SenseFuture

TEC207/215
Temperature Controller

PRODUCT INTRODUCTION MANUAL

Striving for the Bright Future of Precision Optical Measurement.

SenseFuture Technologies Co., Ltd.

Dual Channel Temperature Controller (TEC207/215 Series)

01 Product Functions

TEC207/215 is primarily used for temperature measurement and control in large sample chambers.

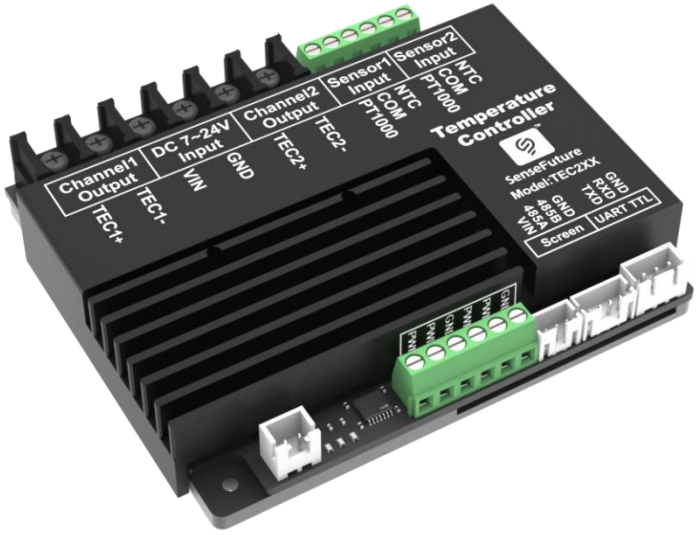


Figure1 TEC207/215 Serise

02 Product Features

- Temperature sensitivity: 0.0001°C, long-term temperature drift (24h) < 0.001°C.
- Temperature control stability: ±0.001°C, meeting the requirements of most scenarios, including precise temperature control for semiconductor lasers.
- Optional bipolar and unipolar output.
- Maximum temperature change rate can be limited.
- Supports NTC thermistor temperature sensors.
- Supports high power output (maximum single channel 24V 15A, combined output of 30A for two channels).
- Equipped with circuit board overheat protection, ensuring reliable performance.
- Supports direct parameter setting via screen or computer display control module, with data memory for power loss, facilitating production for workers.
- Supports two communication interfaces: TTL serial and RS485.
- Supports both ASCII communication protocol and Modbus, providing an open platform.
- Compatible with solid state relays.

03 Product Parameters

Table1 Basic Parameters of TEC207/215 Series

PARAMETER	MODEL				UNIT
	TEC207L	TEC207	TEC215L	TEC215	
Supports Sensors	NTC PT1000/PT100				
Measurable Temperature Range (See Selection Table on P9)	-200~800				°C
Temperature Sensitivity (See Selection Table on P9)	0.001	0.0001	0.001	0.0001	°C
Temperature Measurement Drift Caused by Ambient Temperature	0.0001				°C/°C
Optimal Temperature Control Stability (related to the overall system)	**±0.01**	**±0.001**	**±0.01**	**±0.001**	°C
Communication Method	485 Serial Port (supports Modbus and ASCII communication protocols)				
Power Supply Voltage Range (DC)	7~24				V
Output Polarity	Bipolar、Unipolar				
Number of Channels	2				
Maximum Output Voltage	Settable				
Output Current Range (SSR: Solid State Relay)	**±7A each channel**		**±15A each channel 0-±80A/SSR**		A
Output Current Limit	±10A		±20A		A
Operating Ambient Temperature	-55~60				°C
Operating Ambient Humidity	0~98				%RH
Thermal Dissipation Requirements	No Additional Thermal Dissipation Needed Within Rated Operating Range				
Circuit Board Overheat Protection	Yes				
Power Loss Memory	Yes				
PID Parameters	User Adjustable				
Dimension	94.3*79.5*20.5				mm
Weight	≈240				g

