User Manual for TMB Series Temperature Control Equipment

V1.01

Update record of specification			
Date	Edition	Update content	Remarks
2025-04-10	V1.00	Initial version	
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If you encounter any difficulties or technical issues while using our modular temperature control system, please feel free to contact us. We will provide you with the most satisfactory and prompt technical support. We also welcome your valuable feedback.

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Blue Guardian Temperature Control: Precise Temperature Regulation

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pay attention to

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scope of application

This instruction manual is applicable to the use of the modular temperature control equipment (TMB\TEB\TEU\TEN\TEC\TES) product.

Catalogue

Preface

Company Profile

Guangzhou Blue Guardian is a high-tech enterprise specializing in industrial temperature control, automation control, and information system integration. It provides precise temperature control, environmental monitoring, and industrial data interconnection solutions for industries such as optoelectronic manufacturing, semiconductors, thermal equipment, new energy, rubber and plastics, and research institutions.

With the mission of 'Smart Temperature Control for More Efficient and Safe Industries', the company provides customers with a series of temperature control products featuring high-precision data acquisition and intelligent control algorithms. These include modular thermostats, TEC thermostats, integrated thermostats, power regulators, I/O acquisition modules, protocol gateways, and host computer software platforms.

unit type

Device name	Model	Remarks
Combined temperature control equipment	TMB\TEB\TEU\TEN\TEC\TES	

Suitable Object

Applicable to: R&D engineers, technical support engineers, and end users

Brief Introduction of the Content

This document describes the use of temperature control module equipment.

Chapters and sections	Content	Remarks
1 Device Features	Introduce the overall function and performance index parameters of the equipment	
2 Device installation and connection	Introduction to Equipment Installation and Wiring Marking	
3 Device Application and Debugging	Introduction to Network and Debugging Equipment of Device Application	
4 Common faults	Introduction to Common Equipment Faults and Troubleshooting	
5 Maintenance	Introduce the maintenance of the equipment	
6 safety requirements	Safety tips for device use	

1 Device Features

About this chapter

Chapters and sections	Content	Remarks
1.1 Device Overview	Display device basic information	
1.2 demonstration of the type	Introduce the device model and combination usage instructions	
1.3 Device Features	Introduce the basic features of the device	
1.4 Temperature Modulation Block (TMB) parameters	Introducing the detailed parameters of the temperature control module TMB	
1.5 TEB parameters	Display detailed parameters of the output module TEB	
1.6 TEU parameters	Display TEU output module details	
1.7 TEN parameters	Introducing the detailed parameters of the temperature control module TEN	
1.8 Temperature Acquisition Module (TEC) parameters	Introducing the detailed parameters of temperature control module TEC	
1.9 Serial acquisition module (TES) parameters	Introduction to Serial Module TES Detailed Parameters	

1.1 Device Overview

The combination temperature control equipment is a multi-channel control output and temperature acquisition temperature control equipment which can be expanded by modules.

64 The system features DO/AO control outputs, 64-channel temperature monitoring, and 192-channel inspection data acquisition. It is equipped with 2 RJ45 Ethernet ports and supports AC/DC power conversion.

Function change. The device uses the Modbus TCP&RTU protocol for communication.

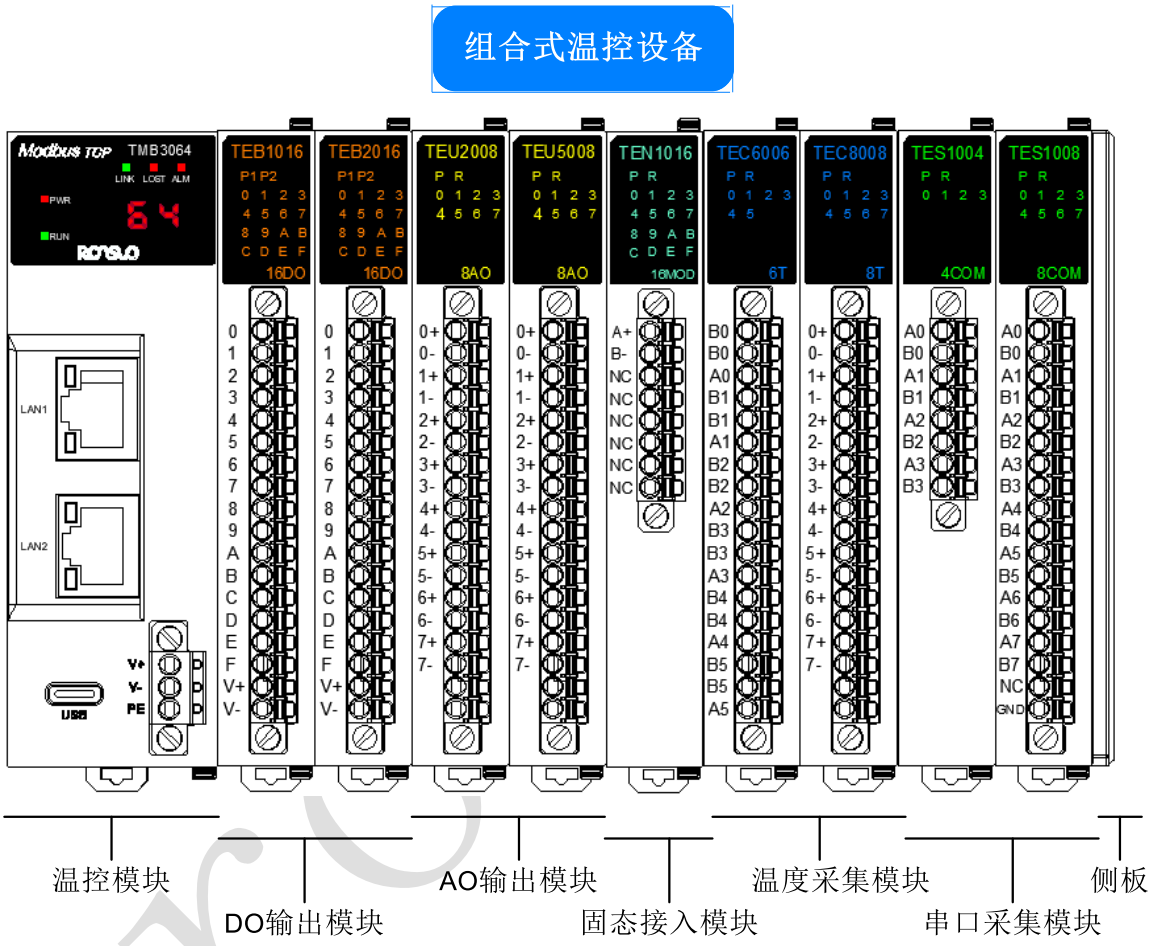
The temperature control module features a display screen that shows the number of temperature control channels and alarm codes. The device ensures precise and stable temperature control.

Characterized by excellent performance, strong interference resistance, and multi-level over-temperature protection. The output is stopped when the control temperature exceeds the over-temperature alarm threshold, and the output is stopped when the control temperature exceeds the upper limit alarm threshold.

By disabling functions like output, it can effectively protect the safety of controlled items.

1.2 Demonstration of the Type

The modular temperature control system consists of a temperature control module (TMB), output expansion modules (DO/TEB/AO/TEU), a regulator access module (TEN), a temperature acquisition module (TEC), and a serial acquisition module (TES).**When used in combination, the TEB/TEU/TEN modules must be directly connected to the TMB host unit**. The system configuration model is illustrated in the figure below:



Device model list:

Order number	class	Name	Model	Explain
1	Temperature control Main engine	Temperature cont-rol module	TMB3064	Scalable TEB/TEU/TEC/TES with up to 64 output channels and Ethernet communication
2	DO module	Output expansion module	TEB1016	16 NPN output expansion module for use with TMB
3		Output expansion module	TEB2016	16 The PNP output expansion module is designed to work with TMB.
4	AO module	Output expansion module	TEU2008	8 AO output expansion module, 0~10V, compatible with TMB
5		Output expansion module	TEU5008	8 AO output expansion module, 4~20mA, compatible with TMB

6	Solid state pass	Regulator	TEN1016	The regulator's access module supports 16 SxA or SUD power regulators via the 485 bus.

	Signal module	Access module		Section module, compatible with TMB
			TEN2064	The regulator access module supports connecting 8 SSA1008 power regulation modules in series via an RJ45 interface, designed for use with TMB.
7	Gather Module	Temperature Collection Module	TEC6006	6 The PT100 acquisition module, available in 3-wire or 2-wire configurations, is designed for use with TMB.
8		Temperature Collection Module	TEC8008	8 K/T type acquisition module, compatible with TMB
9	Serial module	Serial data acquisition module	TES1008	8 Serial port acquisition module, connected to the acquisition board and used in conjunction with TMB
10		Serial data acquisition module	TES1004	4 The serial port acquisition module connects to the acquisition board and works with the TMB.

1.3 Device Features

1.3.1 Industrial Design

- High performance industrial 32-bit processor
- Supports long-term stable operation at-20 to 85°C
- High-temperature resistant, flame-retardant injection-molded casing

1.3.2 Reliability and Stability

- With a watchdog design, the system ensures long-term stable operation
- Implement comprehensive protective mechanisms to ensure equipment stability
- Built-in surge protection for power supply and RS485 interface
- Input power interface anti-reverse connection protection
- DO/AO short-circuit protection function

1.3.3 Product Usability

- The equipment is installed with standard DIN35 guide rails and modular assembly.
- The device utilizes industrial-grade spring-type terminals (screw-free), facilitating easy installation.
- Supports plug-and-play without complex configuration
- The device has a display screen for on-site viewing
- The device supports the Modbu-RTU protocol.
- The device has a TYPE-C debugging interface for on-site debugging
- Supports unified configuration management for dedicated host software

1.3.4 Product Features

- Supports flexible modular combinations (TMB+TEB+TEU+TEN+TEC+TES) for versatile system integration
- Supports up to 64 control outputs (DO type: NPN or PNP; AO type: 0~10V or 4~20mA)
- The temperature control module supports 64 temperature control channels and 192 inspection channels.
- Supports the Modbus RTU standard protocol and function codes 01,03,05,06,15, and 16.
- The temperature control module supports RS485 bus communication (up to 16 units) with opto-isolated RS485 interface.
- All modules feature standard DIN35 rails for easy installation, with compact designs that minimize space requirements.
- The temperature control module supports open PID parameter settings, allowing independent configuration for each channel.
- multiple overtemperature protection mechanism
- Temperature control accuracy: ≤±0.5℃
- Power-off hold of configuration parameters

1.4 Temperature Modulation Block (TMB) Parameters

The TMB3064 temperature control module is compatible with TEB/TEU/TEN/TEC/TES modules, with detailed specifications as follows.

Technical Parameters of TMBxx64 Temperature Control Module		
Project		TMB3064
Module power supply	Mode of connection	3P-3.50 spring terminal
	Working voltage	24VDC（12~36V）
	Module dissipation	≤1W
	Power supply protection	Surge protection, static protection, anti-reverse connection protection
Modular communication	Interface type	Standard RJ45 interface
	Number of network ports	2 Supports Exchange
	Communicating protocol	Standard Modbus TCP/RTU protocol, supporting function codes 01,03,05,06,15, and 16
	Traffic rate	100M
	Network port parameters	Default IP:192. 168. 1. 21 Mask:255. 255. 255. 0
	Transmission distance	≤100m (Cat5 or higher network cable)
	Network port protection	Electrostatic protection
Combined application extension module	Extension Module	TEB/TEU/TEN/TEC/TES
	Maximum output channel	64 Road DO or AO output
	Extended Channel Type	(DNPN or PNP) AO (0~10V or 4~20mA)
	Extended acquisition channel	The temperature control module supports 64 temperature control channels and 192 inspection channels.
Design feature	Outer shell material	High temperature resistant flame retardant PC
	Way to install	Standard DIN35 guide rail installation
	Product size	Height 100mm*Width 34mm*Depth 71mm
Service environment	Working temperature	-20~85℃
	Storage temperature	-20~105℃

	Working humidity	10~95% (no condensation)

1.5 TEB Parameters

The output expansion modules (DO) are available in two variants: NPN and PNP. The TEB1016 supports 16 NPN-channel outputs, while the TEB2016 supports 16 PNP-channel outputs. The technical specifications for both models are detailed below.

TEBx016 Output Extension Module Technical Specifications			
Project		TEB1016	TEB2016
Module power supply	Mode of connection	18P-3.50 spring terminal, power input occupies 2P	
	Working voltage	24VDC (12~36V), external power input	
	Module dissipation	≤0. 1W	
	Power supply protection	Anti-inversion protection	
Outgoing channel	Interface type	18P-3.50 spring terminal, occupies 16P	
	Output channels	16 Road DO	
	Output type	NPN mould	PNP mould
	Drive current	≤60mA/ channel	
	Output protection	Short-circuit protection	
Usage mode	Combination Application	Use in combination with the TMB temperature control module	
Design feature	Shell material	High temperature resistant and flame retardant PC	
	Way to install	Standard DIN35 Guide Rail Installation	
	Product size	Height 100mm*width 15.6mm*depth 71mm	
Service environment	Working temperature	-20~85℃	
	Storage temperature	-20~105℃	
	Working humidity	10~95% (no condensation)	

1.6 TEU Parameters

The output expansion module AO is available in two variants (0~10V and 4~20mA). The TEU2008 supports 8-channel 0~10V outputs, while the TEU5008 supports 8-channel 4~20mA outputs. The technical specifications for both models are detailed below.

Technical Parameters of TEUx008 Output Extension Module			
Project		TEU2008	TEU5008
Module power supply	Mode of connection	18P-3.50 spring terminal, power input occupies 2P	
	Working voltage	24VDC (18~36V), external power input	
	Module dissipation	≤0. 2W	
	Power supply protection	Anti-inversion protection	
Outgoing channel	Interface type	18P-3.50 spring terminal, occupies 16P	
	Output channels	8 AO Road	
	Output type	0~10V	4~20mA
	Output loading	＞500Ω	＜600Ω
	Output protection	Short-circuit protection	
Usage mode	Combination Application	Use in combination with the TMB temperature control module	
Design feature	Shell material	High temperature resistant and flame retardant PC	
	Way to install	Standard DIN35 Guide Rail Installation	
	Product size	Height 100mm*width 15.6mm*depth 71mm	
Service environment	Working temperature	-20~85℃	
	Storage temperature	-20~105℃	
	Working humidity	10~95% (no condensation)	

1.7 TEN Parameters

The TEN1016 module can connect to two types of power regulation modules (SxA for DC-controlled AC solid-state and SUD for DC-controlled DC solid-state). TMB supports one TEN module and 16 SxA or SUD connections. TEN2064 supports 8 SSA1008 modules.

The power regulator and two TEN modules have the following detailed specifications:

Technical Parameters of TEN1016 Regulator Access Module			
Project		TEN1016	TEN2064
Module power supply	Mode of connection	TMB Host Power Supply Splicing	
	Module dissipation	≤0.3W	
External communication interface	Interface type	8P-3.50 Spring terminal	RJ45 network port
	Number of channels	1 Road	
	Communication port type	RS485	RJ45 (Private Communication Interface)
	Enable access	16 SxA or 8 SUDs	8 An SSA1008
	Communication cycle	≤100ms	
	Transmission distance	≤1000m	The bus length is ≤30m (TEN to end SSA)
	Isolation method	Photoelectric isolation	–
	Serial port protection	Surge protection and electrostatic protection	Electrostatic protection
Usage mode	Combined application	Use with TMB temperature control module	
Design feature	Shell material	High temperature resistant flame retardant PC	
	Way to install	Standard DIN35 guide rail installation	
	Product size	Height 100mm * Width 15.6 mm * Depth 71mm	Height 100mm*width 37.5 mm*depth 71mm
Service environment	Working temperature	-20~85℃	
	Storage temperature	-20~105℃	
	Working humidity	10~95% (no condensation)	

1.8 Temperature Emission Control (TEC) Parameters

The temperature acquisition module is available in two variants: PT100 and thermocouple. The TEC 6006 supports 6-channel PT100 temperature acquisition, while the TEC8008 accommodates 8-channel thermocouple temperature acquisition. The technical specifications of these two models are detailed below.

