Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual

ME31-XEXX0600



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1. Overview

1.1 Introduction



ME31-XEXX0600 is a K-type thermocouple temperature acquisition module with 6-channel K-type thermocouple temperature acquisition function, supporting the acquisition of 2-wire K-type thermocouple temperature sensors It also has a display screen to facilitate customer on-site debugging configuration and temperature viewing. The module also supports network and RS485 communication interface, supports Modbus TCP protocol or Modbus RTU protocol for acquisition.

And can be used as a Modbus gateway, will automatically be non-local Modbus address commands sent through the serial port / network port, support Modbus TCP and Modbus RTU protocol conversion, easy to expand the Modbus slave device.

1.2 Features

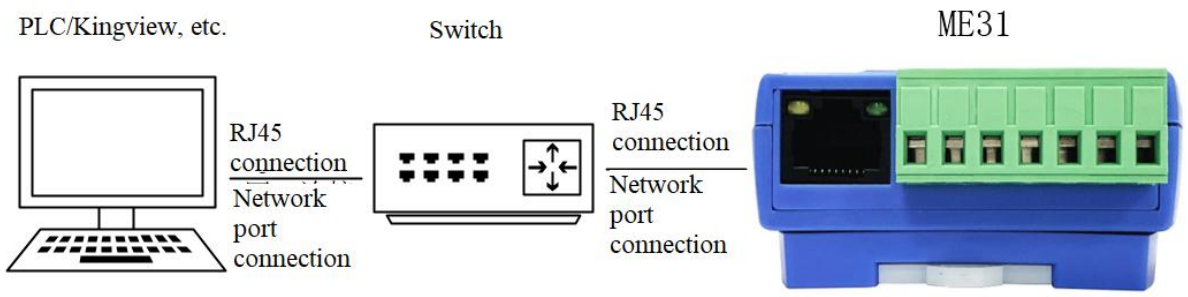
- Supports 6-way 2-wire type K thermocouple temperature sensors;
- high resolution: 0.1° C;
- high precision: ±2℃;
- wide temperature measurement range: -200~1350℃;
- high precision 16-bit ADC;
- sensor not accessed for identification;
- 485 isolation, power isolation, power supply anti-reverse connection, lightning surge protection;
- support rail mounting or screw mounting;
- support all kinds of configuration software/PLC/touch screen;
- supports RS485 Modbus RTU protocol acquisition;
- supports network Modbus TCP protocol acquisition and 4-way host access at the same time;
- supports OLED display to show channel temperature information;
- supports configuration of device parameters by keystroke;
- power, communication, network link indicator;
- supports quick configuration of the upper computer;
- supports customized Modbus address settings;

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- supports multiple baud rate configurations and checksum configurations;
- supports DHCP and static IP;
- supports DNS function, domain name resolution;
- supports Modbus gateway function;

1.3 Product Application Topology Diagram



Network interface application topology diagram



Serial port application topology diagram

2. Quick use

Notes:

This experiment needs to be carried out by default factory parameters.

The upper computer can be downloaded from the corresponding device model in the official website, official website link:www.cdebyte.com

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Configuration tool software is driver-free installation, directly double-click the .exe file to open and use.

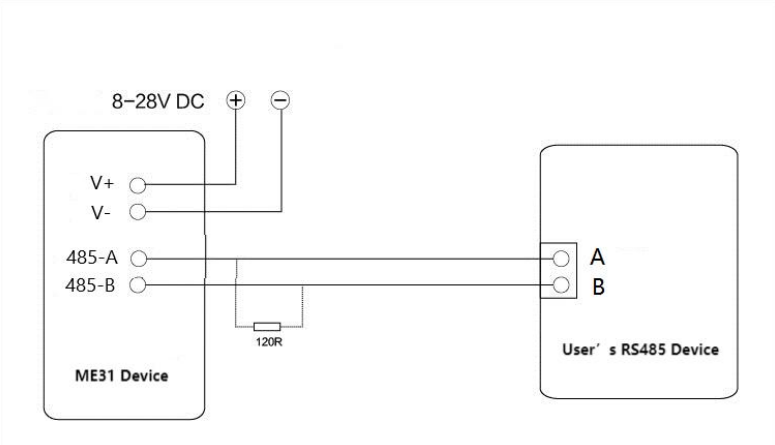
2.1 Preparation for use

The following table shows the materials required for this test:

No	component	quantities
1	ME31-XEXX0600	1
2	USB to RS485 Converter	1
3	Network cable	1
4	Upper computer (can be downloaded from the official website)	1
5	Computer	1
6	Power adapter (12V/1A)	1
7	One screwdriver	1
8	K-type thermocouple temperature sensor	1

2.2 Equipment connection

2.2.1.Power supply, RS485 wiring

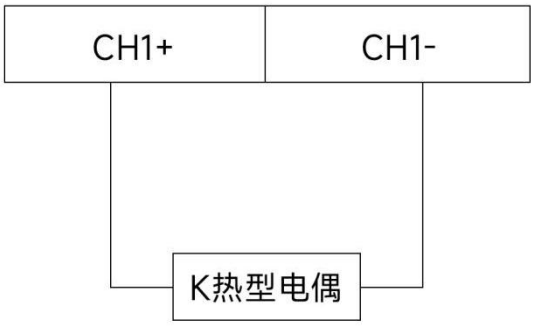


Note: 485 bus high-frequency signal transmission, the signal wavelength is relatively short compared to the transmission line, the signal at the end of the transmission line will form a reflection wave, interfering with the original signal, so it is necessary to add a terminating resistor at the end of the transmission line, so that the signal does not reflect when it reaches the end of the transmission line. The terminating resistor should be the same as the impedance of the communication cable, the typical value is 120 ohms, and its role is to match the bus impedance, to improve the anti-jamming of the data communication and the reliability of the line.

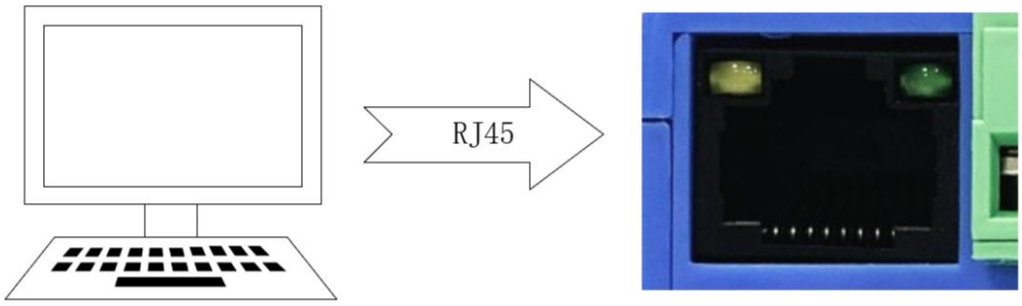
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2.2.2 Type K Thermocouple Sensor Wiring



2.2.3 Simple use



Wiring: PC connects to the RS485 port of ME31-XEXX0600 via USB to RS485, A to A, B to B.
Networking: Plug the network cable into the RJ45 port to connect with PC.
Power supply: Use DC-12V switching power supply (DC 8~28V) to power ME31-XEXX0600.