04 Interface Introduction

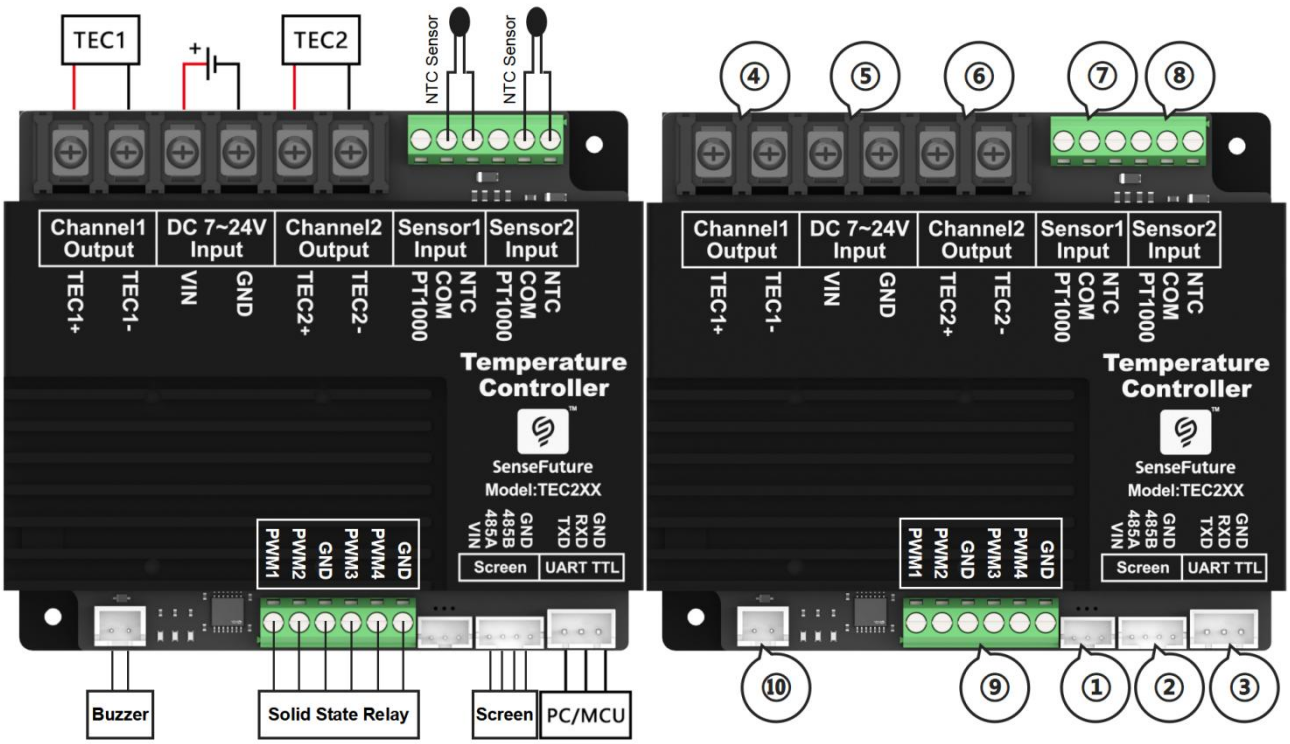


Figure2 Wiring Diagram of TEC207/215 Series

Table2 Pin Definition Table for TEC207/215 Series

	Pin Name	Pin Type	Pin Definition (High Level: 3.3V, Low Level: 0V)
①	ENABLE	Input	Thermostat Enable Terminal. High Level: The thermostat can output normally; Low Level: The thermostat is not allowed to output.
	STATE	Output	Thermostat Overtemperature Alarm Signal Output. High Level: (1) The thermostat's own temperature is greater than its overtemperature threshold; (2) The temperature of sensor 1 or 2 exceeds their respective high and low threshold ranges. Low Level: No overtemperature anomaly.
	GND	Input	Power Supply Input Negative (Low Current)
②	VIN	Input	Power Supply Input Positive (Low Current).
	485A	Output	RS485 Signal Line A. Data Bits: 8 bits, Stop Bits: 1 bit, Parity: None, Baud Rate: 9600.
	485B	Output	RS485 Signal Line B. Data Bits: 8 bits, Stop Bits: 1 bit, Parity: None, Baud Rate: 9600.
	GND	Input	Power Supply Input Negative (Low Current).
③	TXD	Output	Serial Port Transmitter, TTL Level, used for connecting to PC control software. Data Bits: 8, Stop Bit: 1, Parity: None, Baud Rate: 38400.