Technical specifications of the TECx00x temperature acquisition module			
Project		TEC6006	TEC8008
Module power supply	Mode of connection	TMB Host Power Supply	
	Module dissipation	≤0.2W	≤0.3W
Acquisition channel	Interface type	18P-3.50 Spring terminal	18P-3.50 spring terminal, occupies 16 P
	Channel number	6 Road	8 Road
	Sensor type	PT100 (2-wire/3-wire)	K/N/E/J/T thermocouple
	Temperature range	0~250℃	K/N/E/J type (0~650°C), T type (0~400°C)
	Temperature measurement accuracy	≤±0.5℃	≤±1.0℃
	Resolution ratio	0.01℃	
	Sampling period	≤100ms	
Usage mode	Combination Application	Use with TMB temperature control module	
Design feature	Shell material	High temperature resistant and flame retardant PC	
	Way to install	Standard DIN35 guide rail installation	
	Product size	Height 100mm*width 15.6mm*depth 71mm	
Service environment	Working temperature	-20~85℃	
	Storage temperature	-20~105℃	
	Working humidity	10~95% (no condensation)	

1.9 Serial Acquisition Module (TES) Parameters

The serial acquisition module is an RS485 serial port type. The TES1004 model supports 4-channel serial acquisition, while the TES1008 model supports 8-channel serial acquisition. The parameter specifications of these two models are as follows.

Technical Parameters of TES100x Serial Data Acquisition Module			
Project		TES1004	TES1008
Module power supply	Mode of connection	TMB host power supply	
	Module dissipation	≤0.5W	
485 joggle	Interface type	8P-3.50 Spring terminal	18P-3.50 spring terminal, occupies 16P
	Number of channels	4 Road	8 Road
	Number of acquisition channels	A single module can collect up to 64 temperature channels	
	Communication cycle	≤100ms	
	Serial port type	RS485	
	Enable access	Temperature collector	
	Mailing address	485 Interface communication address 0x01	
	Transmission distance	≤1000m	
	Isolation method	Photoelectric isolation	
	Serial port protection	Surge protection and electrostatic protection	
Usage mode	Combined Application	Use with TMB temperature control module	
Design feature	Shell material	High temperature resistant and flame retardant PC	
	Way to install	Standard DIN35 Guide Rail Installation	
	Product size	Height 100mm*width 15.6mm*depth 71mm	
Service environment	Working temperature	-20~85℃	
	Storage temperature	-20~105℃	
	Working humidity	10~95% (no condensation)	

2 Device Installation and Connection

About this chapter

Chapters and sections	Content	Remarks
2.1 Device appearance dimensions	Describe the device's dimensions	
2.2 equipment installation	Introduce the installation steps and precautions	
2.3 Device interface functions	Introduce the functions of each interface of the device	
2.4 Device wiring	Introduce the detailed wiring diagram of the equipment	

pay attention to ：

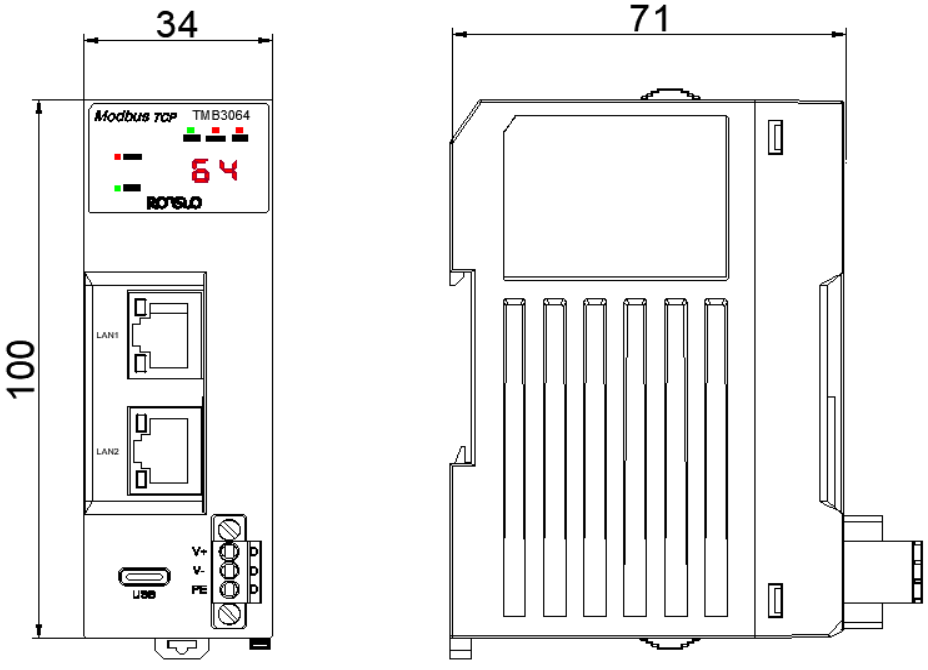
The modular temperature control system requires proper installation to achieve its designed functionality. Before installation, carefully read the user manual before proceeding. For any inquiries, please contact our company.

2.1 Device Appearance Dimensions

2.1.1 Temperature Control Module Dimensions

The temperature control module (TMBxx64) has the following dimensions, as shown in the figure below:

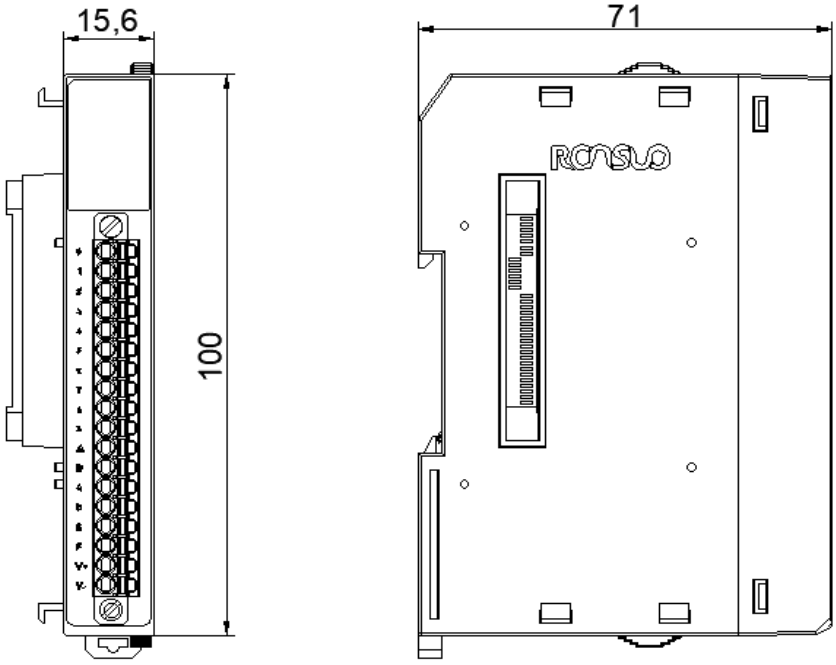
温控模块外观尺寸



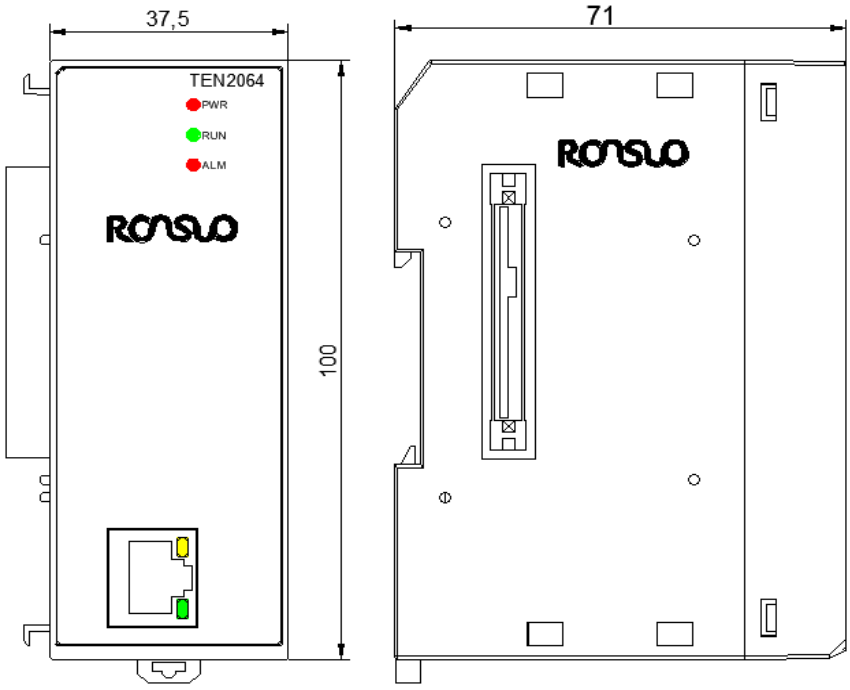
2.1.2 Extension Module Dimensions

The dimensions of the extended modules (TEB, TEU, TEN, TEC, and TES) and the TEN2064 are detailed in the figure below.

扩展模块外观尺寸



TEB/TEU/TEN1016/TEC/TES

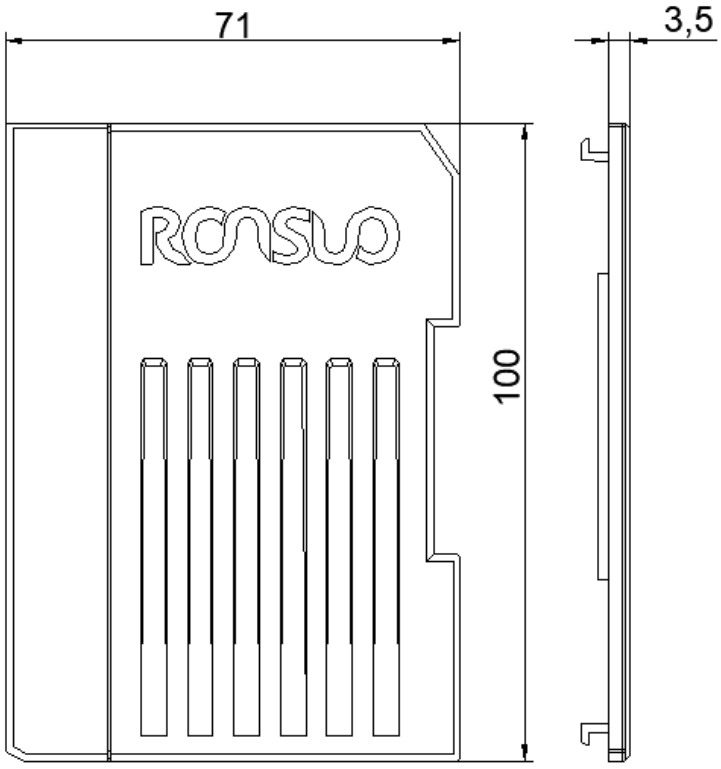


TEN2064

2.1.3 Side Panel Dimensions

The side panel of the modular temperature control system is installed at the terminal end of the unit, with detailed dimensions shown in the figure below.

侧板外观尺寸



2.2 Equipment Installation

2.2.1 Installation Requirements

1、 Installation Notes

All modular temperature control units utilize standard DIN35 rails for easy installation. These units must be installed in electrical cabinets equipped with rails, and the installation area should be kept ventilated and dry. When installed in electrical cabinets, the rails must be properly grounded, and the grounding terminal (PE terminal) on the front panel of the temperature control module must also be securely grounded.

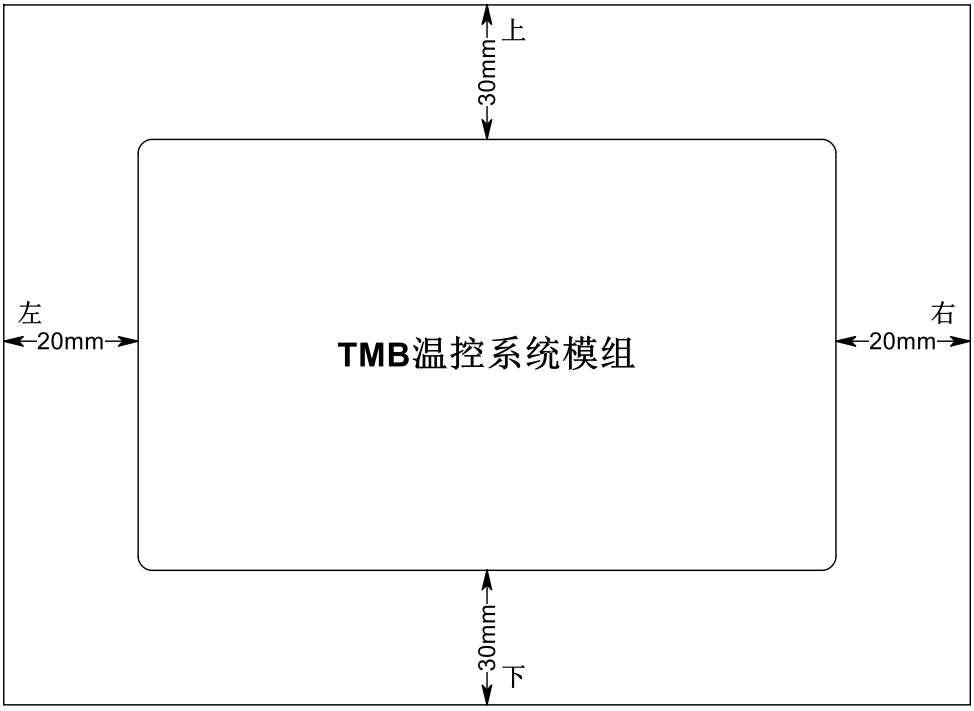
As a precision electronic device, the modular temperature control system must not be installed in areas with strong electromagnetic interference, humidity, or flammable/explosive environments to prevent unnecessary malfunctions or accidents.

The installation sequence for modular temperature control systems must follow one of these configurations: TMB+TEB+TEC/TES, TMB+TEU+TEC/TES, or TMB+TEN+TEC/TES. The TEB, TEU, and TEN1016 modules must be directly connected to the TMB host before connecting the TEC or TES modules. When combined with TEN2064, the TEN2064 module must be installed at the end of the system. For all expansion modules used with the TMB, the TEB, TEU, and TEN models must be paired exclusively with one type of TMB.

2、 Storage space requirements

When installing or removing modular temperature control devices, maintain a minimum operational clearance: at least 20mm between left and right sides, and at least 30mm between top and bottom. Refer to the diagram below for details.

设备安装空间要求


上
30mm
左
20mm
TMB温控系统模组
右
20mm
30mm
下

2.2.2 Device Module Installation

Install the assembled equipment module onto the DIN35 rail as shown in the following steps and diagrams.