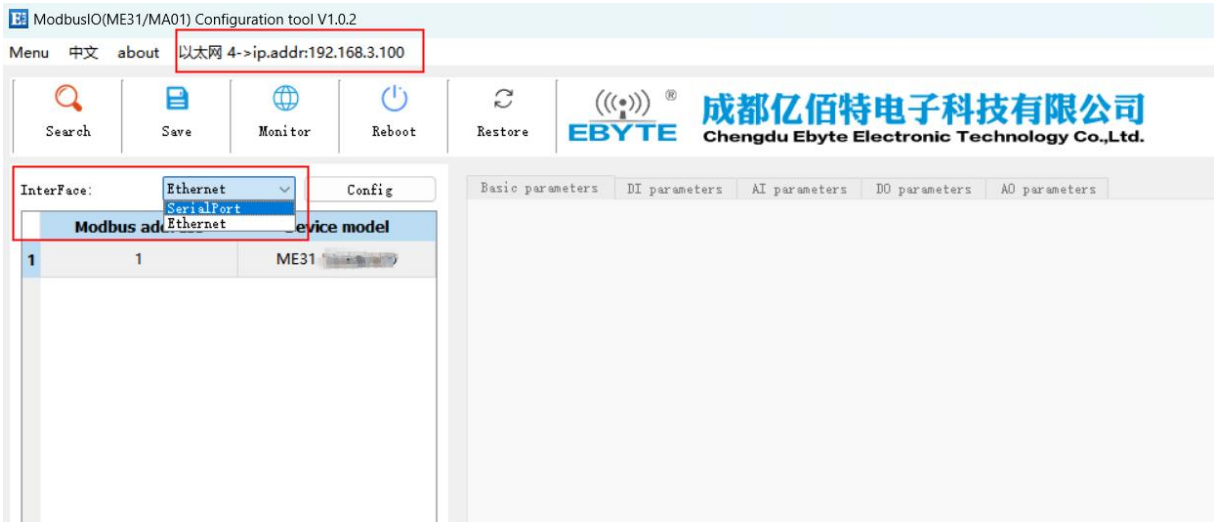
2.3 EDevice Temperature Acquisition Test

Step 1: Device Connection Upper computer connects the device

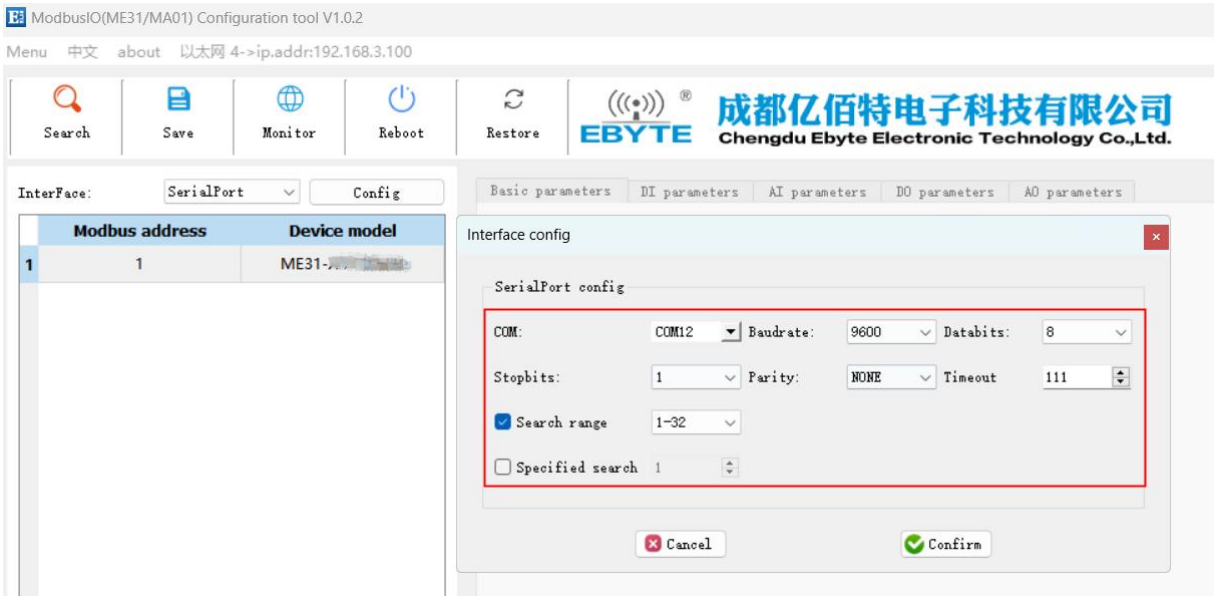
(1)You can configure the device by selecting the interface (serial/network); if you select the network port, you have to search the device after selecting the network card first.

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(2) If you select the serial port, select the corresponding serial port number, and the same baud rate, data bits, stop bits, parity bits and address segment search range as the device, and then search.