	RXD	Input	Serial Port Receiver, TTL Level, used for connecting to PC control software. Data Bits: 8, Stop Bit: 1, Parity: None, Baud Rate: 38400.
	GND	Input	Power Supply Input Negative (Low Current).
④	TEC1+	Output	The positive terminal of the temperature control current output is typically connected to the positive terminal of the Thermoelectric Cooler (TEC).
	TEC1-	Output	The negative terminal of the temperature control current output is usually connected to the negative terminal of the Thermoelectric Cooler (TEC).
⑤	VIN	Input	Power Input Positive Pole, with an input voltage range of 7 to 24V.
	GND	Input	Power Supply Input Negative (High Current).
⑥	TEC2+	Output	The positive terminal of the temperature control current output is typically connected to the positive terminal of the Thermoelectric Cooler (TEC).
	TEC2-	Output	The negative terminal of the temperature control current output is usually connected to the negative terminal of the Thermoelectric Cooler (TEC).
⑦	1k	Input	Platinum Resistance Thermometer (Pt1000) Interface (Please contact Technical Support before purchase).
	COM	Input	Common Interface for Platinum Resistance Thermometer (Pt1000) and NTC Thermistor.
	10k	Input	Thermistor (NTC) Interface.
⑧	1k	Input	Platinum Resistance Thermometer (Pt1000) Interface (Please contact Technical Support before purchase).
	COM	Input	Common Interface for Platinum Resistance Thermometer (Pt1000) and NTC Thermistor.
	10k	Input	Thermistor (NTC) Interface.
⑨	PWM1	Output	Solid State Relay Input Terminal 1
	PWM2	Output	Solid State Relay Input Terminal 2
	GND	Input	Power Supply Input Negative (Low Current)
	PWM3	Output	Solid State Relay Input Terminal 3
	PWM4	Output	Solid State Relay Input Terminal 4
	GND	Input	Power Supply Input Negative (Low Current)
⑩	VCC	Output	Buzzer Alarm Positive. Outputs high level when there is an error in temperature control.
	GND	Output	Buzzer Alarm Negative.