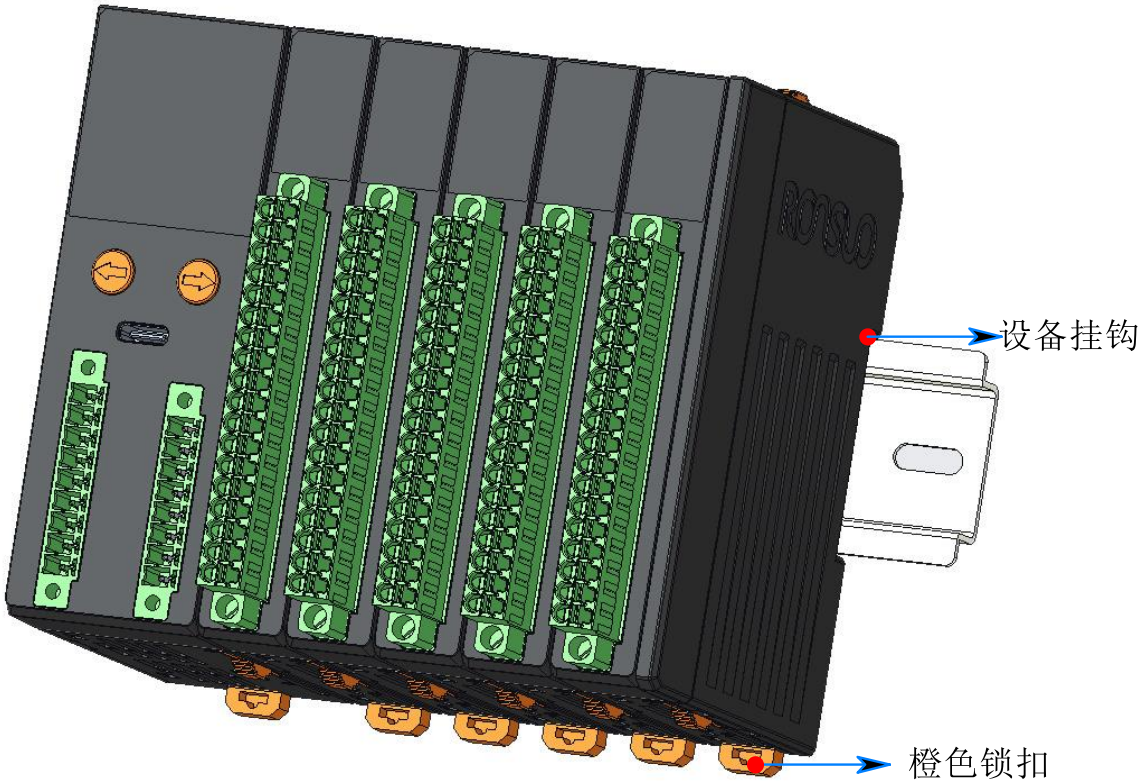
1、 Pull all the **orange clips** at the bottom of the device downward to release them;

2、 **Fix the assembly of the device hook** on the DIN35 guide rail;

3、 Pull the **orange buckle** at the bottom of the device upward to lock the device;

4、 The device is installed.

设备模组安装图



2.2.3 Add Module Installation

Add an expansion module (TEB, TEC, or TES) to the installed device, as shown below:

1、 Pull all the **orange clips** at the bottom of the module to be installed downward and release them;

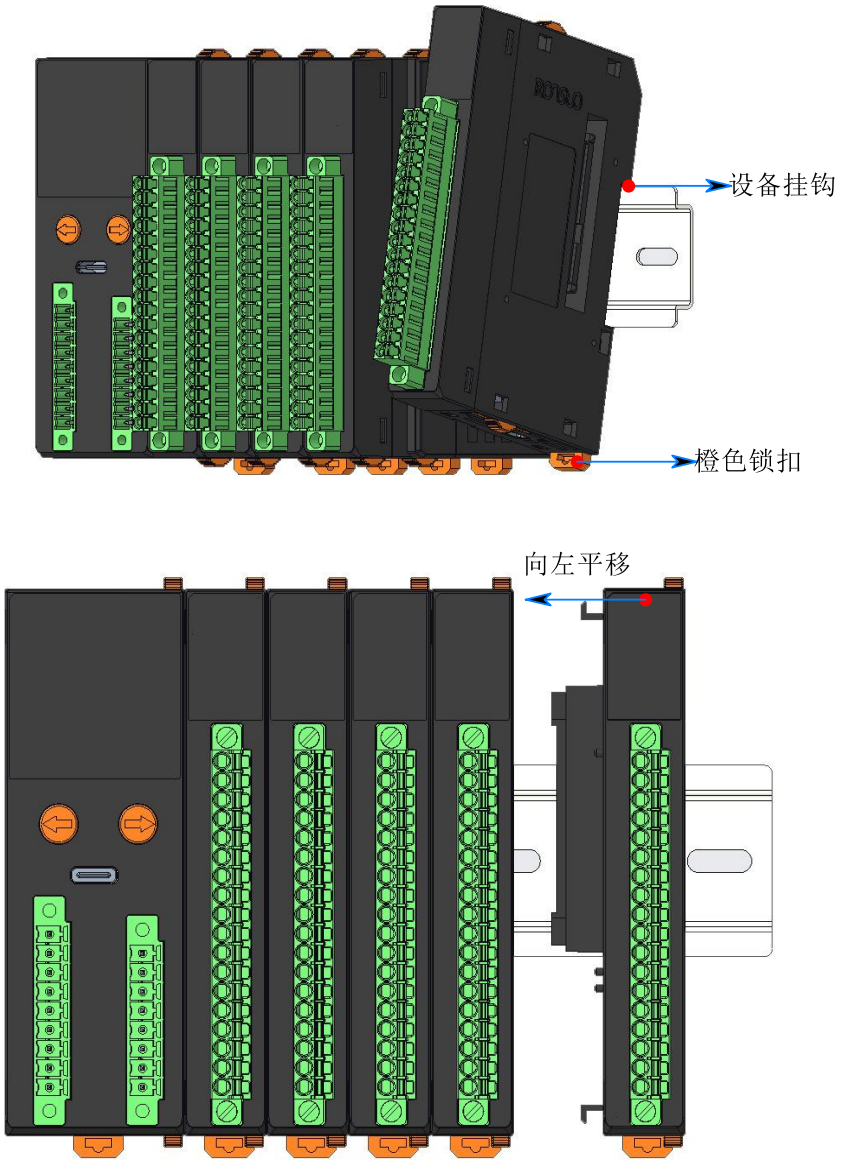
2、 **Hook the module** to the DIN35 rail;

3、 Then the module is **shifted to the left** to combine the left module into one;

4、 Then pull the **orange buckle** at the bottom of the module upward to lock the equipment;

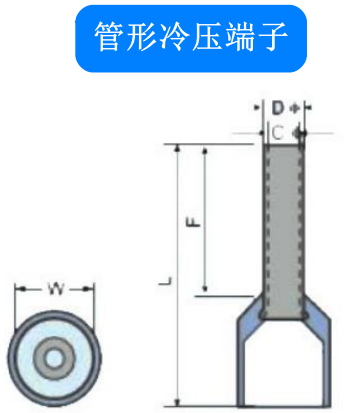
5、 Module installation is complete.

新增模块安装图



2.2.4 Equipment Wiring Requirements

The input and output terminals of the modular temperature control device use plug-and-play 3.50mm spring-type terminals. The wire cross-section connected to the terminal must be 0.2~1.5mm ^{2}. The wire insulation can be removed to directly connect to the terminal or use a tube-type cold-pressed terminal for crimping. When using a tube-type cold-pressed terminal, follow the diagram below:



1、 Specifications for tubular cold-pressed terminals:

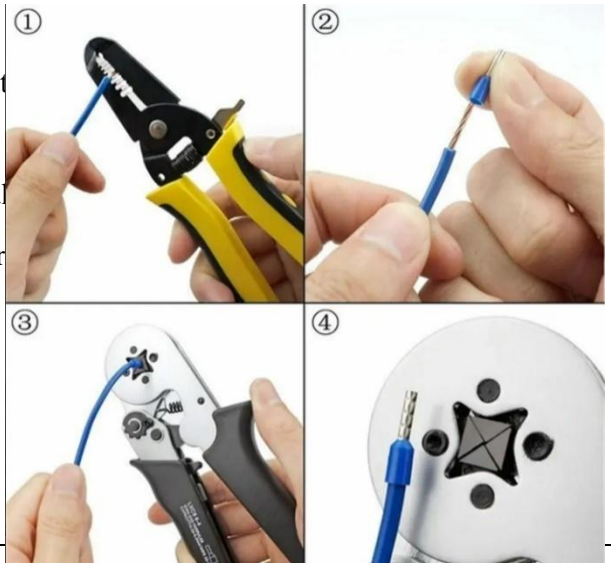
Conductor cross-section National standard mm ^{2}	Terminal size (-indicates no special requirements)				
	F	L	W	D	C
0.2~1.5	10.0mm	-	≤3.5mm	≤1.5mm	-

2、 Use a special wire crimping pliers (hexagonal) to crimp the wire. The operation steps are shown in the figure below: Note: 1) Use a wire stripper to pull off 10mm length of the wire at one end;

2) The wire end was pulled out and put pressed terminal;

3) Use a wire clamp to secure the terminal

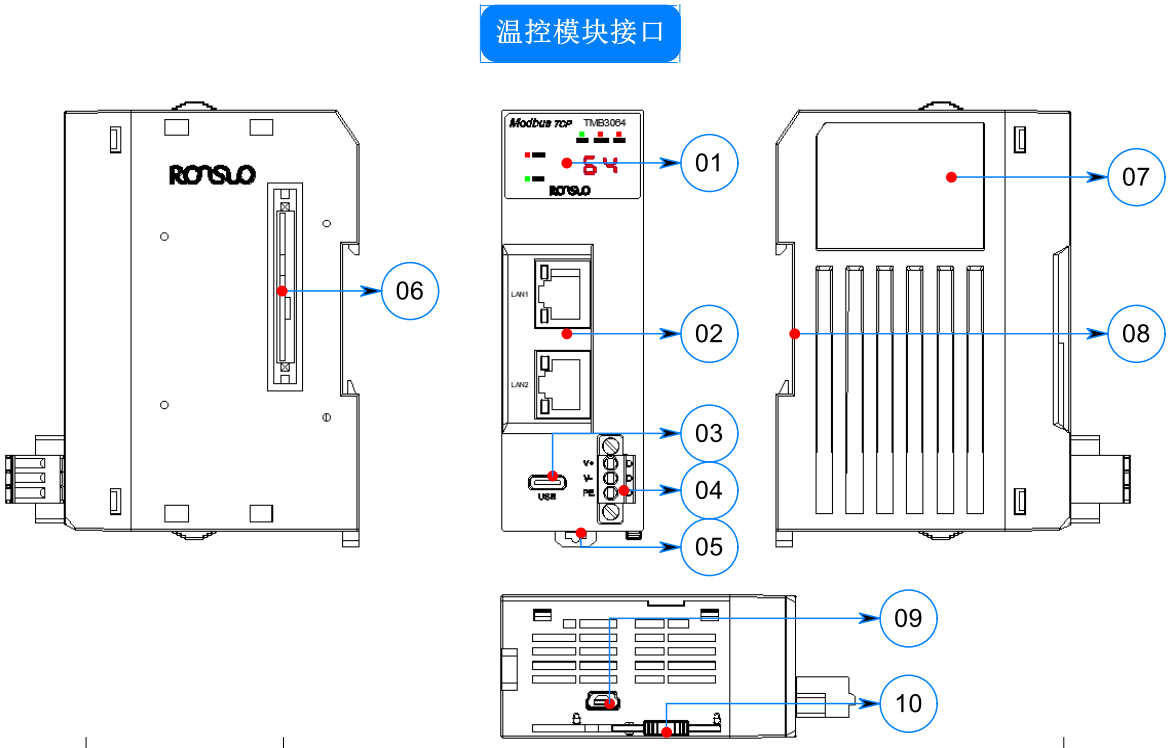
4) Ensure the crimped wire terminals ar nor broken.



2.3 Device Interface Function

2.3.1 Temperature Control Module (TMB) Interface Functions

1、 The interface functions of the temperature control module (TMB3064) are detailed in the figure below:



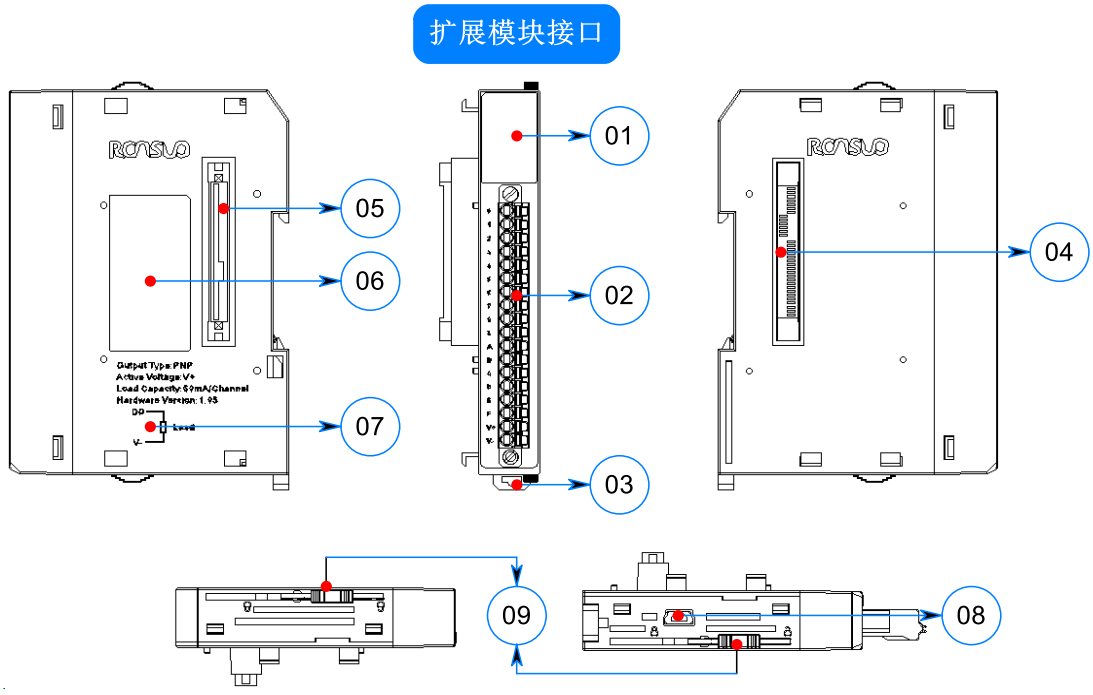
2、 Temperature Control Module (TMB) Interface Specification:

Number	Definition	Explain	Remarks
01	Module display	**Temperature control module model:** TMB3064: Supports up to 64 temperature control outputs	Display screen
		Pilot lamp ： PWR (red): Power indicator light that remains on during device startup RUN (green): Status indicator that flashes once per second when the device is operating normally LINK (green): The indicator stays on when the TCP client connection is successful LOST (red): Flashes when sending data upstream ALM (red): The device remains illuminated when alarms occur (e.g., overheating, over-limit, short circuit, or configuration errors)	
		Digital tube:the number of output channels configured and currently active is always on, and the number of devices with alarm is off	
		LOGO: Blue Guardian (RONSUO) Brand LOGO	

02	RJ45 network port	**LIN1&LIN2:**Two network interfaces with switching capability	
03	Type-C port	Connect to the computer debugging interface (fixed communication parameters: 921600, N, 8, 1)	
04	3P terminal	24VDC power supply interface and grounding (see 2.4.1.1 for details)	
05	Guide rail clip	DIN35 rail mounting and securing clip	
06	Extension interf-ace	Use with extension modules	
07	Tag information	Print information on the left side, including module name, model, power supply, and production serial number (SN).	
08	Installation slot	Standard DIN35 mounting slot	
09	Mini USB port	Modular firmware local update interface	
10	Module latch	When installing the module assembly, fasten the upper and lower clamps (to Pull the lock tab to open the direction indicator. The directional lock mechanism requires both upper and lower latches to be pulled in the same direction to open or secure the module. Unlock the latches: Pull both upper and lower latches toward the front panel of the module. Locking mechanism: Both upper and lower latches are pulled toward the rear of the module.	