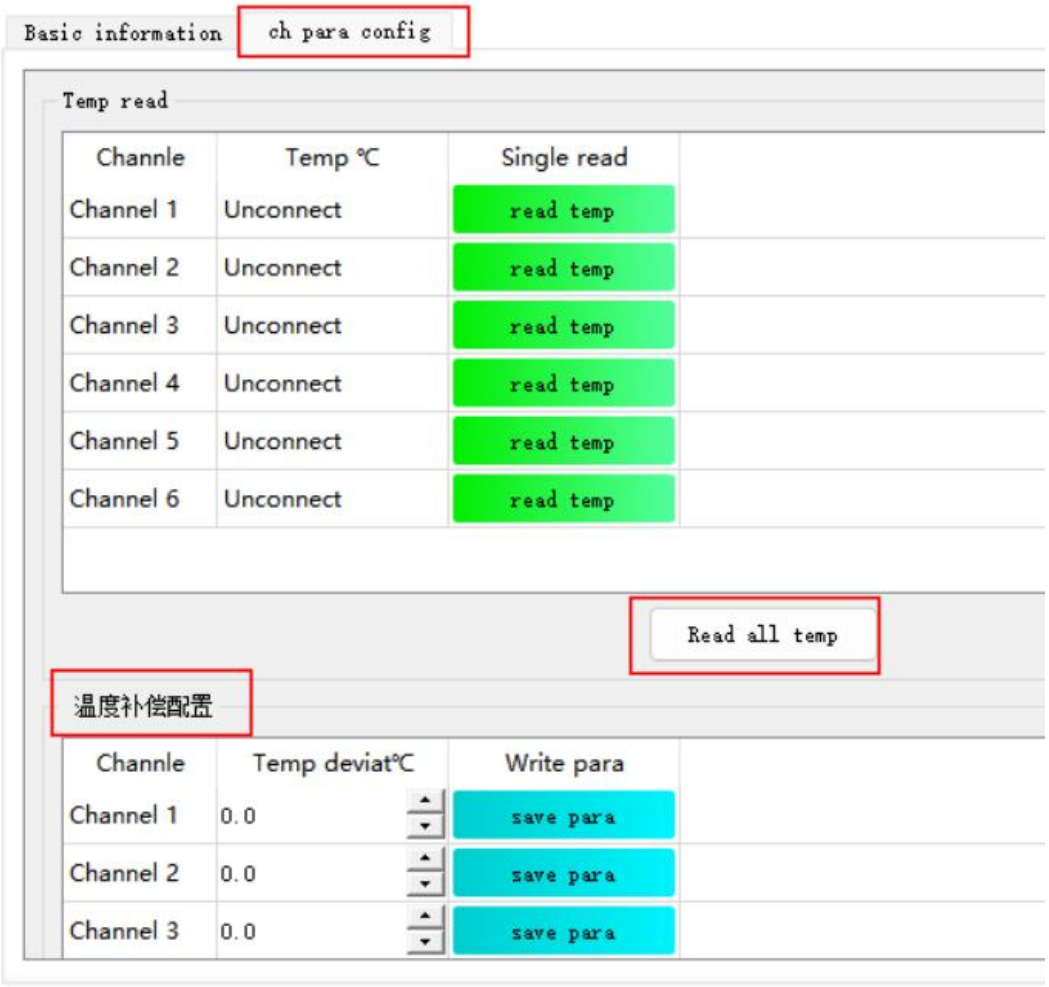
Step 2: Select the corresponding device



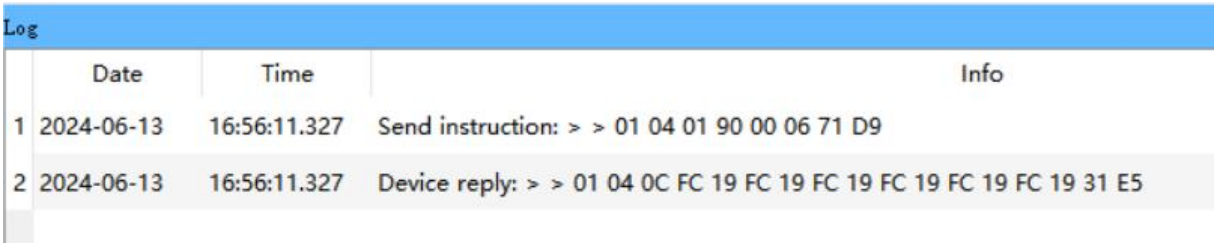
Step 3: Click on the channel parameter configuration, you can see all the temperature acquisition channels of this device,

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and then click on the read all the temperature, you can collect the temperature value on the channel; you can also set the temperature offset value of the channel in the configuration of temperature compensation, the specific use of details can be seen in the product function description



Note: Modbus commands can be viewed in the log area when clicking on Read All, Read, Configure, etc.



3. Technical indicators

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3.1 Specification parameters

categories	Name	parameters
power supply	Operating Voltage	DC8～28V
	Power indication	Blue LED indication
newsletter	Communication Interface	RJ45、RS485
	Baud rate	1200~115200bps（默认 9600）
	Protocol	Standard Modbus TCP, Modbus RTU protocols
MODBUS	Device Address	Modifiable by Modbus command, host computer, device keystroke
temperature acquisition	Number of circuits	6-Way
	Sensor Type	2-wire type K thermocouple temperature sensor
	Temperature Resolution	0.1℃
	Accuracy	Normal temperature (25±5℃) conditions: ±0.2%±2℃
	Acquisition frequency	Full-temperature (-40~85℃) condition: ±0.5%±2℃
	Acquisition Display	1Hz
other	Product Size	OLED screen display
	Product weight	121mm * 72mm * 34mm (L*W*H)
	Working temperature and humidity	140 ±5 g
	Installation	-40 ~ +85℃, 5% ~ 95%RH (no condensation)

3.2 Device default parameters

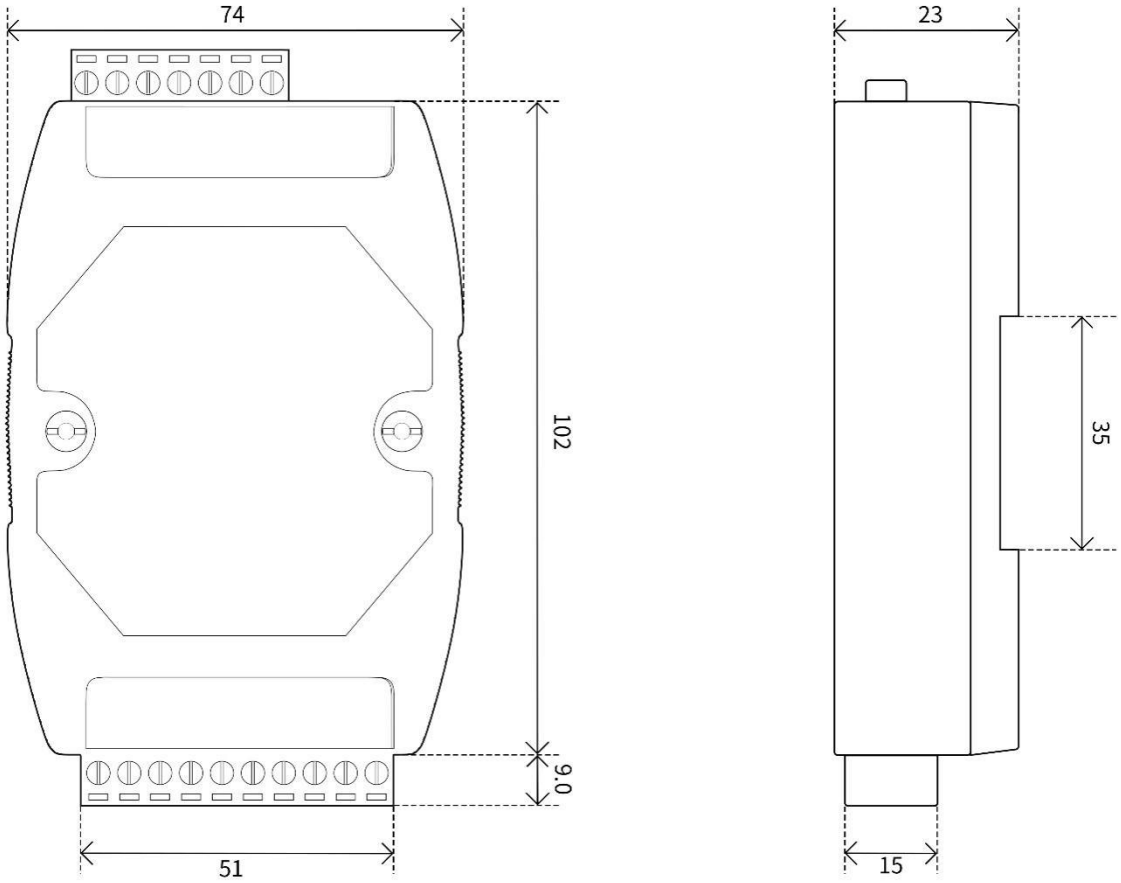
categories	Name	parameters
Ethernet parameters	Working Mode	TCP server (up to 4 client accesses)
	Local IP	192.168.3.7
	Local Port	502
	Subnet Mask	255.255.255.0
	Gateway Address	192.168.3.1
	DHCP	Shutdown
	Local MAC	Determined by chip (fixed)
	Destination IP	192.168.3.3
	Destination Port	502