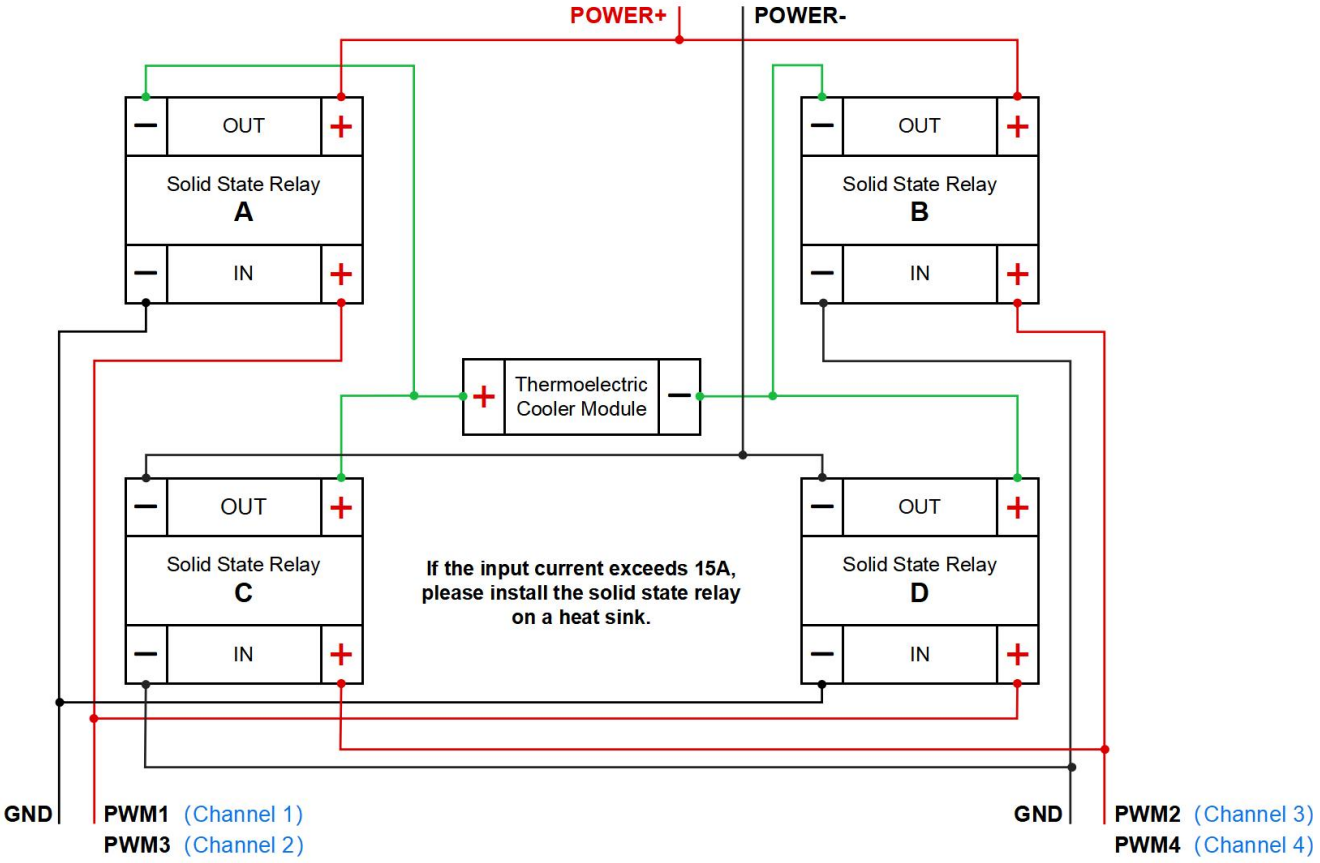
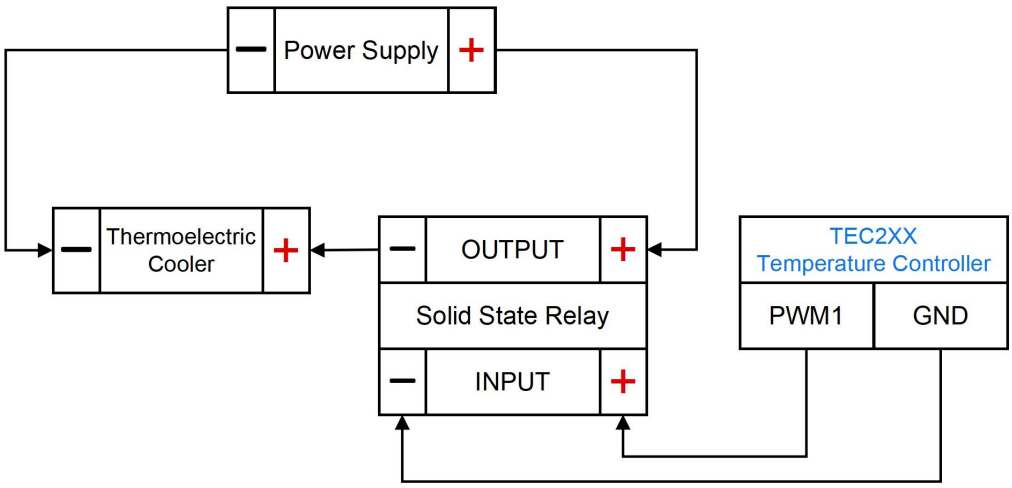