2.3.2 Extended Module (TEB\\TEU\\TEN\\TEC\\TES) Interface Functions

1、 The interface functions of the output expansion module (TEB/TEU), regulator access module (TEN), temperature acquisition module (TEC), and serial acquisition module (TES) are detailed as shown in the figure below:



2、 Interface Specifications for the Extended Modules (TEB, TEU, TEN, TEC, and TES):

Number	Definition	Explain	Remarks
01	Module display	**Extension module model:** TEB1016:16-channel NPN output expansion module TEB2016:16-channel PNP output expansion module TEU2008:8-channel analog output (0~10V) expansion module; TEU5008:8-channel analog output (4~20mA) expansion module TEN1016:1 channel 485 serial regulator access module TEC6006:6-channel PT100 temperature acquisition module TEC8008:8-channel K/T thermocouple temperature acquisition module TES1004:4-channel 485 serial data acquisition module TES1008:8-channel 485 serial data acquisition module	
		TEB module indicator light: P1 (red): Power indicator light, which remains on during module power-up P2 (red): External power indicator light that remains on when connected to an external power source (TEB1016 does not have this light) 0-F (green): Corresponds to module output channels 1-16. The indicator lights up when PWM signal output is active. **TEU module indicator light:** P (red): Power indicator, remains on when the module is powered on R (green): Status indicator light that flashes every 200ms when the module is operating normally 0-7 (green): Corresponds to module output channels 1-8, illuminated when signal output is active **TEN1016 module indicator light:** P (red): Power indicator, remains on when the module is powered on R (green): Status indicator light, flashing 200ms per cycle when the module is operating normally 0-F (green): Connects to solid-state modules of station numbers 1-16. The light remains on when communication is normal. **TEN2064 module indicator light:** PWR (Red): Power indicator light, remains on during module power-up RUN (Green): The status indicator flashes 200 times when the module is operating normally. ALM (Red): The alarm indicator light remains on when the communication link between the alarm and the SSA module fails. **TEC module indicator light:** P (red): Power indicator, remains on during module power-up R (green): Status indicator light, flashing 200ms per cycle when the module is operating normally	

		0-5 (green): The TEC6006 module will remain illuminated when the PT100 sensor is properly connected 0-7 (green): The TEC8008 module's thermocouple sensor is normally lit **TES module indicator light:** P: Power indicator (red) remains on during module power-up	

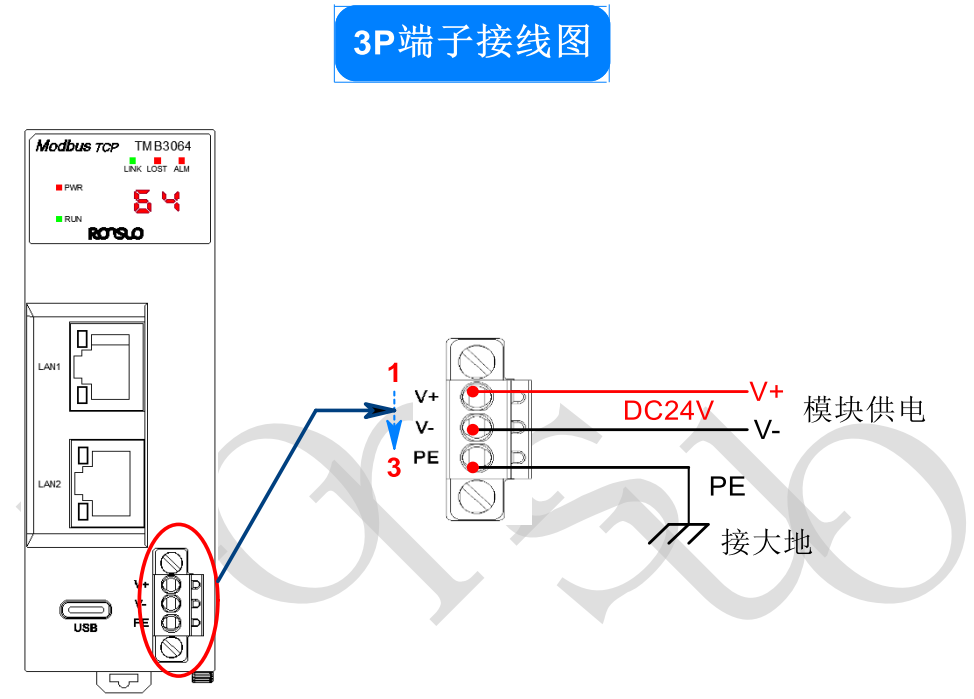
		R: The status indicator light (green) flashes once every 200ms when the module is operating normally. 0-8: TES module serial ports 1-8 remain illuminated when communication with the acquisition board is normal.	
02	8/18P terminal and RJ45 port	TEB: Output Expansion Module Terminal Wiring Specifications (Refer to Section 2.4.2 for details) TEU: Terminal Wiring Specifications for Output Expansion Module (Refer to Section 2.4.3 for details) TEN1016: Terminal Wiring Specifications for Regulator Access Module (Refer to Section 2.4.4 for details) TEN2064: RJ45 Interface Specifications for Regulator Access Module (Refer to Section 2.4.4 for details) TEC: Terminal Wiring Specifications for Temperature Acquisition Module (Refer to Section 2.4.5 for details) TES: Serial port acquisition module terminal wiring definition (refer to 2.4.6 for details)	
03	Guide rail clip	DIN35 rail mounting fastener	
04	Extension Interf-ace 1	Use in combination with the previous module	
05	Extension Interf-ace 2	Use to combine with the next module	
06	Label information	Print information on the right side: module name, model, power supply, and production serial number (SN).	
07	Wiring Label	Input/output type and wiring method of the identification module	
08	Mini USB port	Local firmware update interface (TEB module does not support this feature)	
09	Module latch	When installing the modular assembly, fasten the upper and lower clamps (to Pull the lock to open the direction indicator The directional lock mechanism requires both upper and lower latches to be pulled in the same direction to open or secure the module. Unlock the latches: Pull both upper and lower latches toward the front panel of the module. Locking mechanism: Both upper and lower latches are pulled toward the rear of the module.	

2.4 Device Wiring

2.4.1 Temperature Control Module (TMB) Wiring

2.4.1.1 Power Terminal Wiring

1、 The 3P plug-and-play 3.50 spring terminal on the temperature control module (TMB3064) is wired as shown in the diagram below:

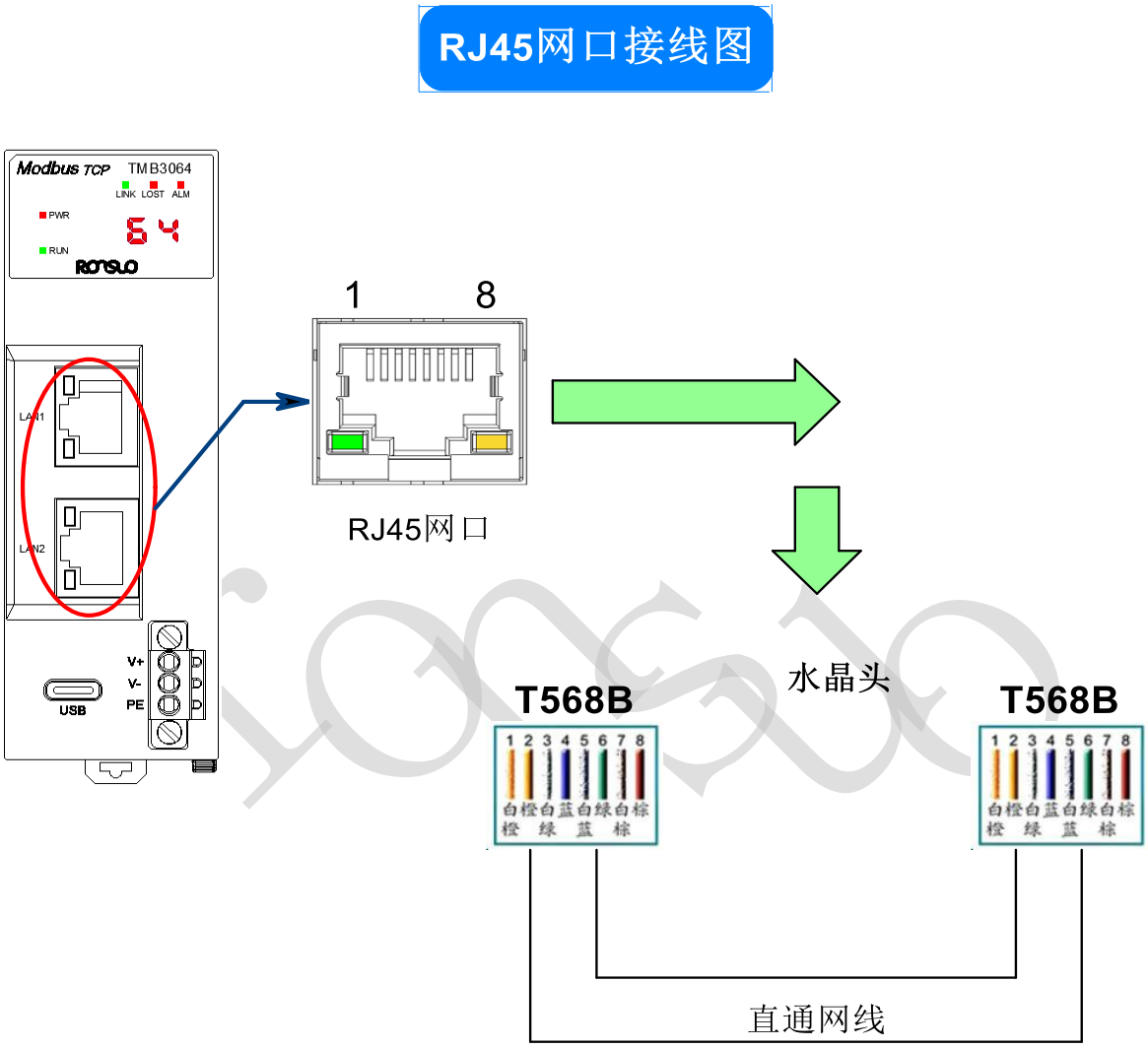


2、 3P Terminal Definition:

Terminal number	Silk screen logo	Explain
1	V+	24VDC power input positive terminal
2	V−	Negative terminal of the 24VDC power input
3	PE	Grounding

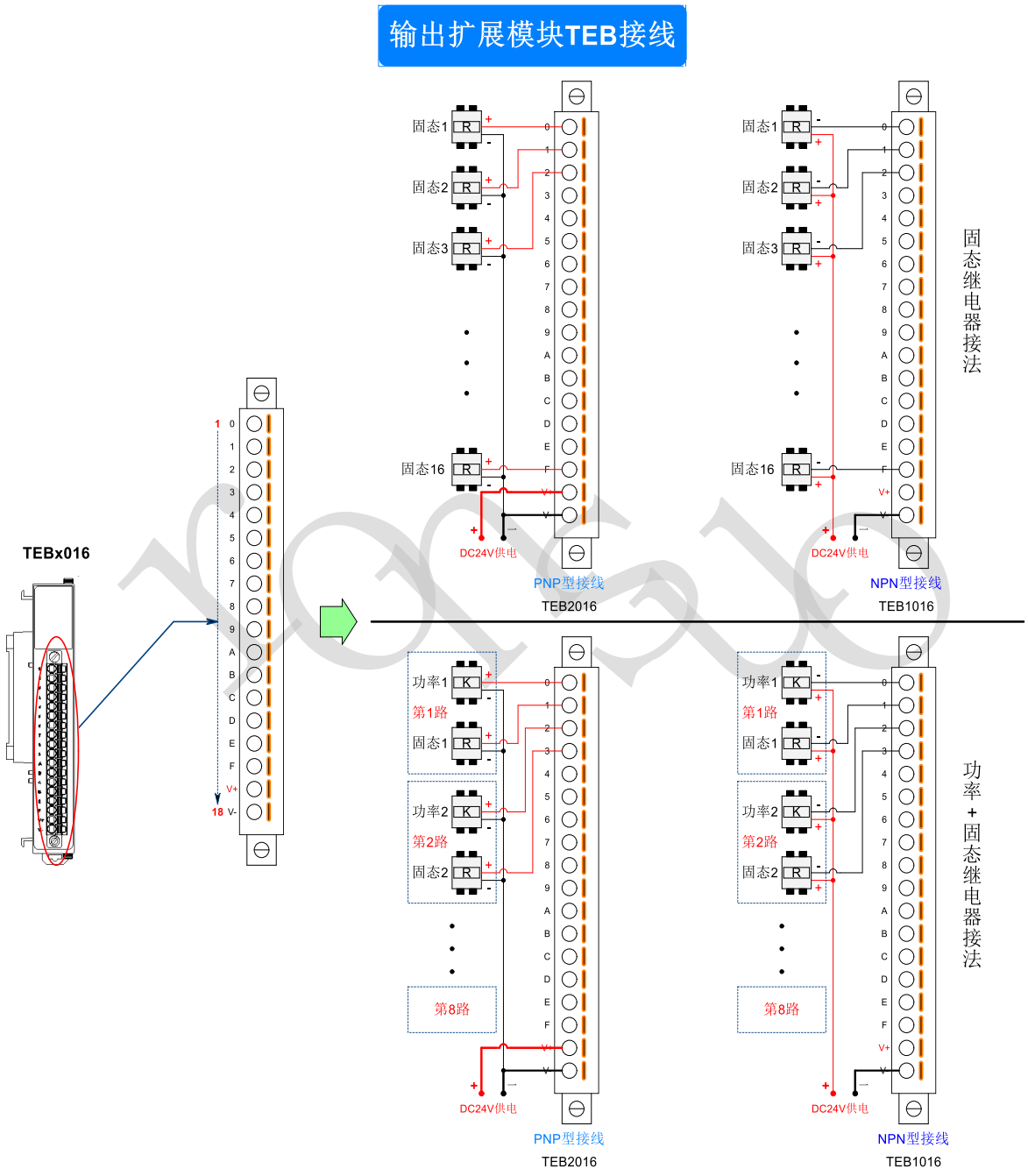
2.4.1.2 RJ45 Network Port Wiring

1、 The Two RJ45 Network Ports on the Temperature Control Module (TMB3064) Are Connected as Shown in the Diagram Below.



2.4.2 TEB Wiring

1、 The 18P plug-and-play 3.50 spring terminals on the TEB output expansion module feature TEB1016 (16-channel NPN type) and TEB2016 (16-channel PNP type) control outputs. Each module is designed with independent external power supply, and the detailed wiring configuration is illustrated in the diagram below.



Note: 1. The output expansion module (DO) features PNP and NPN types. Users should connect it correctly according to the device model.

2、 It supports 16 control outputs when connected as a single solid-state relay.

