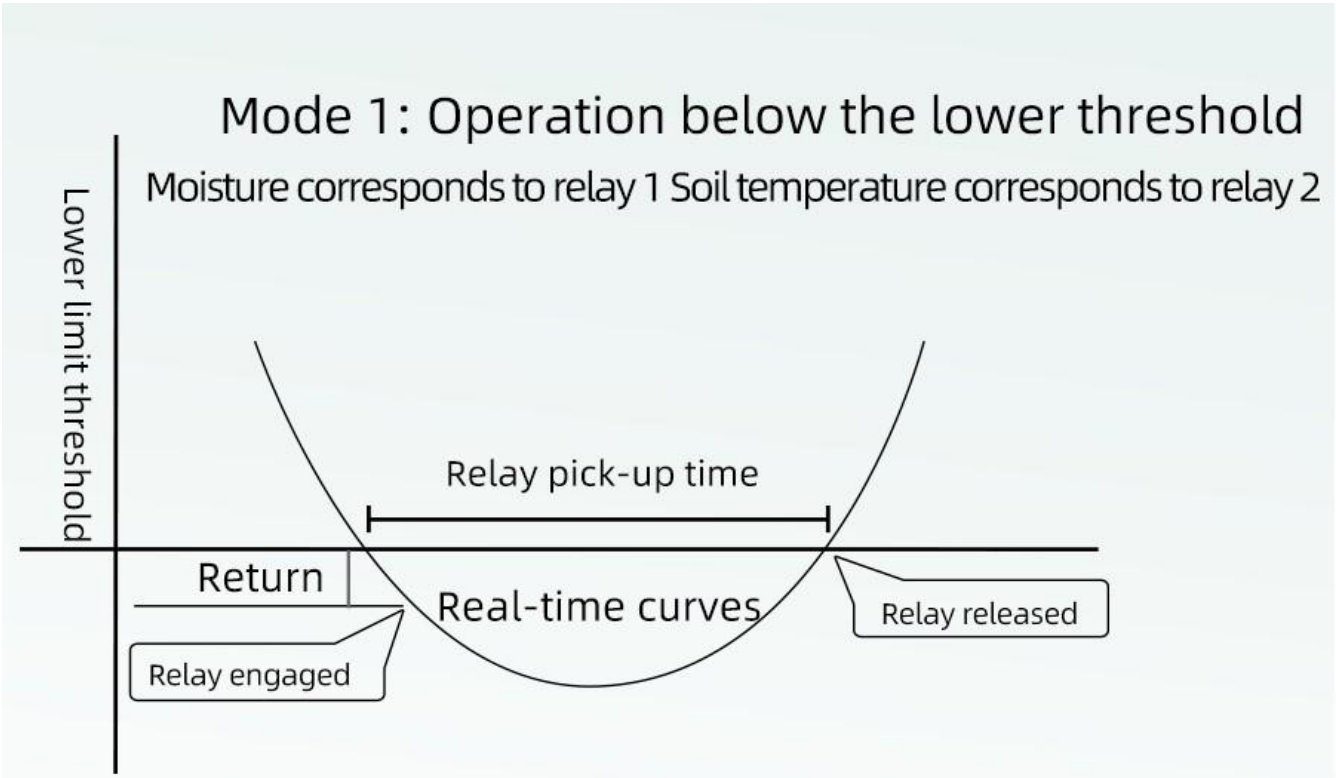
Above the upper limit threshold, below the lower threshold, over/below the threshold



The process of opening and closing the temperature and humidity control equipment

Relay 1 pick-up action conditions: measured value> upper limit threshold value + return difference value
Relay 1 release operating conditions: measured value< upper limit threshold-return difference value

*As shown in the figure above, when the measured value is higher than the upper limit threshold and the difference is added back, the controller relays power internally.Engage, turn on the device; When the measured value drops to the upper limit threshold minus the difference, it is continued Appliances disconnect, turn off the device.