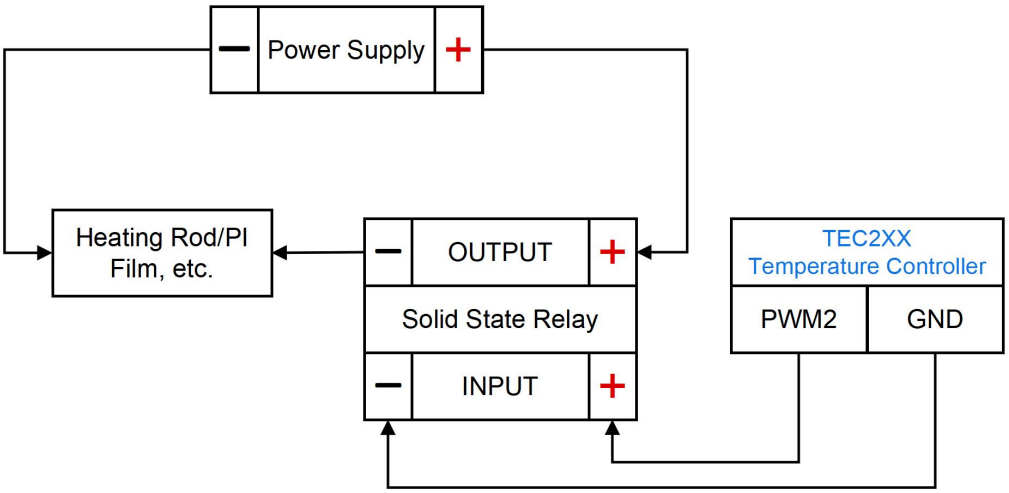