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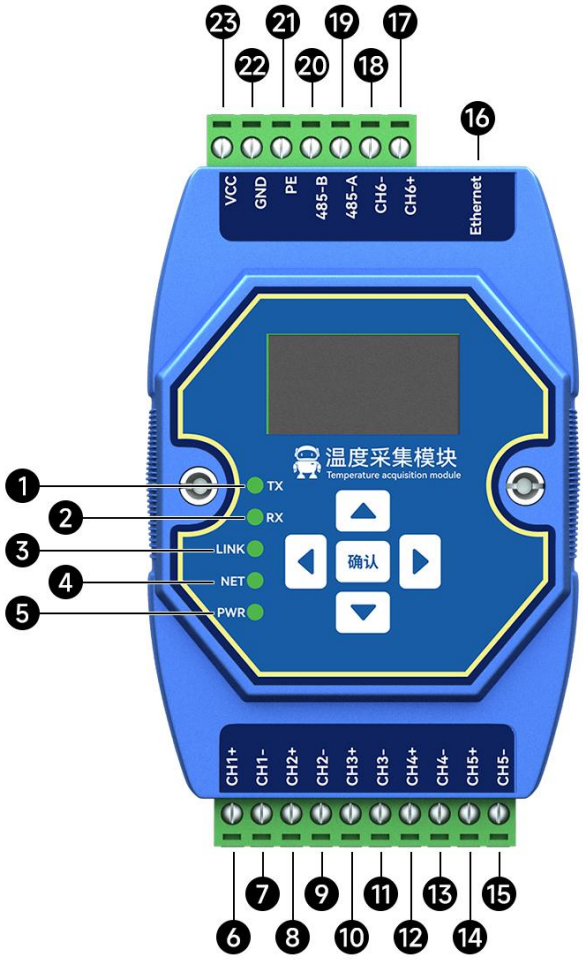
	DNS Server	114.114.114.114
	Active Upload	Shutdown
Serial Parameters	Baud rate	9600bps (8 types)
	Calibration Method	None
	Data Bit	8
	Stop Bit	1
MODBUS parameters	Modbus Master-Slave	Slave;
	Modbus master-slave	1

3.3 Mechanical dimensional drawings



3.4 Port and Indicator Description

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No.	Label Description	Label Description
1	TX（LED）	Serial Transmit Data Indicator
2	RX（LED）	Serial Receive Data Indicator
3	LINK（LED）	Network Connection Indicator
4	NET（LED）	Network data send/receive indicator
5	PWR（LED）	Power input indicator
6	CH1+	Thermocouple Positive Input, 5.08mm Phoenix Terminal.
7	CH1-	Type K thermocouple temperature acquisition channel 1, Type K thermocouple negative input, 5.08mm Phoenix terminals.
8	CH2+	2nd type K thermocouple temperature acquisition channel, type K thermocouple positive input, 5.08mm Phoenix terminal.
9	CH2-	2-way type K thermocouple temperature acquisition channel, type K thermocouple negative input, 5.08mm Phoenix terminals.
10	CH3+	3rd type K thermocouple temperature acquisition channel, type K thermocouple positive input, 5.08mm Phoenix terminal.
11	CH3-	3rd type K thermocouple temperature acquisition channel, type K thermocouple negative input, 5.08mm Phoenix terminals.

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12	CH4+	Type K thermocouple temperature acquisition channel 4, Type K thermocouple positive input, 5.08mm Phoenix terminals.
13	CH4-	4-way type K thermocouple temperature acquisition channel, type K thermocouple negative input, 5.08mm Phoenix terminals.
14	CH5+	Type K thermocouple temperature acquisition channel 5, Type K thermocouple positive input, 5.08mm Phoenix terminals.
15	CH5-	Type K thermocouple temperature acquisition channel 5, Type K thermocouple negative input, 5.08mm Phoenix terminals.
16	Ethernet	Ethernet interface, standard RJ45 connector.
17	CH6+	The 6th K-type thermocouple temperature acquisition channel, K-type thermocouple positive input, 5.08mm Phoenix terminal.
18	CH6-	The 6th K-type thermocouple temperature acquisition channel, K-type thermocouple negative input, 5.08mm phoenix terminal.
19	485-A	Serial port A is connected to external device A interface, 5.08mm Phoenix terminal.
20	485-B	Serial port B is connected to external device B interface, 5.08mm Phoenix terminal.
21	PE	Ground, 5.08mm Phoenix terminal.
22	V-	Negative power input, DC 8V~28V, 5.08mm Phoenix terminal.
23	V+	Power input positive, DC 8V~28V, 5.08mm Phoenix terminal.

4. Product Features

4.1 Temperature Acquisition

4.1.1.Type K thermocouple temperature acquisition

This product uses input registers to save the collected temperature value, the input registers are read-only registers, the value in each register is a 16-bit signed integer or floating point value, and a fixed one decimal point is used to indicate the actual collected temperature value. The sampling frequency is 1Hz.

4.1.2. Shaping values, floating point values for temperature acquisition

There are two ways to read the temperature value collected by the device:

(1) Read the temperature shaping value and convert the temperature value directly. The starting address of the temperature shaping value register is 0x0190, the register type is input register, and the read function code is 0x04. The value returned by this method is one register representing one channel. The method of calculating the temperature value is

-2000~13500 corresponds to -200~1350℃.

Temperature value = Reading value / 10 ℃.

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Note: Temperature data is uploaded as complementary code when the temperature is lower than 0℃.
Temperature: 0xFFCE = -50 → Temperature = -5.0 °C

(2) Read the temperature floating-point value and use the IEE754 conversion tool to convert the hexadecimal data to floating-point number to get the input temperature. Temperature floating point value register start address is 0x01C2, register type is input register, read function code is 0x04. This method returns two registers to represent one channel.

4.2 Temperature offset values

Temperature value = actual temperature acquisition value + temperature offset value.
The register type of the temperature offset value is a holding register with address 0x2328; the value stored in the register divided by 10 is the temperature offset value (e.g., if the value in the register is 85, then the temperature offset is 8.5°C).
Temperature offset value range: -10.0~10.0℃ (-100~100) (accurate to one decimal point).

4.3 Modbus Gateway

The device can transmit non-native Modbus commands from the network/serial port to the serial port/network, and native Modbus commands are executed directly.

4.3.1.Modbus TCP/RTU protocol conversion

When turned on, Modbus TCP data on the network side is converted to Modbus RTU data.

4.3.2.Modbus Address Filtering

This function enables bidirectional protocol conversion between the specified Modbus address and RS485 via the network only.
A parameter of 0 transmits the data, a parameter of 1-255 passes only the data of the set slave address.