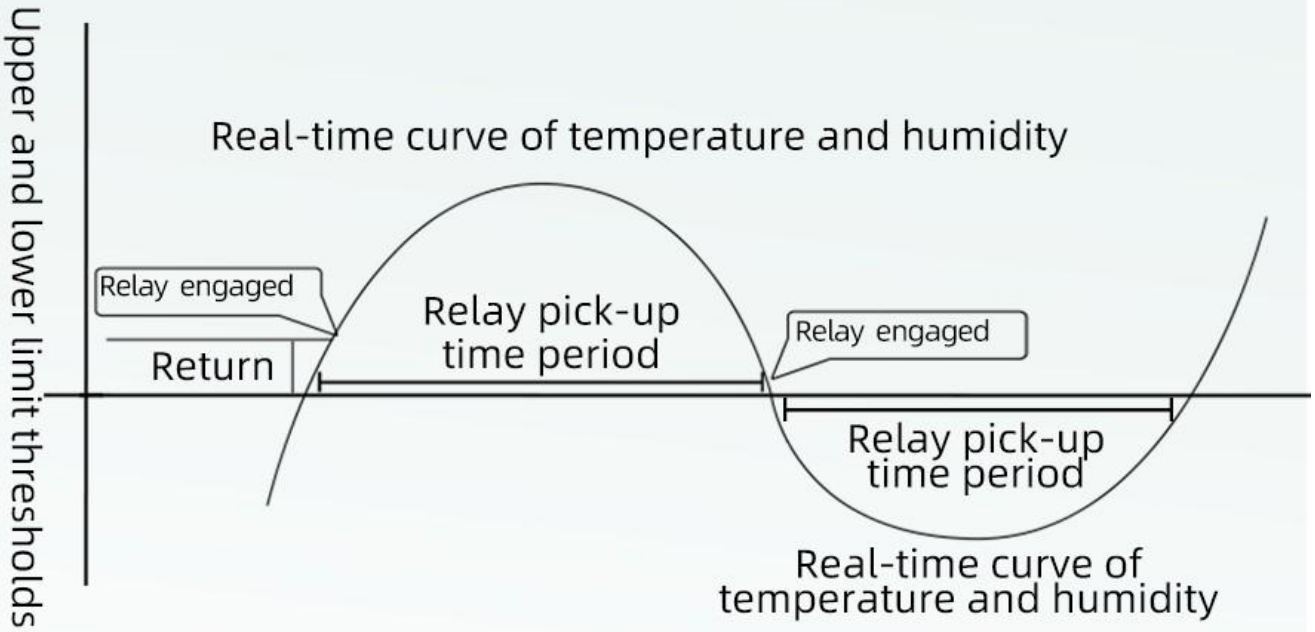
The process of opening and closing the temperature and humidity control equipment

Relay pick-up action conditions: measured value < lower limit threshold value - return difference value Relay release action condition: measured value > lower limit threshold value + return difference value

※As shown in the figure above, when the measured value is below the lower limit threshold minus the difference, the controller relays power internally device picks up, closes the equipment; When the measured value rises to the lower limit threshold and adds back to the difference, it is followed Appliance is disconnected and the device is turned on.

Mode 3: Over/Under threshold action

Relays above the upper limit threshold operate, below the lower threshold.Moisture corresponds to relay 1 Soil temperature corresponds to relay 2



The process of opening and closing the temperature and humidity control equipment

Relay pick-up conditions: measured value > upper limit threshold + return difference value

Relay pick-up conditions: measured value< lower limit threshold-return difference value

※As shown in the figure above, when the measured value is higher than the upper limit threshold + return difference value, the controller is internally relayed device is engaged, and the motor of the general control equipment is rotated so as to start the equipment; After starti ng, lower down When the threshold value is limited to the return diffe rence value, then the relay is engaged, and the motor of the general control equipment is reversed Turn off the device.

Measurement method

▶ Application of intelligent controllers

Selection example: When the water or temperature is exceeded/lower than the threshold during irrigation, the sensor will transmit the humidity and temperature data to the controller, and then the controller will turn off/open the irrigation device according to the pre-set threshold, and the data can be synchronized to the appropriate measurement location of the computer through the RS485 communication port, avoid stones, plane the topsoil according to the depth required for measurement, maintain the original tightness of the underlying soil, hold the sensor vertically into the soil, and do not shake left and right when inserting to ensure close contact with the soil

Buried surveys

Intelligent soil moisture temperature and humidity controller

Rapid measurement method

Select a suitable measurement location, avoid stones, plane the topsoil according to the depth required for measurement, maintain the original tightness of the underlying soil, hold the sensor and insert it vertically into the soil, and do not shake it from side to side when inserting to ensure close contact with the soil

Intelligent soil moisture temperature and humidity controller

Product List

Intelligent Soil Moisture Controller (with Power Supply and Sensor)

Communication Protocol

The product uses the RS485 MODBUS-RTU standard protocol format, and all operation or reply commands are in hexadecimal data. When the device leaves the factory, the default device address is 1, and the default baud rate is: for modules and non-recording instruments: 9600, 8, n, 1 (for the recorder series products, the default is: 115200, 8, n, 1).

1. Read data (Function code 0x03)

The inquiry frame (in hexadecimal). Example of sending: To query 1 piece of data of device No. 1, the host computer sends the command: 01 03 00 00 00 02 C4 0B .

Address	Function code	Starting address	Data length	Checksum
01	03	00 00	00 02	C4 0B

For a correct inquiry frame, the device will respond with data: 01 03 04 02 19 00 00 2A 4C , and the response format is:

Address	Function code	Length	Data 1	Data 2	Checksum
01	03	04	02 18	02 19	2A 4C

Data description: The data in the command is in hexadecimal. Taking Data 1 as an example, 02 18 converted to decimal value is 536. Assuming the data magnification factor is 100, then the true value is 536/100 = 5.36, and the others can be deduced by analogy.