Figure2 Wiring Method for Channel 1/Channel 2 Solid State Relay



Wiring Method for Single Cooling Solid State Relay



Wiring Method for Single Heating Solid State Relay

05 Dimensional Drawing

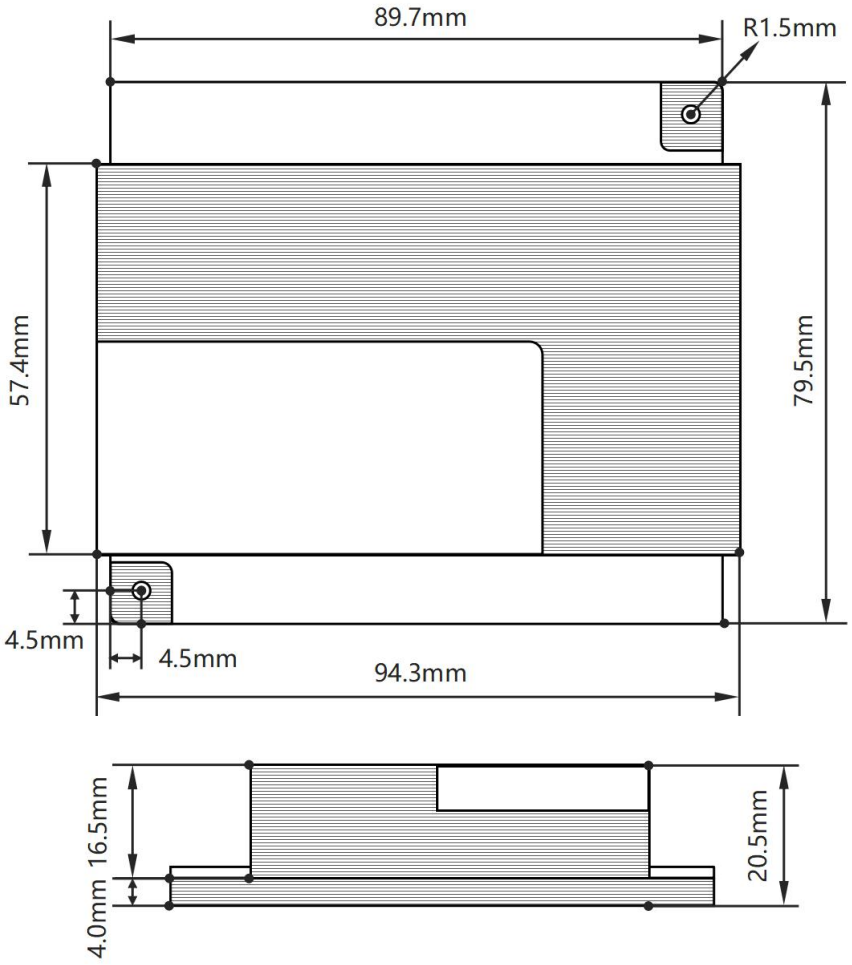


Figure4 Dimensional drawing of TEC207/215 Series

06 Computer Software (Communication Protocol Refer to Attachment)

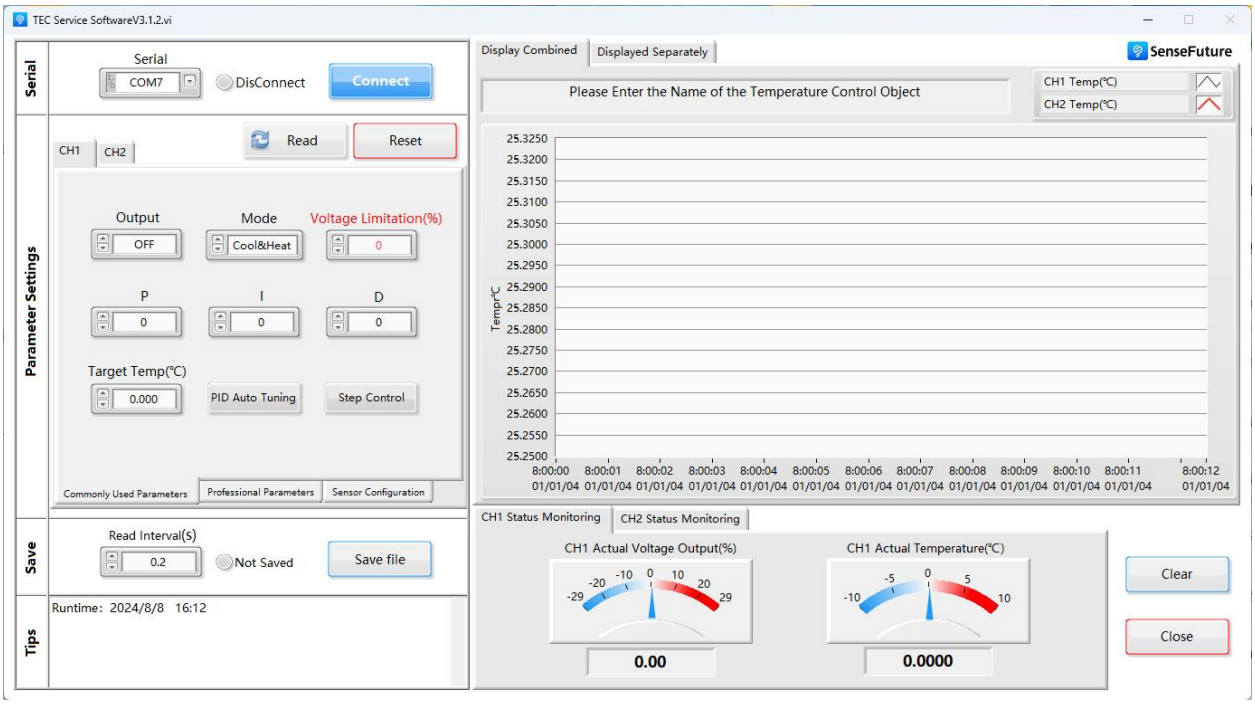


Figure5 Computer Software

Download：
https://drive.google.com/file/d/1-2Ruffh7yyJPImV5w0OIUB0lyTqhbeRD/view?usp=sharing