4.3.3.Modbus TCP Protocol Data Frame Description

TCP frame format:

transaction identification	protocol identifier	lengths	device address	function code	starting address	data segment
2 Byte	2 Byte	N+2 Byte	1 Byte	1 Byte	2 Byte	N Byte

Transaction Processing Identifier: It can be understood as the sequence number of the message, and generally 1 should be added after each communication to distinguish different communication data messages.

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protocol identifier: 00 00 means Modbus TCP protocol.

Length: indicates the length of the next data in bytes.

Example: Getting Temperature Data Getting Temperature Data

00 00	00 00	00 06	01	04	01 90	00 01
transaction identification	protocol identifier	lengths	device address	function code	Starting address	Number of channels

4.3.4.Modbus RTU Protocol Data Frame Description

RTU frame format:

device address	function code	data segment	Check digit CRC
1 Byte	1 Byte	N Byte	2 Byte

Example: Getting temperature data

01	04	01 90 00 04	F0 18
Device Modbus Address	function code	data segment	CRC check digit

4.4 Active upload

The device supports the function of uploading the collected temperature according to a fixed time interval. Setting the value of the corresponding register can control the interval time and whether to upload or not.

If the value is set to 0, the uploading is closed, and if the value is set to other positive integer value N (the configuration period is 1-65535), the uploading will be carried out according to the time interval of N seconds.

[Note] The device is only valid if it is configured in client mode, and a non-zero register value turns on active uploading.

4.5 Customizing Module Information

4.5.1Modbus address

The device address defaults to 1 and supports modification of the address, which ranges from 1 to 247.

4.5.2.Module name

Users can configure the device name for differentiation according to their needs, supporting English, numeric format, up to 20 bytes.

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4.5.3.Network parameters

Without special instructions: the following network-related parameters default to IPV4-related parameters.

(1)MAC of the device: user can get it by reading the specified register, this parameter is not writable.
(2) IP address: device IP address, readable and writable.
(3)Modbus TCP Port: the port number of the device, readable and writable.
(4)Subnet Mask: address mask, readable and writable.
(5)Gateway Address: gateway.
(6)DHCP: Set how the device gets IP: static (0), dynamic (1).
(7)Target IP: the target IP or domain name for the device to connect to when the device is working with client mode.
(8) Target Port: When the device works with client mode, the target port that the device connects to.
(9)DNS Server: when the device is working with client mode, resolve the server domain name.
(10)Module working mode: switch the working mode of the module. Server: the device is equivalent to a server, waiting for the user's client to connect, the maximum number of connections is 4. Client: the device actively connects to the target IP and port set by the user.
(11)Active upload: when this parameter is not 0 and the device is in client mode, the collected temperature value will be uploaded according to the configured time period.

4.5.4.Serial port parameters

Used to set parameters for serial port communication:
Default parameters:
Baud rate:9600(03);
Data Bit:8bit.
Stop bit:1bit.
Parity bit:NONE(00).
(1) Baud rate:

baud rate code value table	
0x0000	1200
0x0001	2400
0x0002	4800
0x0003（默认）	9600
0x0004	19200
0x0005	38400
0x0006	57600
0x0007	115200

(2) check digit:

check digit	
0x0000(默认)	NONE
0x0001	ODD
0x0002	EVEN

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4.6 OLED display and key parameterization

The display screen contains the information display page (all channel temperature values) and the parameter setting page (some parameters).

4.6.1.Information display screen

Contains all channel temperature value display pages.
When the channel in the screen displays ----, it indicates that the type K thermocouple sensor for the changed channel is not connected or the wiring is faulty.

4.6.2.Device parameter display interface

Press the left button or right button, will enter the password input interface, complete the correct password input, will display the device parameters information interface (password interface: the default password: 0000; short press the middle of the check password (if the password is wrong will be reported to the wrong prompt, and need to re-enter the password interface), left and right buttons to switch the password bit, up and down buttons to switch the current bit of the value of the password is a total of 4 digits, each input range of 0-9 numbers):: the password is a total of 4 digits, each input range of 0-9 digits): the password is a total of 4 digits. (Each digit is a number in the range of 0-9):
Parameter display interface from top to bottom are:
1. Modbus address;
2. Baud rate;
3. Data bits;
4. parity bit;
5. stop bit;
6. CH1 temperature offset value;
7. CH2 temperature offset value;
8.CH3 temperature offset value;
9.CH4 temperature offset value;
10.CH5 temperature offset value;
11.CH6 temperature offset value;
12. local port;
13. local IP address;
14. network mode;
15.gateway;
16.subnet mask;
17.DNS;
18.MAC address;

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19.DHCP;
20.target IP;
21.target port;
22.Modbus TCP/RTU protocol conversion;
23.Active upload;
24.Modbus address filtering;

After successfully entering the parameter display interface, if you want to exit this interface, press the left or right button.

4.6.3.Device Parameter Configuration Screen

To enter the parameter configuration interface, you need to long press the confirmation key, will enter the password input interface, after completing the correct password input, you will enter the parameter configuration interface (password interface: default password: 0000; short press the center check password, left and right buttons to switch the password bit, up and down buttons to switch the value of the current bit, the password is a total of 4 digits, each input range of 0-9 digits).
Select setting item: short press up and down key to switch setting item after entering parameter configuration page;
Selected setup item: short press confirmation or right key, setup item gets the cursor on behalf of selected and enter the setup item;
Adjust the parameter value: after selecting the setting item, up and down keys can change the value or optional value; left and right keys move the cursor within the parameter item;
Determine the parameter value: after adjusting the parameter value, press the confirmation key to exit the current setup item (after parameter modification, you need to save and restart to take effect).
Save parameter setting and reboot: after setting the parameter, move the cursor to save and reboot, and then press the confirmation key briefly to enter the state of confirming save and reboot, press the confirmation key briefly (pressing other keys will exit the confirming state) to save the parameter and reboot the device.
Exit without saving parameters: move the cursor to Exit, then press the Confirm key briefly to enter the state of confirming to exit, press the Confirm key briefly (press other keys to exit the confirm state), you can exit the parameter configuration interface, and the parameters will not be saved.
Among them, data bits, stop bits can not be set, after turning on the DHCP mode, the local IP address, gateway, subnet mask can not be configured only assigned by the router;
Parameter configuration interface from top to bottom are:
1. Modbus address;
2. Network working mode;
3. Dynamic IP;
4. local IP address;
5. local port;
6. subnet mask;
7. gateway address;
8.DNS;
9. destination IP address;
10. target port;
11. serial port baud rate;

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12. serial port parity bit;
13. Modbus protocol conversion;
14. Modbus address filtering;
15.Automatic upload;
16.CH1 temperature offset value;
17. CH2 temperature offset value;
18.CH3 temperature offset value;
19.CH4 temperature offset value;
20.CH5 temperature offset values;
21.CH6 temperature offset values;
22. language;
23. screen hibernation;
24.password;
25.Restore factory;
26.save and reboot;
27.Exit;

4.6.4.Screen Hibernation

The screen of the device has a hibernation function, which is closed by default, and can be set to open in the parameter configuration interface of the device.
Under any interface, the screen will enter the hibernation mode after 180 seconds of no key operation, at this time the interface shows the Xiaoyi robot, press any key to exit the hibernation mode.