2. Common Data Address Table

Configuration	Register Address	Register	Data Type	Value Range

Address		Description		
40001	00 00	soil Moisture	Read Only	0~65535
40002	00 01	soil temperature	Read Only	0~65535
40101	00 64	Model Code	Read-only	0~59999
40102	00 65	Total Number of Measuring Points	Read-only	1~1600
40103	00 66	Device Address	Read/Write	1~249
40104	00 67	Baud Rate	Read/Write	0~6
40105	00 68	Communication Mode	Read/Write	1 Query
40106	00 69	Protocol Type	Read/Write	1 MODBUS-RTU

3. Read and modify the device address

(1) Read or query the device address

If you don't know the current device address and there is only one device on the bus, you can query the device address through the command FA 03 00 66 00 01 71 9E .

Device address	Function code	Starting address	Data length	Checksum
FA	03	00 66	00 01	71 9E

FA, which is 250, is the universal address. When you don't know the address, you can use 250 to obtain the real device address. 00 66 is the register of the device address.

For a correct query command, the device will respond. For example, the response data is: 01 03 02 00 01 79 84. The format analysis is shown in the following table:

Device address	Function code	Starting address	Address ID	Checksum
01	03	02	00 01	79 84

In the response data, the first byte 01 represents the real address of the current device.

(2) Change the device address

For example, if the current device address is 1 and you want to change it to 02, the command is: 01 06 00 66 00 02 E8 14 .

Device address	Function code	Register address	Target address	Checksum
01	06	00 66	00 02	E8 14

After the change is successful, the device will return the information: 02 06 00 66 00 02 E8 27. The format analysis is shown in the following table:

Device address	Function code	Register address	Target address	Checksum
02	06	00 66	00 02	E8 27

In the response data, after the modification is successful, the first byte is the new device address. Generally, after the device address is changed, it takes effect immediately. At this time, users need to modify the query commands in their own software accordingly.

4. Read and modify the baud rate

(1) Read the baud rate

The default factory baud rate of the device is 9600. If you need to change it, you can perform the change operation according to the following table and the corresponding communication protocol. For example, to read the baud rate ID of the current device, the command is: 01 03 00 67 00 01 35 D5 . The format analysis is as follows.

Device address	Function code	Starting address	Data length	Checksum

01	03	00 67	00 01	35 D5

Read the baud rate code of the current device. Baud rate codes: 1 for 2400; 2 for 4800; 3 for 9600; 4 for 19200; 5 for 38400; 6 for 115200.

For a correct query command, the device will respond. For example, the response data is: 01 03 02 00 03 F8 45. The format analysis is shown in the following table:

Device address	Function code	Data length	Baud rate code	Checksum
01	03	02	00 03	F8 45

According to the baud rate code, 03 represents 9600, which means the current baud rate of the device is 9600.

(2) Change the baud rate

For example, to change the baud rate from 9600 to 38400, that is, change the code from 3 to 5, the command is: 01 06 00 67 00 05 F8 16 .

Device address	Function code	Register address	Target baud rate	Checksum
01	06	00 67	00 05	F8 16

Change the baud rate from 9600 to 38400, that is, change the code from 3 to 5. The new baud rate will take effect immediately. At this time, the device will stop responding, and the query command for the device's baud rate needs to be modified accordingly.

5. Read and modify the correction value (valid for some products)

(1) Read the correction value

When there is an error between the data and the reference standard, we can reduce the display error by adjusting the “correction value”. The adjustable range of the correction difference is plus or minus 1000, that is, the value range is 0 - 1000 or 64535 - 65535. For example, when the displayed value is 100 less than the actual value, we can correct it by adding 100. The command is: 01 03 00 6B 00 01 F5 D6 . In the command, 100 is the hexadecimal value 0x64. If you need to decrease the value, you can set a negative value. For example, - 100 corresponds to the hexadecimal value FF 9C. The calculation method is 100 - 65535 = 65435, and then convert it to hexadecimal, which is 0x FF 9C. The device correction value starts from 00 6B. We take the first parameter as an example for illustration. When there are multiple parameters, the methods for reading and modifying the correction value are the same.

Device address	Function code	Starting address	Data length	Checksum
01	03	00 6B	00 01	F5 D6

For a correct query command, the device will respond. For example, the response data is: 01 03 02 00 64 B9 AF. The format analysis is shown in the following table:

Device address	Function code	Data length	Correction value	Checksum
01	03	02	00 64	B9 AF

In the response data, the first byte 01 represents the real address of the current device, and 00 6B is the register for the correction value of the first state variable. If the device has multiple parameters, the operation methods for other parameters are the same. Generally, temperature and humidity sensors have this parameter, while light sensors usually do not.

(2) Change the correction value

For example, if the current state variable value is too small and we want to increase its real - value by 1, the command to correct the current value by adding 100 is: 01 06 00 6B 00 64 F9 FD .

Device address	Function code	Register address	Target address	Checksum
01	06	00 6B	00 64	F9 FD

After the operation is successful, the device will return the information: 01 06 00 6B 00 64 F9 FD. After the change is successful, the parameter takes effect immediately.

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