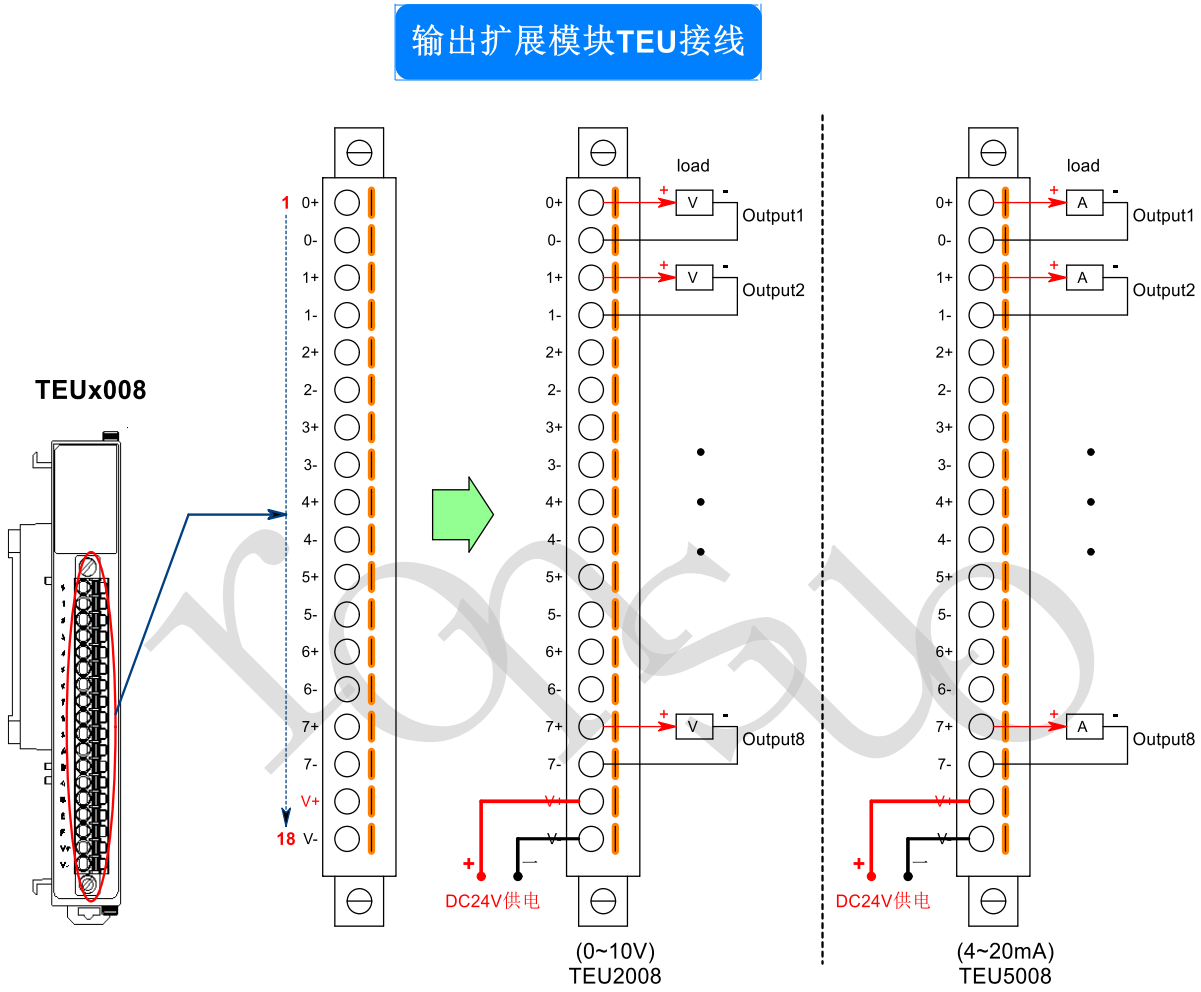
3、 When power and solid-state relay are connected, it supports 8 control outputs (C0&C1 as the first output, C2&C3 as the second, and so on).

2、 TEB 18P Terminal Definition:

Terminal number	Silk screen logo	Explain	
		Solid-state relay control output	Power + solid-state relay control output
1	0	Control Output Channel 1	Control Output Channel 1
2	1	Control Output Channel 2	
3	2	Control Output Channel 3	Control Output Channel 2
4	3	Control Output Channel 4	
5	4	Control Output Channel 5	Control Output Channel 3
6	5	Control Output Channel 6	
7	6	Control Output Channel 7	Control Output Channel 4
8	7	Control Output Channel 8	
9	8	Control Output Channel 9	Control Output Channel 5
10	9	Control Output Channel 10	
11	A	Control Output Channel 11	Control Output Channel 6
12	B	Control Output Channel 12	
13	C	Control Output Channel 13	Control Output Channel 7
14	D	Control Output Channel 14	
15	E	Control Output Channel 15	Control Output Channel 8
16	F	Control Output Channel 16	
17	V+	Positive terminal of the DC24V power supply input	
18	V−	Negative terminal of the DC24V power input	

2.4.3 TEU Wiring

1、 The 18P plug-in 3.50 spring terminals on the TEU output expansion module feature control outputs TEU2008 (8-channel 0~10V) and TEU5008 (8-channel 4~20mA). The detailed wiring configuration is illustrated in the diagram below.



Note: 1. The AO expansion module provides 0-10V and 4-20mA output types. Users should connect them correctly according to the specific equipment model.

2、 The module supports 8 analog control outputs and requires external power supply.

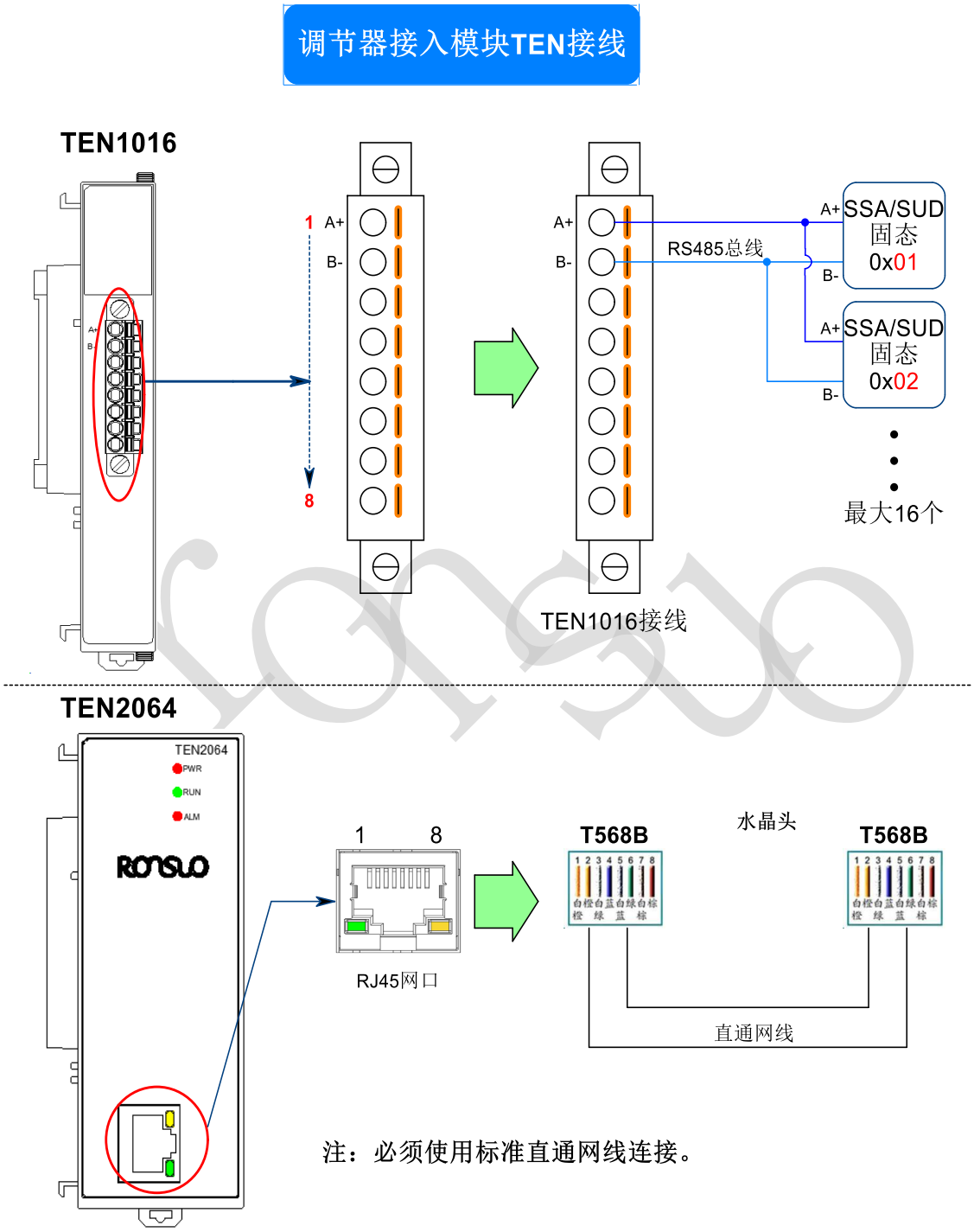
3、 When connecting the analog load controller, pay attention to the correct connection of the positive and negative signs of the interface.

2、 TEU 18P Terminal Definition:

Terminal number	TEU2008		TEU5008	
	Characteristic	Explain	Characteristic	Explain
1	0+	0~10V Output Channel 1	0+	4~20mA Output Channel 1
2	0−		0−	
3	1+	0~10V Output Channel 2	1+	4~20mA output channel 2
4	1−		1−	
5	2+	0~10V Output Channel 3	2+	4~20mA output channel 3
6	2−		2−	
7	3+	0~10V Output Channel 4	3+	4~20mA output channel 4
8	3−		3−	
9	4+	0~10V Output Channel 5	4+	4~20mA output channel 5
10	4−		4−	
11	5+	0~10V Output Channel 6	5+	4~20mA output channel 6
12	5−		5−	
13	6+	0~10V Output Channel 7	6+	4~20mA output channel 7
14	6−		6−	
15	7+	0~10V output channel 8	7+	4~20mA output channel 8
16	7−		7−	
17	V+	Positive terminal of the DC24V power supply input		
18	V−	Negative terminal of the DC24V power input		

2.4.4 TEN Module Wiring

1、 The TEN 8P plug-and-play regulator module features 3.50mm spring terminals, with detailed wiring connections as shown in the diagram below.

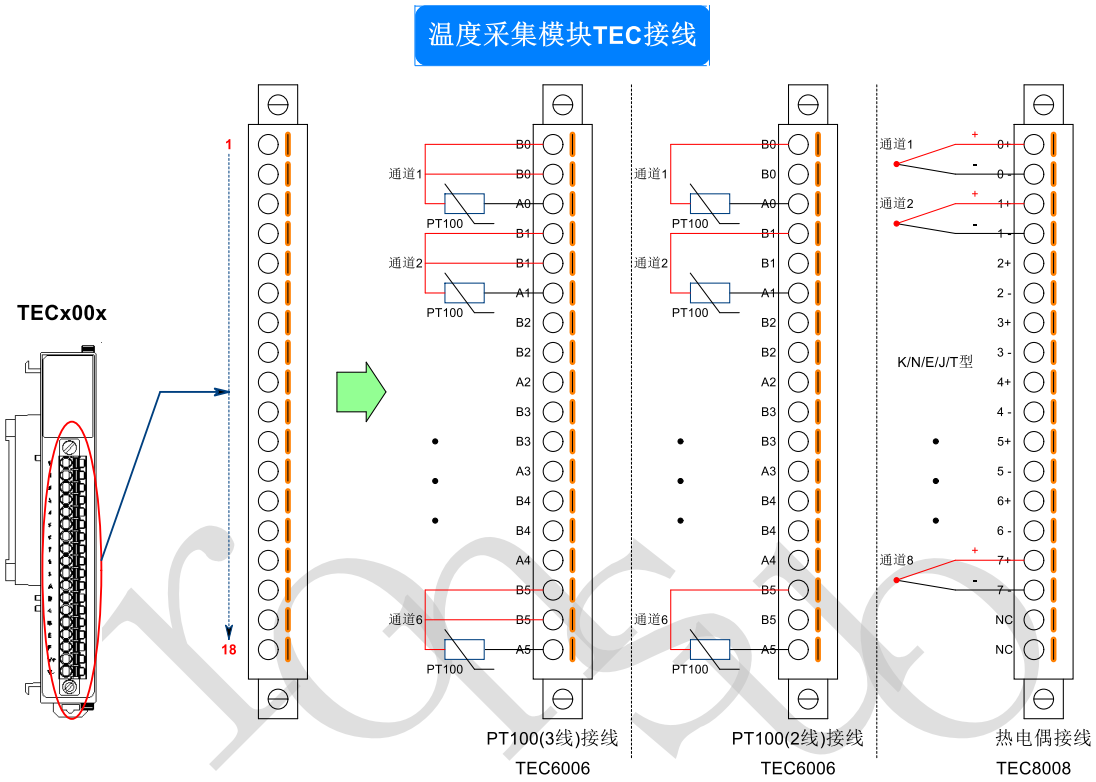


Note: 1. The TEN1016 module features a single RS485 interface, supporting integration with our SxA/SUD power regulators.

2、 The TEN2064 module features 1 RJ45 port, supporting integration with our company's SSA1008 power regulator.

2.4.5 Temperature Acquisition Module (TEC) Wiring

1、 The 18P plug-and-play 3.50mm spring terminals on the Temperature Acquisition Module (TEC) connect to the TEC6006 (6-channel PT100) and TEC8008 (8-channel thermocouple) sensors, with the detailed wiring configuration shown in the figure below.



pour ：

1、 The temperature acquisition module is available in two types: PT100 and thermocouple, with users connecting them correctly according to the equipment model.

2、 The TEC6006 data acquisition module supports 6-channel PT100 sensor connections (default 3-wire configuration).

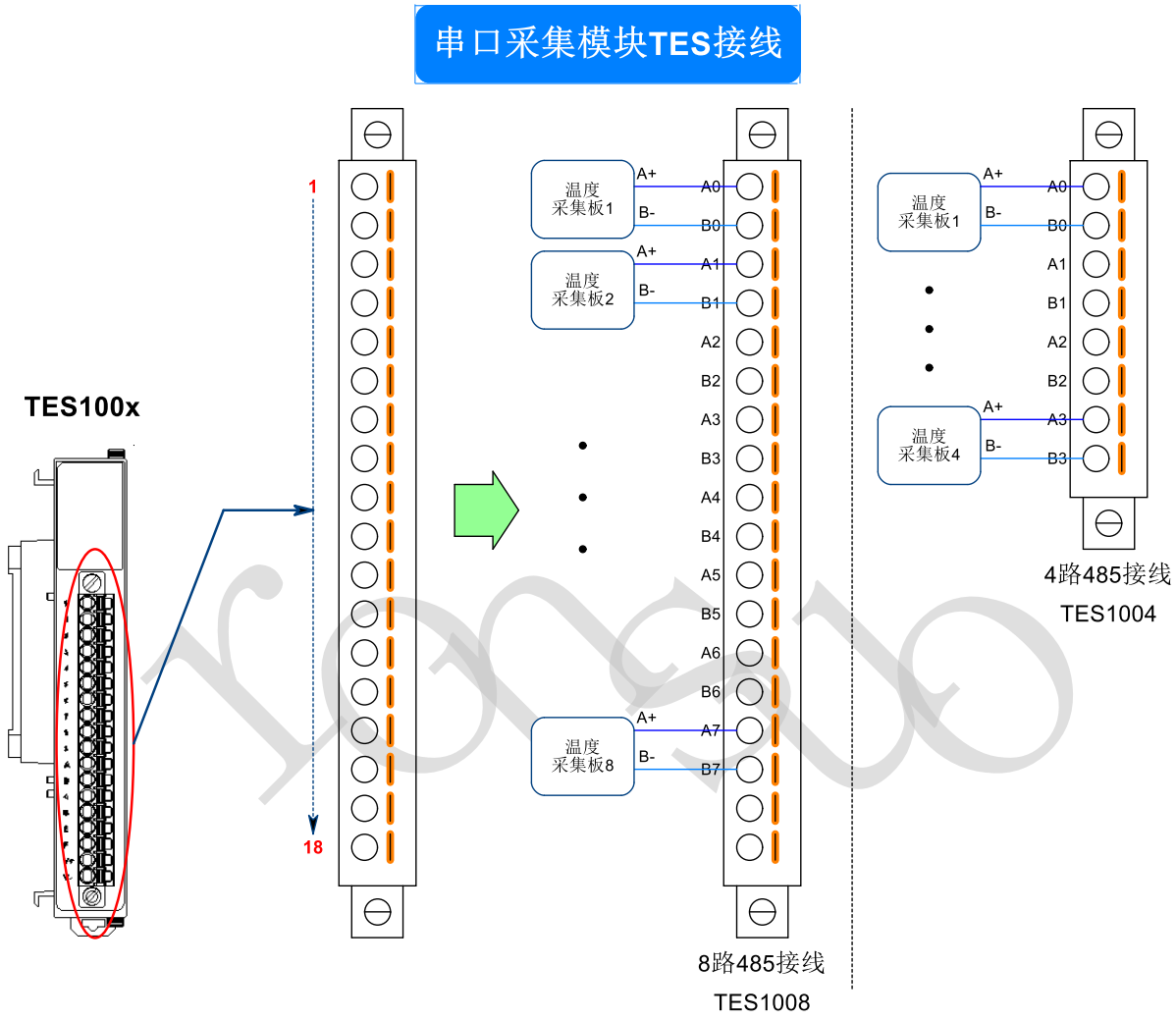
3、 The TEC8008 acquisition module supports 8-channel K/N/E/J/T thermocouple sensors.