4.7 Sensor Not Accessed Recognition

The device supports sensor connection status detection. When no sensor is connected, the channel of the screen will display ---- and the value stored in the register is 0xFC19 (corresponding to the signed integer -999).

5. MODBUS Parameter Configuration

5.1 Temperature Value Register List

register function	register address	Register Type	number of individuals	manipulate	Data range/remarks	Related Function Codes
Temperature Integer Values	0x0190	Input Registers	6	R	6-bit Integer	R：0x04

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Temperature floating point values	0x01C2	Input Registers	12	R	32-bit Floating Point	R：0x04
Temperature Offset Shaping Value	0x2328	Holding Register	6	RW	16-bit Integer	R：0x03 W：0x06、0x10

5.2 Module Related Registers

Register Function	register address	Register Type	number of individuals	manipulate	Data Range/Remarks	Related Function Codes
Module Address	0x07E8	Holding Register	1	RW	Modbus address.	R：0x03 W：0x06
Module Model	0x07D0	Holding Register	12	R	1 to 247 configurable address	R：0x03
Firmware Version	0x07DC	Holding Register	1	R	Get current model number	R：0x03
Module Name	0x07DE	Holding Register	10	RW	Get firmware version number	R：0x03 W：0x10
Module Reboot	0x07EA	Holding Register	1	W	Customize module name	W：0x06
Restore Factory Parameters	0x07E9	Holding Registers	1	W	Write any value to reboot	W：0x06
Baud Rate	0x0834	Holding Registers	1	RW	Write random value to restore factory parameters	R：0x03 W：0x06、0x10
Serial Check Digit	0x0836	Holding Registers	1	RW	See baud rate code table.	R：0x03 W：0x06、0x10

5.3 Network Related Registers

Register Function	register address	Register Type	number of individuals	manipulate	Data Range/Remarks	相关功能码
Module MAC Address	0x0898	Holding Register	3	R	MAC parameters of the device	R：0x03
Local IP Address	0x089B	Holding Register	2	RW	Default: 192.168.3.7	R：0x03 W：0x06、0x10

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Local Port	0x089D	Holding Register	1	RW	1 ~ 65535, default: 502	R：0x03 W：0x06、0x10
Subnet Mask Address	0x089E	Holding Register	2	RW	Default: 255.255.255.0	R：0x03 W：0x06、0x10
Gateway address	0x08A0	Holding Register	2	RW	Default: 192.168.3.1	R：0x03 W：0x06、0x10
DHCP Mode Setting	0x08A2	Holding Registers	1	RW	0x0000 Static IP (default) 0x0001 Automatic IP acquisition	R：0x03 W：0x06、0x10
Destination IP/Domain Name	0x08A3	Holding Registers	64	RW	IP/Domain name in string format Default IP: 192.168.3.3	R：0x03 W：0x06、0x10
Server Port	0x08E3	Holding Registers	1	RW	0-65535, default 502	R：0x03 W：0x06、0x10
DNS server IP address	0x08E4	Holding Registers	2	RW	Default 8.8.8.8	R：0x03 W：0x06、0x10
Module working mode	0x08E6	Holding Registers	1	RW	0x0000 Server Mode 0x0001 Client Mode	R：0x03 W：0x06、0x10
Active upload	0x08E7	Holding Registers	1	RW	0x0000 disabled, others: 1 to 65535s cycle send	R：0x03 W：0x06、0x10
MOSBUS TCP/RTU	0x08E8	Holding Registers	1	RW	0,off,1 turn on protocol switching	R：0x03 W：0x06、0x10
Conversion Enable	0x08E9	Holding Registers	1	RW	0: pass-through, 1-255:Non-native data when checking the slave address of the command instruction, when it is a set value you can pass the	R：0x03 W：0x06、0x10

5.4 Example of Modbus Command Operation Description

5.4.1.Modbus RTU acquisition

1. Read the temperature value of the 1st channel of the device address 0x01

Example:

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01	04	01 90	00 01	30 1B
Modbus address	function code	register first address	Read the temperature value of the 1st channel	CRC check digit

After sending the above command to the device over the 485 bus, the device will return the following values (e.g. the temperature is read as 30.0°C):

01	0	02	01 2C	B9 7D
Modbus address	function code	Number of bytes of data	Returned temperature value data	CRC check digit

Additional functions can be tested with the commands in the table below:

Function (function code)	directives
Read 1st way temperature (0x04)	01 04 01 90 00 01 30 1B
Read 1~6 way temperature (0x04)	01 04 01 90 00 06 71 D9

Notes:

The input registers read for the demo case are engineering quantities (16-bit integer values, 32-bit floating point values can also be obtained by reading the 0x01C2 register).

The actual temperature value captured is obtained by converting the value read from the input register to decimal and dividing by 10.

5.4.2.Modbus TCP Acquisition

1. Read the temperature value of the 1st channel of the device address 0x01

Example:

00 00	00 00	00 06	01	04	01 90	00 01
transaction identification	protocol identifier	lengths	device address	function code	starting address	Number of channels

After sending the above commands to the device over the Ethernet bus, the device will return the following values (e.g. reads a temperature of 30.0°C):

00 00	00 00	00 05	01	04	02	01 2C
transaction identification	protocol identifier	lengths	device address	function code	data length	digital

Additional functions can be tested with the commands in the table below.

Function (function code)	directives
Read 1st way temperature (0x04)	00 00 00 00 00 06 01 04 01 90 00 01
Read 1~4 way temperature (0x04)	00 00 00 00 00 06 01 04 01 90 00 06

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Notes:

The input registers read for the demo case are engineering quantities (16-bit integer values, 32-bit floating point values can also be obtained by reading the 0x01C2 register).

The actual temperature value captured is obtained by converting the value read from the input register to decimal and dividing by 10.

6. Quick Start with the Upper Unit

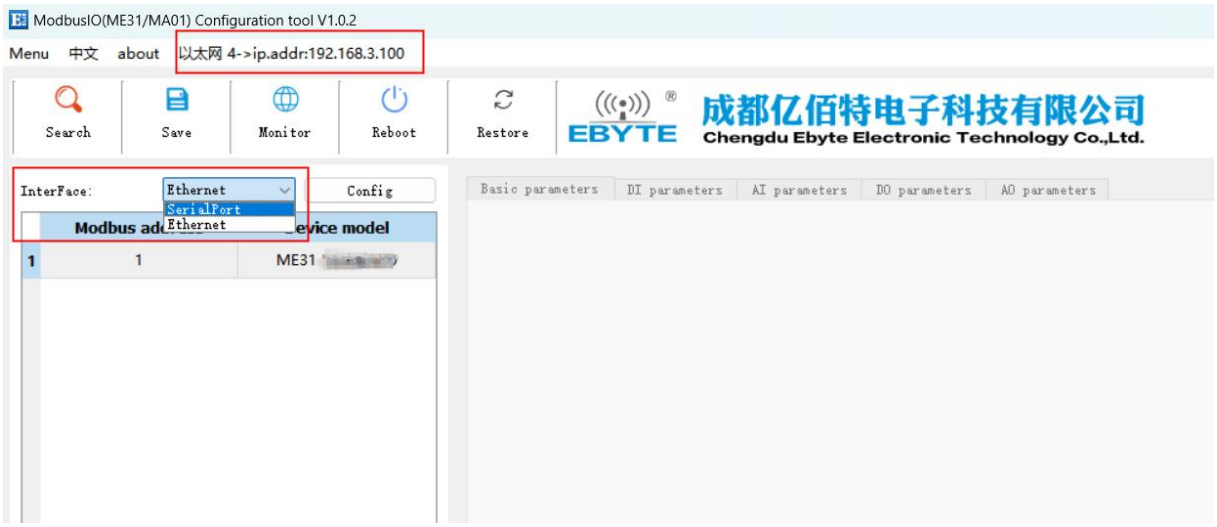
The upper computer can be downloaded from the corresponding device model in the official website, official website link: https://www.ebyte.com/product-class.aspx