2、 Temperature Acquisition Module (TEC) 18P Terminal Definition:

Terminal number	PT100 sensor (TEC6006)			K/N/E/J/T Type Thermocouple Sensor (TEC 8008)	
	3 Line Control Mark	2 Line Control Mark	Explain	Characteristic	Explain
1	B0	B0	Channel 1	0+	Channel 1
2	B0	NC		0−	
3	A0	A0		1+	Channel 2
4	B1	B1	Channel 2	1−	
5	B1	NC		2+	Channel 3
6	A1	A1		2−	
7	B2	B2	Channel 3	3+	Collection Channel 4
8	B2	NC		3−	
9	A2	A2		4+	Channel 5
10	B3	B3	Channel 4	4−	
11	B3	NC		5+	Channel 6
12	A3	A3		5−	
13	B4	B4	Collection Channel 5	6+	Channel 7
14	B4	NC		6−	
15	A4	A4		7+	Collection Channel 8
16	B5	B5	Collection Channel 6	7−	
17	B5	NC		NC	Continue to have
18	A5	A5		NC	

2.4.6 Serial Data Acquisition Module (TES) Wiring

1、 The serial acquisition module (TES) 18P features plug-and-play 3.50mm spring terminals for TES1008 (8-channel) and TES1004 (4-channel) RS485 interfaces, with detailed wiring shown in the diagram below.



pour ：

1、 The serial acquisition module supports 8 or 4 RS485 channels, exclusively for temperature acquisition boards. Users should connect the device correctly according to the specific model.

2、 The TES1008 data acquisition module supports 8-channel 485 interfaces, while the TES1004 module supports 4-channel 485 interfaces.

2、 Serial Acquisition Module (TES) 18P Terminal Definition:

Terminal number	Silk screen logo	Demonstration of the type	
		TES1008 (18P terminal)	TES1004 (8P terminal)
1	A0	RS485 Serial Port 1	RS485 Serial Port 1
2	B0		
3	A1	RS485 Serial Port 2	RS485 Serial Port 2
4	B1		
5	A2	RS485 Serial Port 3	RS485 Serial Port 3
6	B2		
7	A3	RS485 Serial Port 4	RS485 Serial Port 4
8	B3		
9	A4	RS485 Serial Port 5	–
10	B4		
11	A5	RS485 Serial Port 6	–
12	B5		
13	A6	RS485 Serial Port 7	–
14	B6		
15	A7	RS485 Serial Port 8	–
16	B7		
17	–	–	–
18	–	–	–

3 Device Application and Debugging

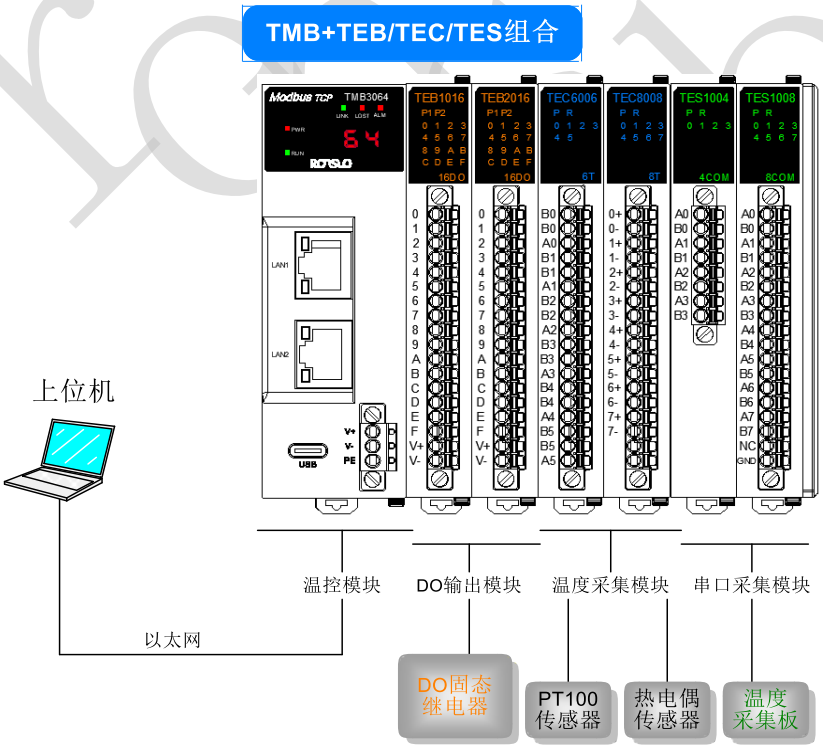
About this chapter

Chapters and sections	Content	Remarks
3.1 Network application example	Introduction to the application of various networking devices	
3.2 Device setup and connection	Introduction to the device debugging and connection method	
3.3 The host computer software (TSC) is used	Introduce the detailed method of upper computer software configuration	
3.4 Alarm code	Introducing the explanation of device abnormal alarm codes	

3.1 Typical Application Examples of Network Configuration

3.1.1 Application Example 1 (TMB+TEB/TEC/TES)

The modular temperature control system (TMB+TEB+TEC or TES) employs a networked configuration, with the connection topology diagram as shown below:



pour ：

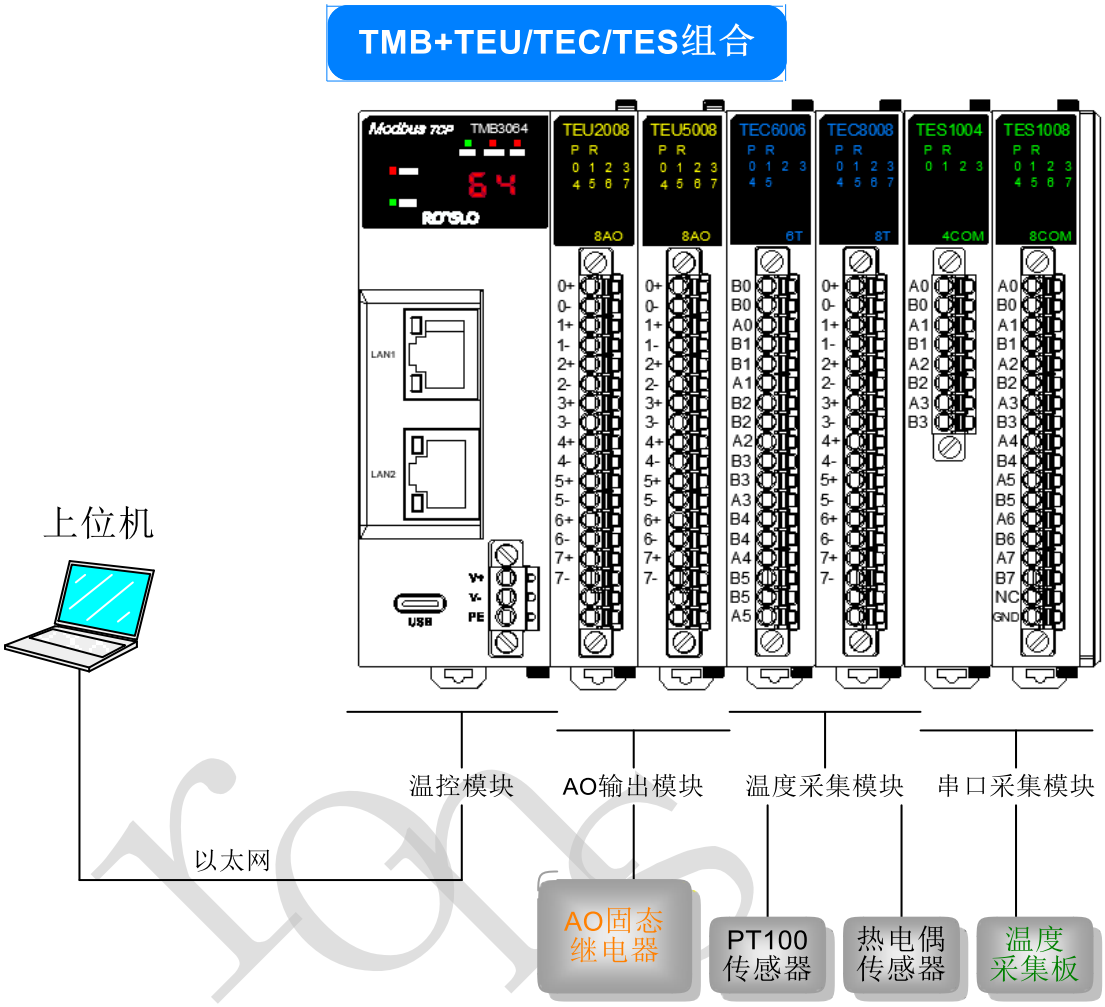
1、 In the proposed solution, the TMB+TEB+TEC or TES combination is implemented, where TEB serves as the DO output, TEC functions as a temperature acquisition module that can directly connect to PT100 or thermocouple sensors for temperature control, and TES acts as a serial acquisition module that interfaces with a temperature acquisition board to collect and control temperature data.

2、 For other networking solutions, please contact our company to customize a tailored networking

plan.

3.1.2 Application Example 2 (TMB+TEU/TEC/TES)

The network topology for the modular temperature control system (TMB+TEU+TEC or TES) is illustrated below:



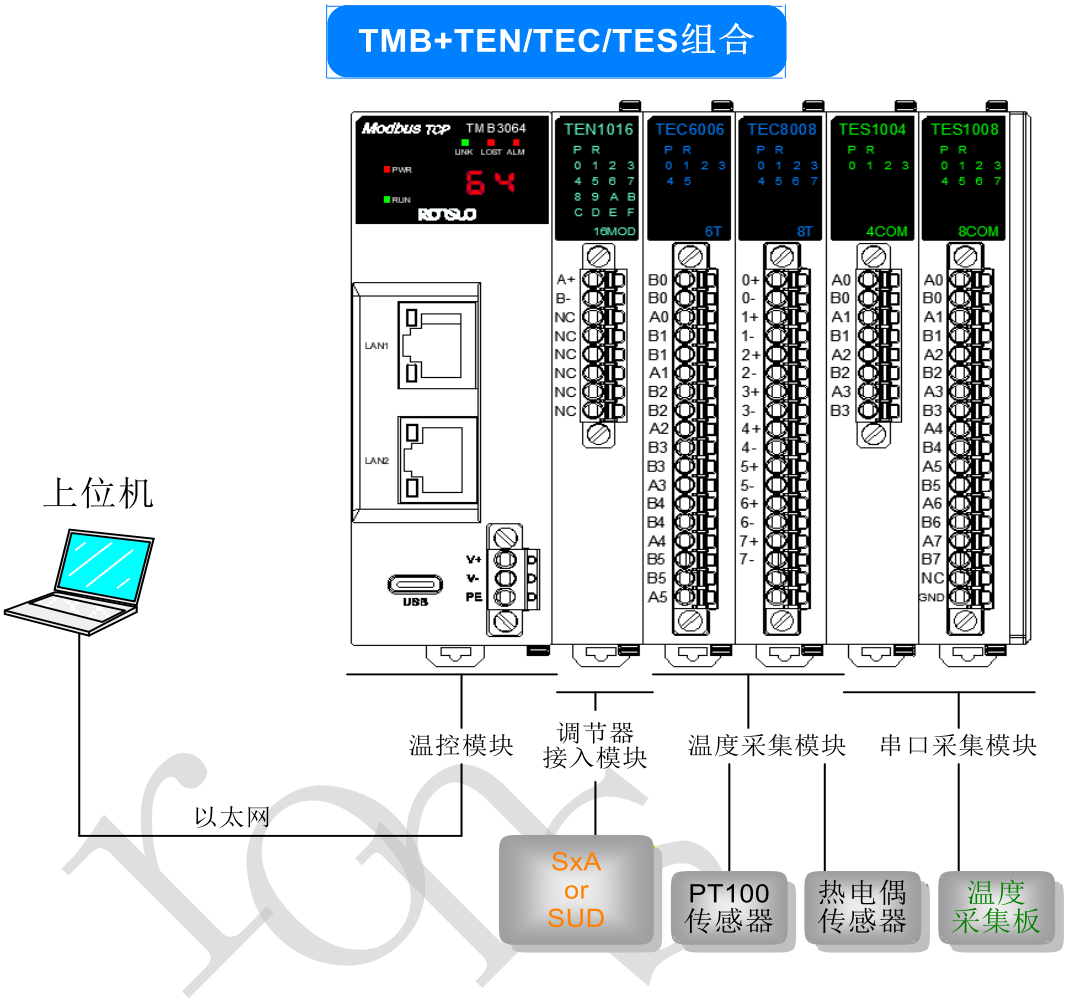
pour ：

1、 In the proposed solution, the TMB+TEU+TEC or TES combination is implemented, where TEU serves as the AO output, TEC functions as a temperature acquisition module that can directly connect to PT100 or thermocouple sensors for temperature control, and TES acts as a serial acquisition module that interfaces with a temperature acquisition board to collect and control temperature.

2、 For other networking solutions, please contact our company to customize a tailored networking plan.

3.1.3 Application Example 3 (TMB+TEN/TEC/TES)

The application network topology for the modular temperature control system (TMB+TEN+TEC or TES) is illustrated below:



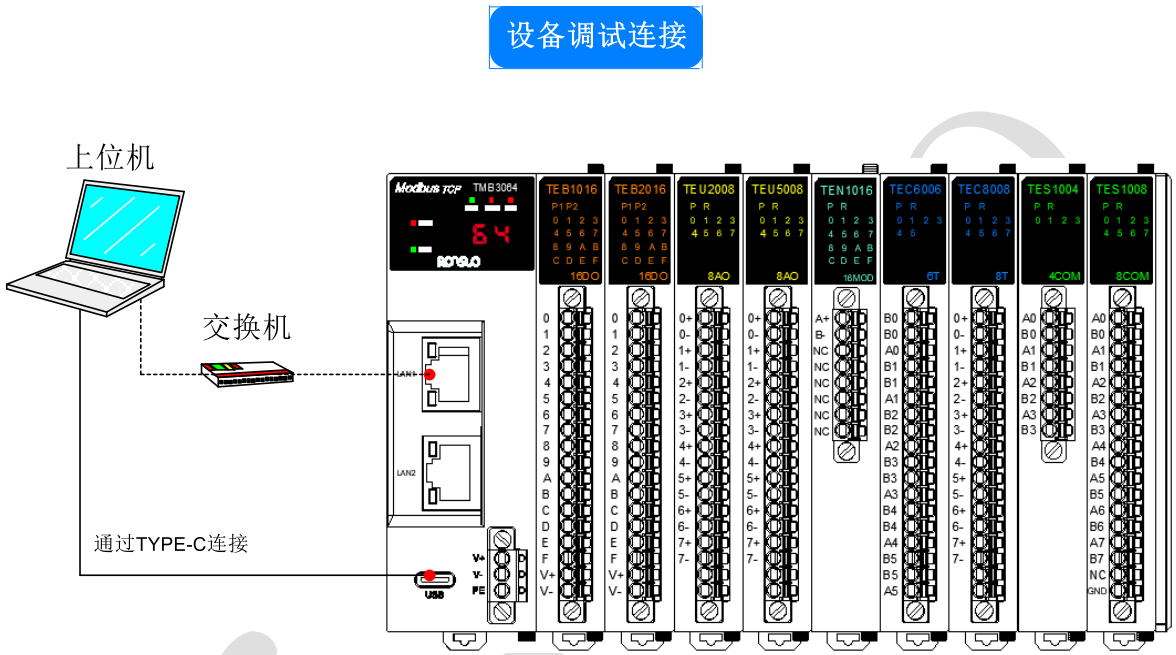
pour ：

1、 The proposed solution combines TMB, TEN, and TEC or TES modules. The TEN module, functioning as a regulator access module, exclusively supports SxA or SUD power regulators. The TEC module, serving as a temperature acquisition module, can directly connect to PT100 or thermocouple sensors for temperature control. The TES module, acting as a serial acquisition module, interfaces with a temperature acquisition board to collect and utilize temperature data for control purposes.

2、 For other networking solutions, please contact our company to customize a tailored networking plan.

3.2 Device Setup and Connection

The device comes with default parameter settings upon factory delivery. For field deployment, simply configure it using the Temperature Control System Configuration Tool (TSC) according to the project's specific requirements to ensure proper operation. Connect the device to the host computer via the following configuration: (Type-C port settings: 921600, N, 8, 1; network interface default:192. 168. 1. 21), as detailed in the diagram below:



pour ：

1、 For on-site debugging, connect the computer to the device using either a USB cable or Ethernet cable (choose one).

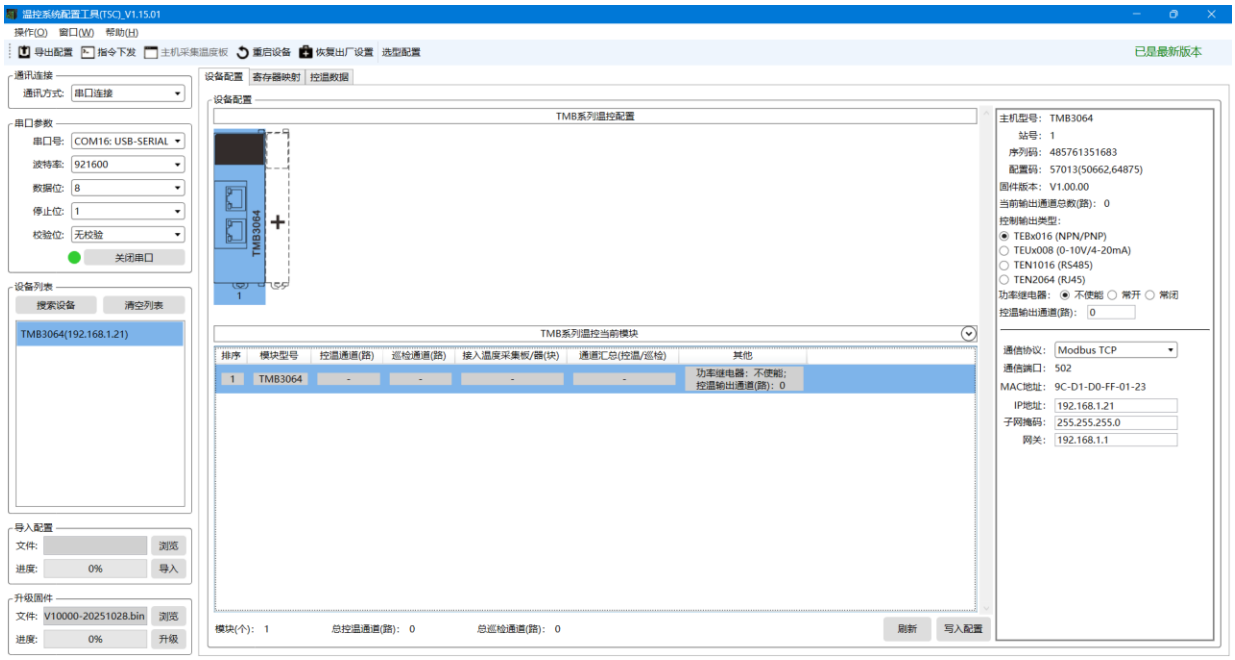
2、 Fixed parameters of the computer's TYPE-C port: 921600, N, 8, 1. Default network port:192. 168. 1. 21

3、 Use the upper computer tool "Temperature Control System Configuration Tool (TSC)" on the computer for configuration management.

3.3 The Host Computer Software (TSC) Is Used

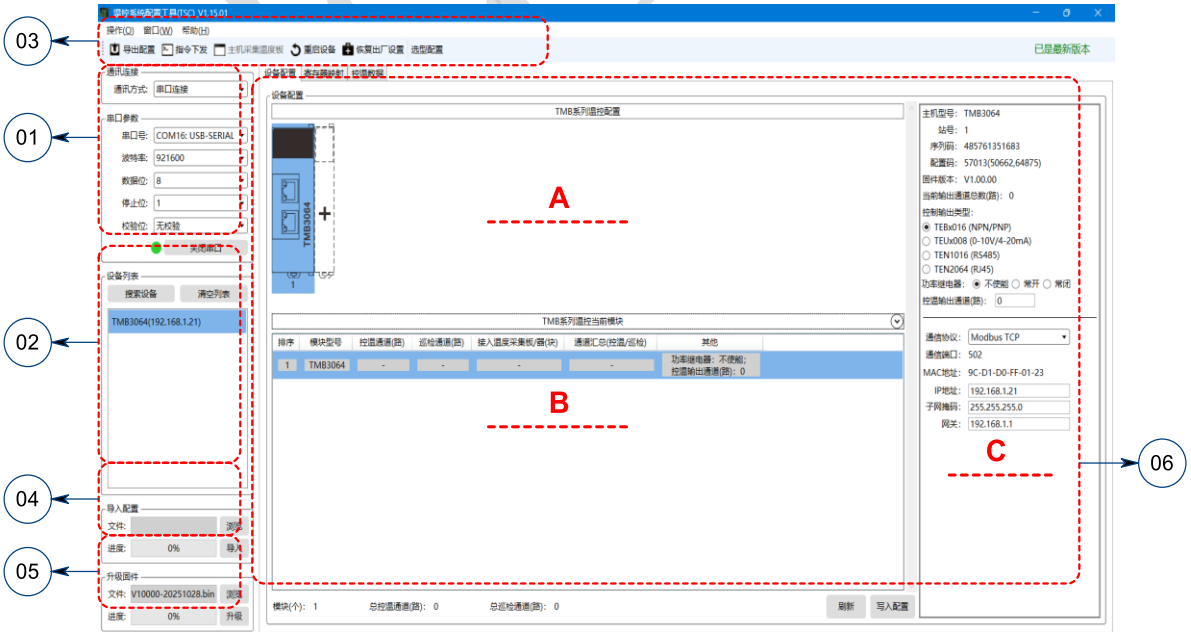
3.3.1 Configure Software

The modular temperature control system can be configured and managed using the desktop-based 'Temperature Control System Configuration Tool (TSC)'. Double-click [TSC.exe] to launch the configuration software, which displays the following interface on the home screen:



3.3.2 Software Feature Introduction

1、 The TSC tool features the following sections:



2、 TSC Tool Panes Description:

Number	Definition	Explain
01	Communication junct-ion	Configure communication parameters for connected devices (TYPE-C): Serial port name: Select the correct COM port for the current connected device Baud rate: 9600 to 921600 (fixed at 921600 when the temperature control module is connected via Type-C). Data bits: 8 by default Stop bit: Default 1 bit Check digit: No check by default Open/Close: Action button Status: Open/Close indicates the serial port connection status Network port connection device function: Communication method: Network connection Search devices: Find all TMB devices on the LAN
02	Device list	After searching for devices, the connected device list is displayed: Search devices: Search connected devices Clear list: Clear the devices displayed in the list List window: Displays the device model and station number address (address in hexadecimal format) that were found. Selected device: Clicks on any found device to display its information on the right side of the tool software.
03	Quick Access	Export configuration: Export the device's configuration file (.cfg) for import into other devices of the same model. Command issued: Debugging application window. Use when debugging is needed. Host temperature acquisition board: Not supported Restart device: Restart the current connected device Restore factory settings: Restore the current connected device to its factory default configuration Switch to Device Configuration/Register Mapping to view the configuration window interface
04	Import configuration	Used for importing device configuration files (in practice, you only need to configure one device to export the file, which can then be imported to other devices of the same model): File: Click the [Browse Files] button to select the path to the.cfg file Progress: Click the [Import] button to display the import progress percentage
05	Upgrade firmware	For device firmware updates: File: Click the [Browse Files] button to select the path to the.bin file Progress: Click the [Upgrade] button to display the upgrade progress percentage Cancel: Click to cancel this firmware update during the upgrade process
06	Application Settings	This feature area primarily configures module parameters for actual device application scenarios: **A:**The diagram shows the way the **configured** modules of the device are spliced

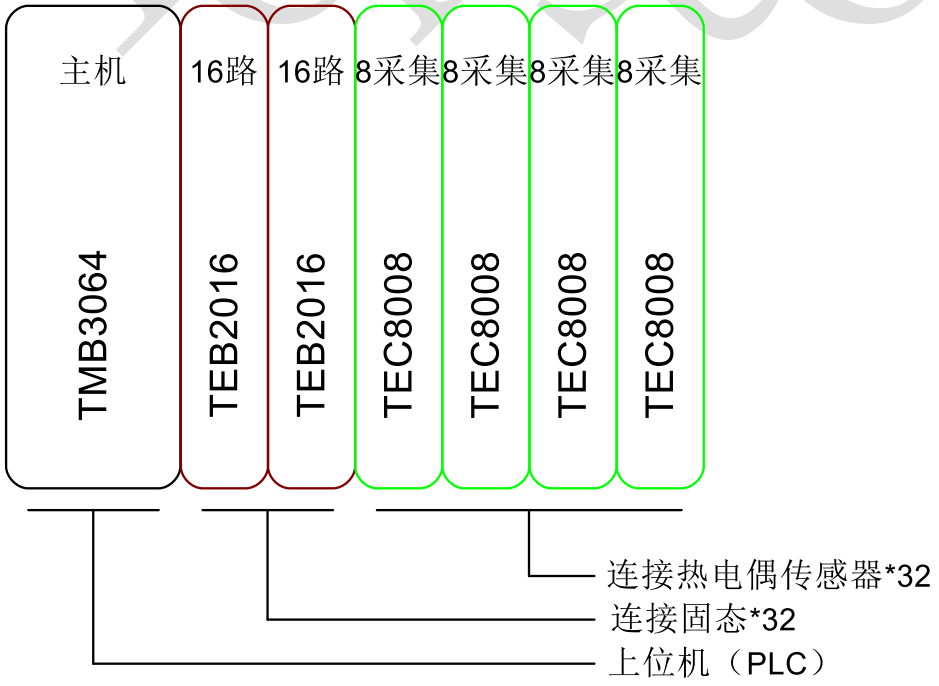
		B:List the module information **configured** by the device (single module) Module: Display the number of access modules Total temperature control channel: Number of channels configured in the acquisition module connected to the TMB host

		Total inspection channel: Number of channels configured in the acquisition module connected to the TMB host Refresh: Click to get TMB host information again Write configuration: To modify parameters of the TMB host or connected TEC/TES modules, click this button to save the configuration to the TMB host. C:Device detailed attribute parameters, display module configuration or read-only attribute parameter information. Control output signal type: The output module is TEB. Select [NPN/PNP]. The output module selects [0~10V/4~20mA] for TEU Output module: TEN [TEN1016 or TEN2064] power relay: disabled (default) Communication protocol: Modbus TCP (default) & Modbus RTU over TCP Communication port: 502 IP address:192. 168. 1. 21(default), can be modified according to the actual application

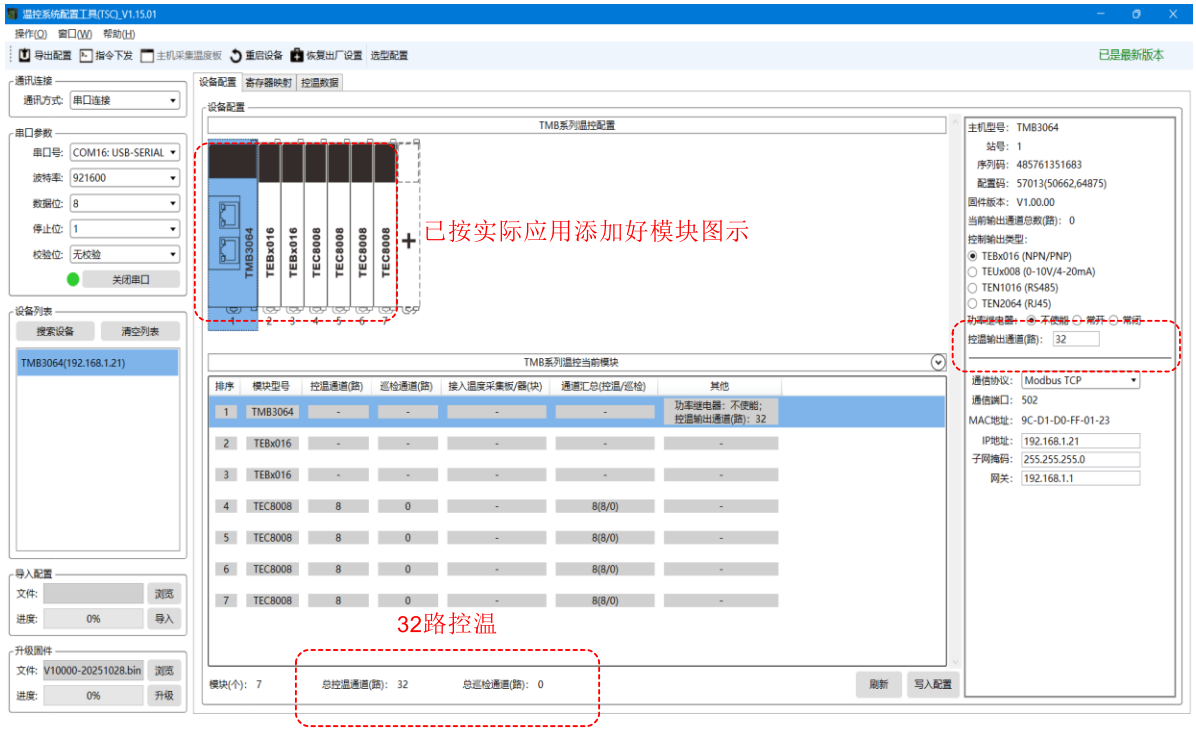
3.3.3 Application Instance Configuration

3.3.3.1 Combination mode (TMB+TEB+TEC)

1、 System Description: This setup integrates 1 TMB3064 temperature control module, 2 TEB2016 expansion output modules, and 4 TEC8008 serial acquisition modules. It enables 32-channel thermocouple data acquisition combined with 32-channel PNP temperature control output. The detailed configuration is illustrated in the diagram below.