Configuration tool software is driver-free installation, directly double-click the .exe file to open and use.

6.1 Temperature acquisition and monitoring

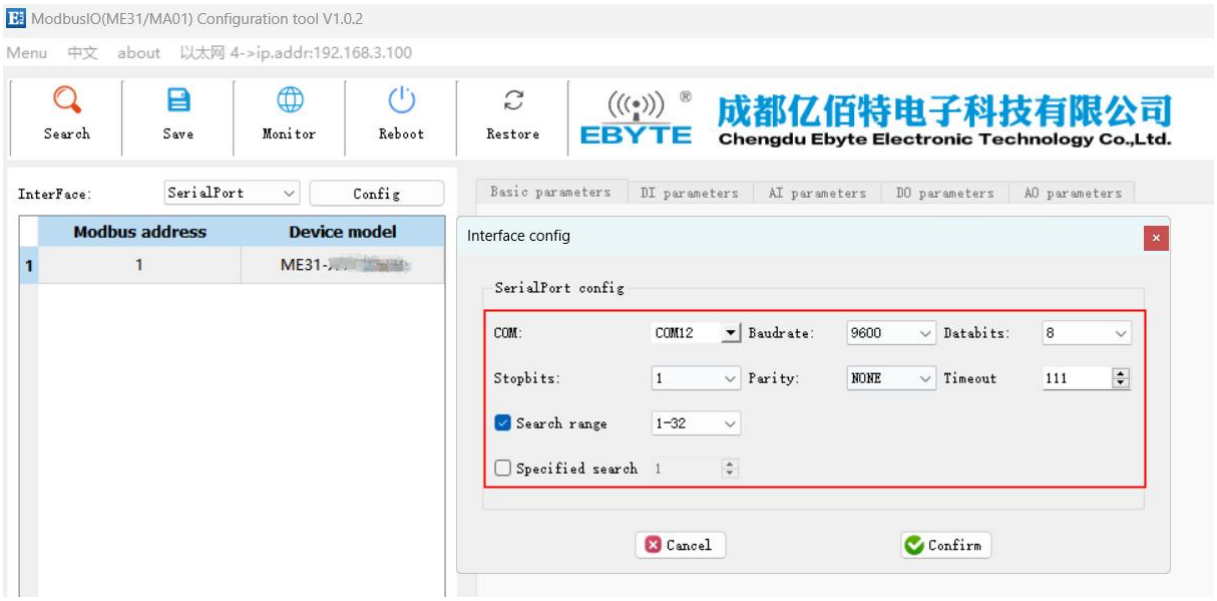
Step 1: The host computer connects to the device

(1) You can configure the device by selecting the interface (serial/network); if you select the network interface, you have to search for the device after selecting the network card first.



(2) If you select the serial port, select the corresponding serial port number, and the same baud rate, data bits, stop bits, parity bits and address segment search range as the device, and then search.

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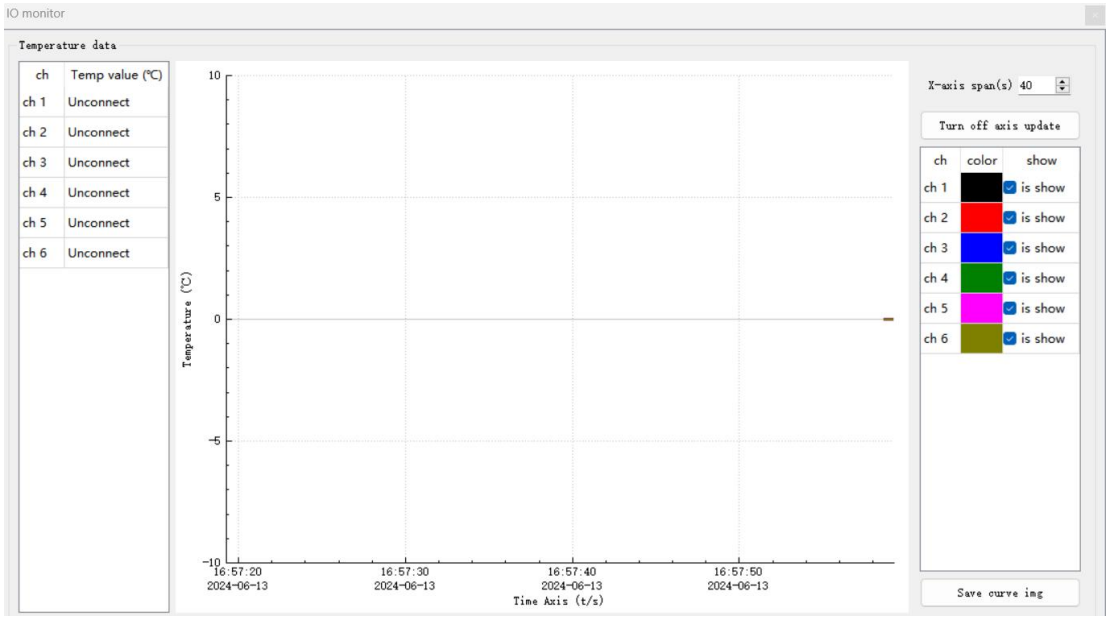
Step 1: Select the corresponding device



Step 2: Click on the device online, you can enter the temperature value collection and monitoring, the following is the collection of temperature screen display