2、 The host computer software configuration is shown below:

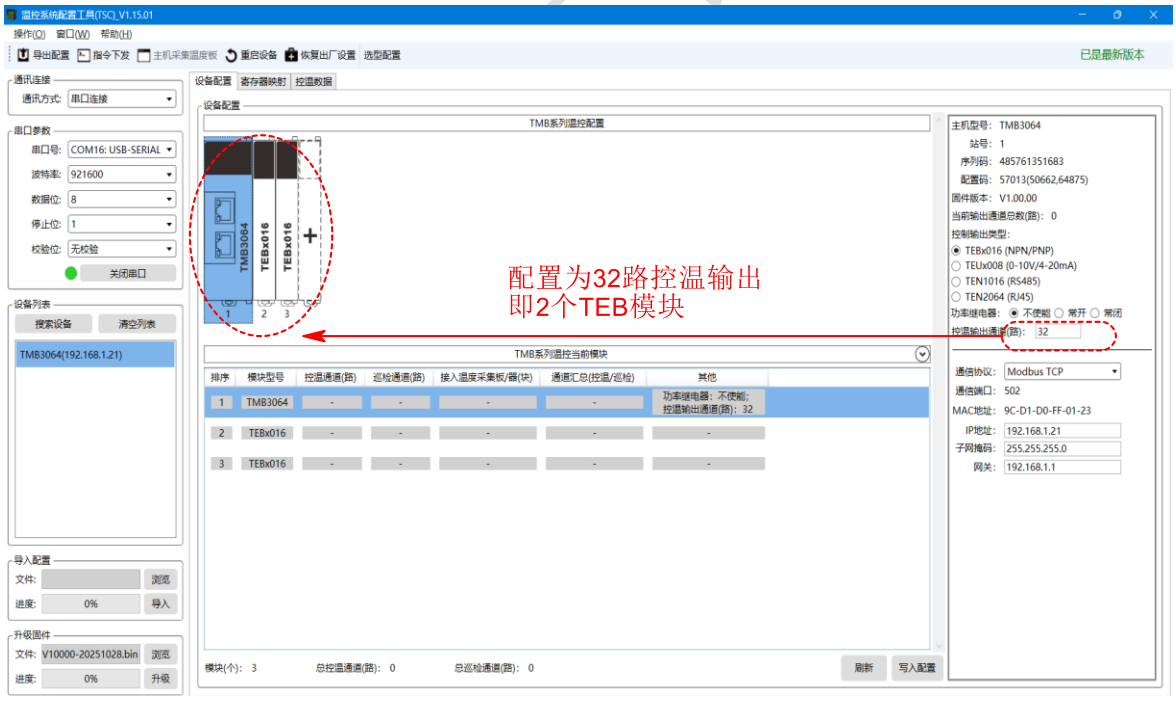


Step 1:

TMB host configuration output channels (16 channels per TEB module). When configuring temperature control output channels 1-16, the system automatically adds one additional channel.

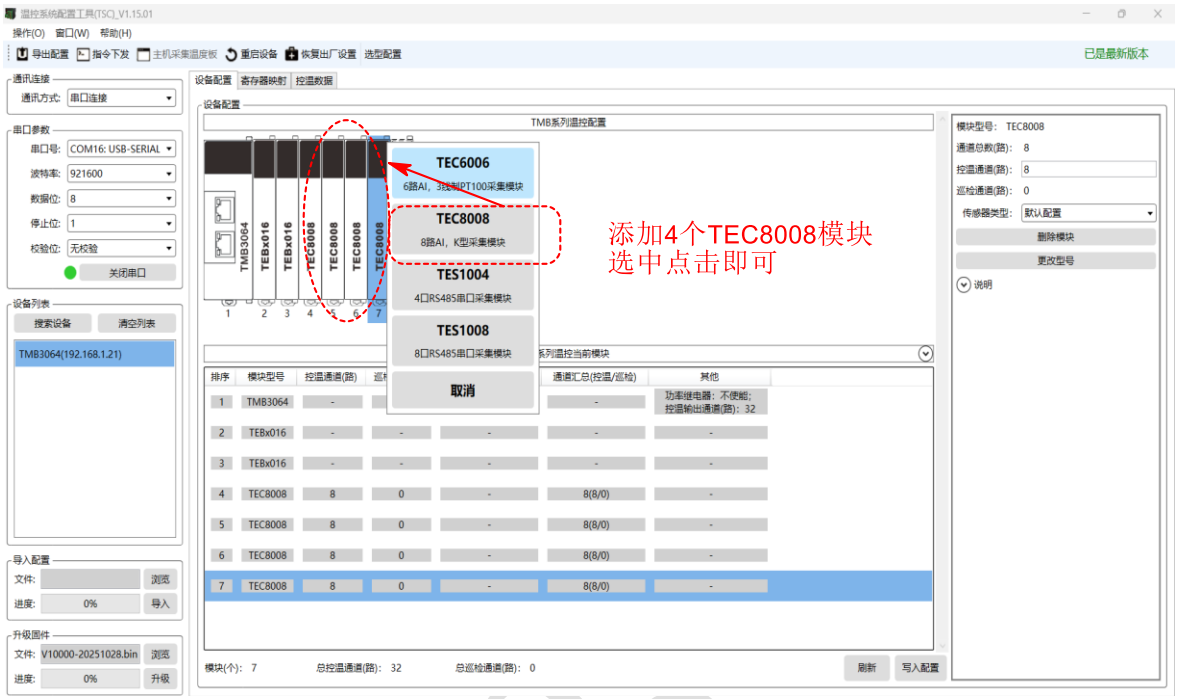
TEB module. When configured with 17 to 32 units, the system automatically adds 2 TEB modules, and so on, with a maximum output of 64 channels. The configuration method is as follows.

As shown:



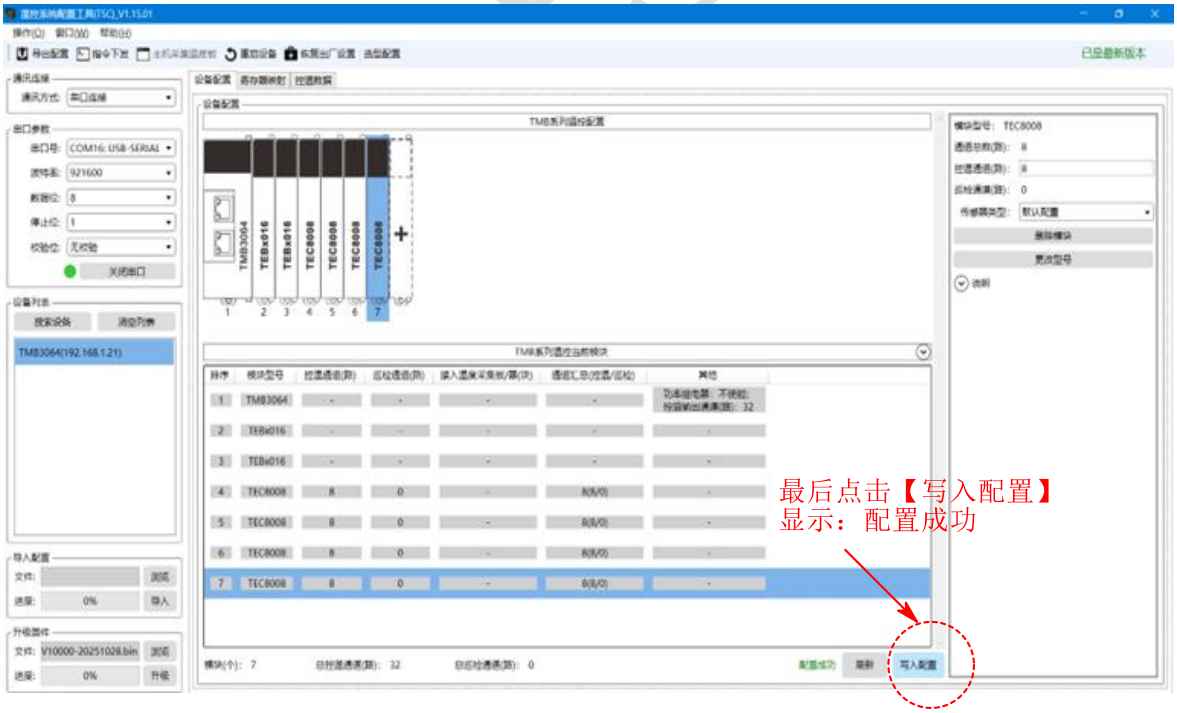
Step 2:

Add 4 TEC8008 modules as shown in the figure below.



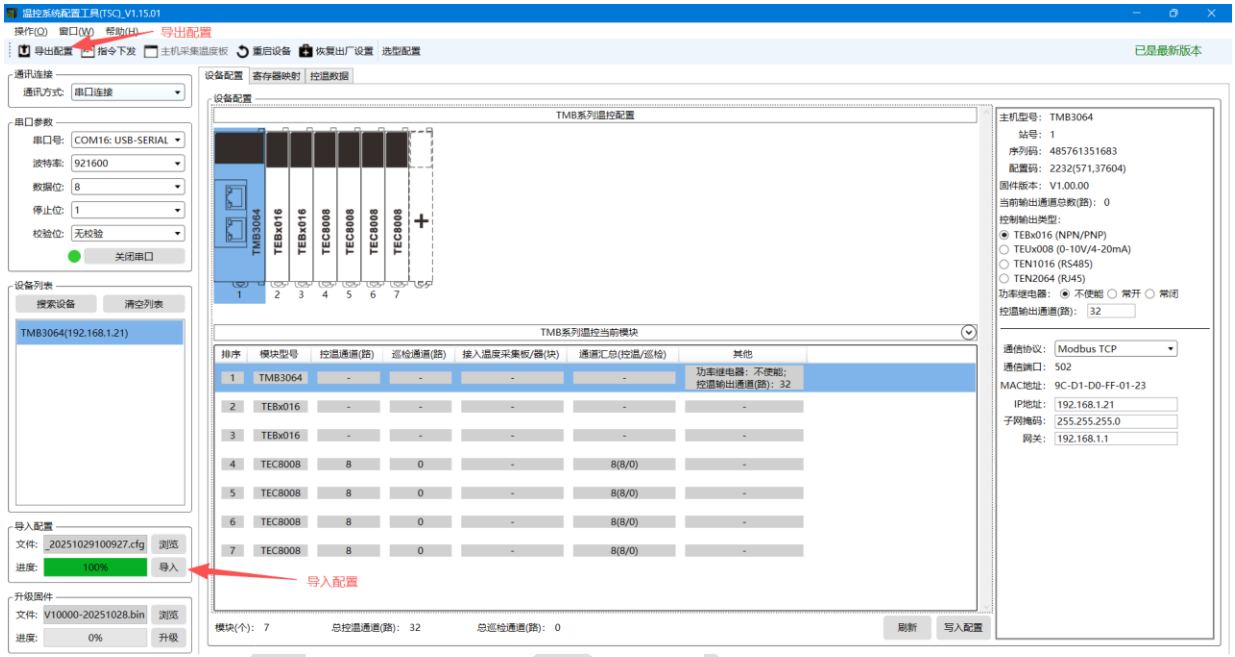
Step 3:

After configuration, click Write Configuration to complete.



Step 4:

After completing the device configuration, you can export the settings. Click the [Export Configuration] button in the quick menu bar to save the configuration file. The exported file can be imported to another device of the same model to synchronize configurations between two devices without repeating the setup process. As shown in the figure below:



3.4 Alarm Code

Order number	Alarm code (MV display)	Description (TMB panel display)
1	E0	The device is not connected to the output module
2	E1	The device is not authorized
3	E2	Hardware self-test error alert
4	E3	Output channel short circuit (requires reboot or register reset to recover)
5	P0	The temperature control module does not integrate the TEC or TES acquisition modules.
6	P1	The configured collection module communication is interrupted
7	P2	Configuration error in the collector board register
8	P3	The number of channels in the TEC or TES acquisition module configuration does not match
9	C0	Overlimit alarm: If the temperature exceeds the limit on any circuit, the output of that circuit will be disconnected. The alarm will not automatically reset when the temperature returns to normal. You can enable the output of that circuit to clear the alarm (disabled by default).
10	C1	Temperature alarm: Displays when any channel exceeds the temperature alarm threshold and automatically clears when normal. (Default enabled, 2°C over-temperature)
11	C2	Temperature anomaly during inspection. The system will trigger an alarm if any temperature control channel deviates from the inspection temperature by more than the set value. The deviation will be automatically eliminated when normal (default: disabled).
12	C3	Low-temperature alarm: When the abnormal detection time expires, the system will trigger an alarm if any channel's temperature drops below the set value by 5 °C. The alarm will automatically clear when temperatures return to normal (default: disabled).
13	C7	Stop output when all temperature readings from the acquisition module channels are abnormal
14	MV digital flicker	The configured output channels exceed the physical output channels.
15	MV digital always on	System is working properly

4 Common Faults

The device may experience certain malfunctions during use. Users can troubleshoot based on the listed symptoms and solutions to restore normal operation. If the issue persists, please contact our company.

power failure

The problem is that the indicator lights on the back panel do not light up after power-on.

Exclusion method:

1、 Check if the power wiring is properly connected to the terminals.

2、 Check if the positive and negative terminals of the power cord are connected in reverse.

3、 Use a multimeter to check if the input voltage is within the specified range (12~36VDC).

Communication failure

Fault: RS485 communication failed

Exclusion method:

1、 Check if the device parameters are configured correctly.

2、 Check if the device panel indicator lights are displaying correctly.

3、 Check if the communication wiring is correct. After confirming the wiring is correct, verify that the communication parameters are properly configured.

4、 Check if the 485 DIP switch address matches the communication address of the host computer.

5 Maintenance

When maintenance is required, the power supply should be disconnected first. Under normal operating conditions, the equipment does not require frequent maintenance or servicing. Only periodic

12 Check the equipment status and terminal connections for looseness monthly, and clean the surface dust with a dry soft-bristled brush. Long-term storage

When not in use, disconnect the device from power. Avoid placing it in areas with extreme temperatures or high humidity.

6 Safety Requirements

Please read the following safety precautions to avoid personal injury and prevent damage to this product or any other connected products. To avoid potential hazards, this product must only be used within the specified scope.

Only authorized technicians from our company are permitted to perform the repairs.

Use the appropriate power source.

Check the input power type, voltage value, and polarity of the device.

Connect and disconnect correctly.

Do not disconnect the data communication cable while the device is powered on.

equipment ground 。

To prevent electric shock, the casing grounding wire must be connected to the ground. Before connecting to the input or output terminals of this product, ensure the device is properly grounded, and the grounding wire resistance should be less than 1 Ω.

Correct connection.

Use the original accessories when connecting. If you need to make special connections, pay attention to the interface labels.

Avoid contact with exposed circuits.

Do not touch exposed contacts or components while the equipment is energized.

Do not operate if there is a suspected fault.

If you suspect this product is damaged, please have it repaired by our authorized service personnel.

Provide a well-ventilated environment.

Handle this device carefully to avoid strong impacts or vibrations. Do not install it in areas with severe shaking.

Do not touch the power switch or this device with wet hands.

Do not operate in humid environments.

Do not operate in explosive environments.

Keep the surface of the device clean and dry.