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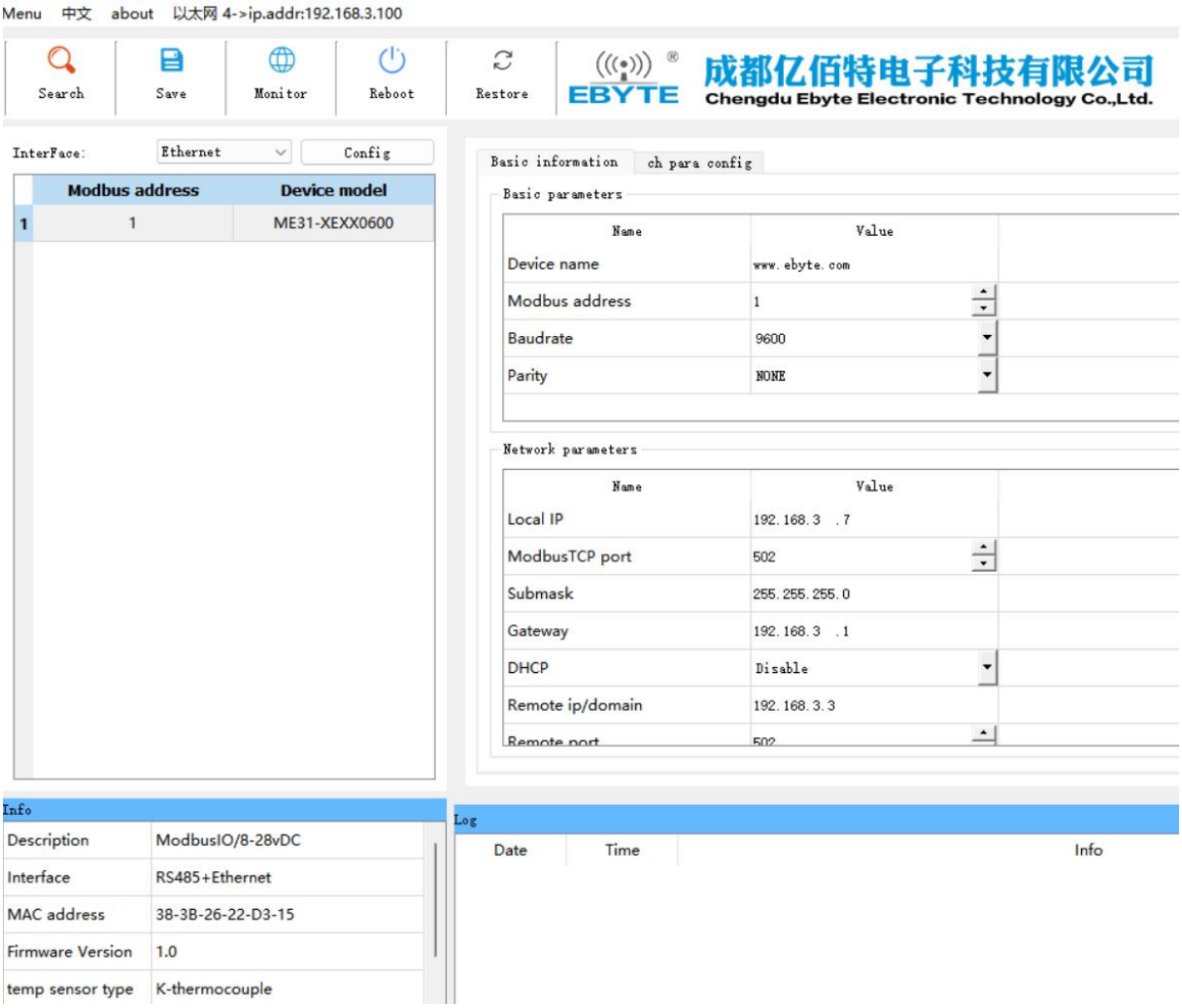
6.2 Parameter Configuration Interface

Step 1: Connect the device and refer to "Temperature Acquisition".

Step 2: You can configure device parameters, network parameters, temperature offset value parameters.

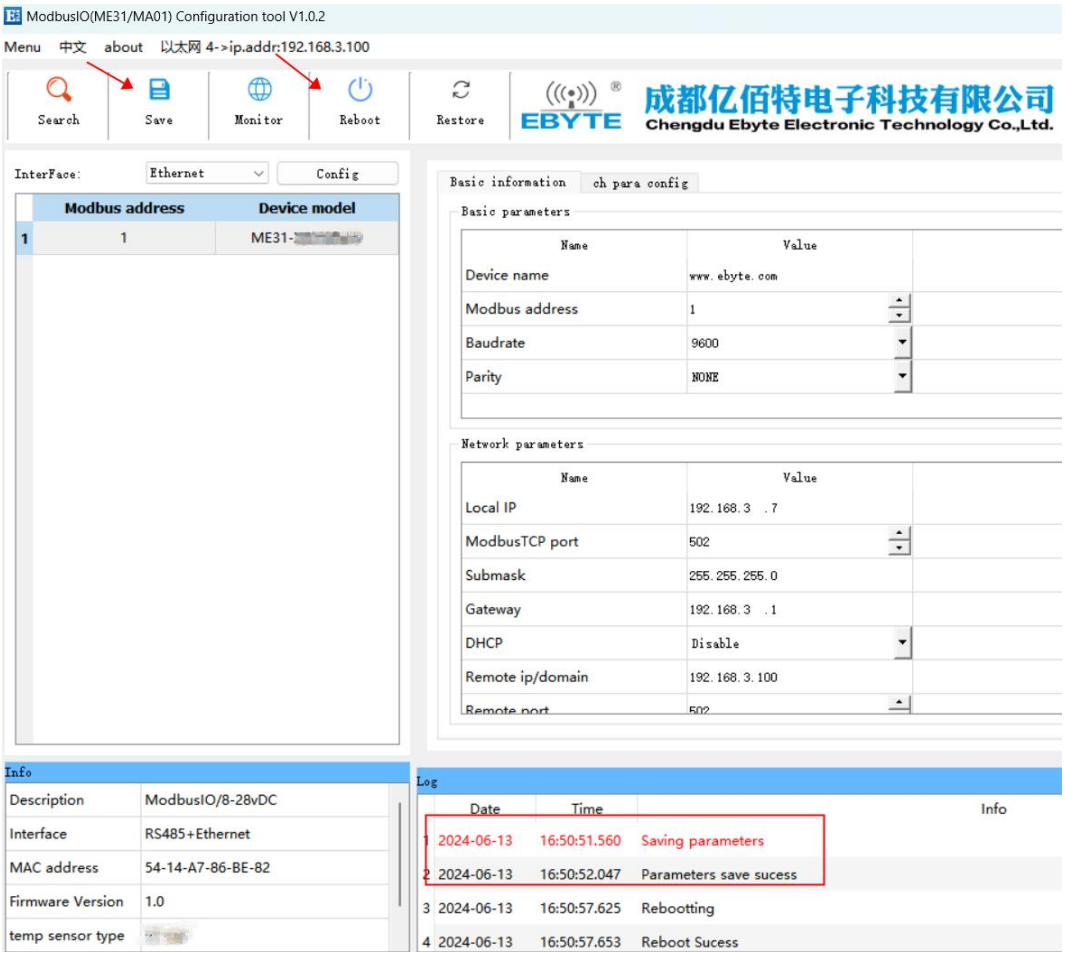
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Step 3: After you have configured the parameters, click Download Parameters, and after you see the message in the log output that the parameters are saved successfully, click Reboot Device, and after the device reboot is completed, the modified parameters will take effect.

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Revision history

Versions	Revision Date	Revision Notes	Maintaining people
1.0	2023-4-15	Initial Version	LT

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