07 Instructional Video

【SenseFuture】±0.001℃ Temperature Controller (TEC207/215 Series) Instructions for Use —— DFB Laser Temperature Control
https://www.youtube.com/watch?v=yV1PcmtrX5Y

08 Selection Guide

Table3 Temperature Controllers Selection Guide

MODEL	STABILITY (℃)@20℃	SENSOR TYPES	CHANNELS	DRIVING CAPACITY @24V	POWER SUPPLY VOLTAGE(V)	FEATURES
TEC103L	±0.01	NTC	1	±3A	7-24	Single-channel, Compact
TEC103	±0.001					
TEC207L	±0.01	NTC PT1000	2	±7A each channel		Dual-channel, Medium Current
TEC207	±0.001					
TEC215L	±0.01			±15A each channel ±80A/Solid State Relay		Dual-channel, High-current, Solid State Relay
TEC215	±0.001					
TEC215 pro	±0.001	NTC PT1000 CCR Low Temperature Resistor				Dual-channel, High-current, Solid State Relay, Polynomial Temperature Calibration

Temperature Measurement Range and Sensitivity of Temperature Sensors Compatible with **TEC103/207/215**

Sensitivity	NTC (500k B4250)	NTC (100k B3950)	NTC (10k B3950)	NTC (1k B3470)	PT1000	PT100
≤±0.001℃	60~300℃	25~210℃	-20~150℃	-60~70℃	-200~800℃	——
≤±0.01℃	300~470℃	210~350℃	150~200℃	70~110℃	——	-200~800℃
≤±0.1℃	470~550℃	350~500℃	200~290℃	110~180℃	——	——

Temperature Measurement Range and Sensitivity of Temperature Sensors Compatible with **TEC103L/207L/215L**

Sensitivity	NTC (500k B4250)	NTC (100k B3950)	NTC (10k B3950)	NTC (1k B3470)	PT1000	PT100
≤±0.01℃	60~400℃	25~290℃	-20~180℃	-60~100℃	-200~800℃	——
≤±0.1℃	400~550℃	290~430℃	180~280℃	100~130℃	——	-200~800℃
≤±1℃	——	430~550℃	——	130~180℃	——	——

09 Customized Temperature Control System Services

We offer complete temperature control solutions, providing custom temperature control systems for institutions such as the National Institute of Metrology of China, the Anhui Institute of Optics and Fine Mechanics, Nanjing University, and Shenzhen University.

For customized temperature control systems, please contact our technical support at +86 191 2054 5883（WhatsApp ID same as phone number）

Attachment 1. Typical Application Cases

01 Gas Absorption Chamber Temperature Control Case

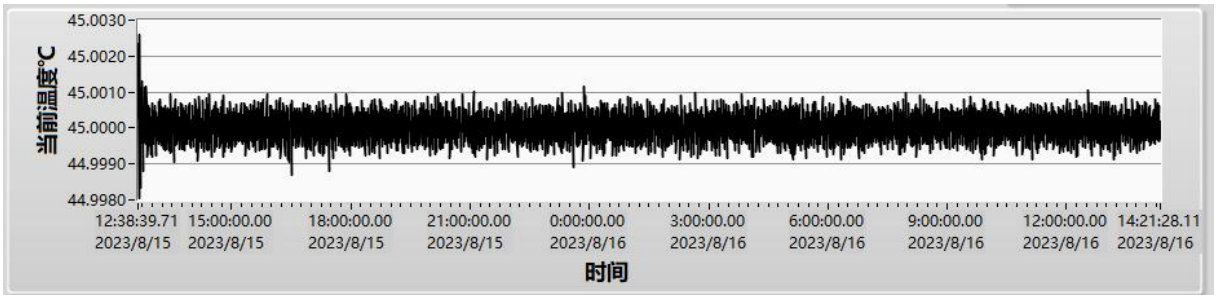
- **Temperature Control Object Information:** Aluminum alloy gas chamber measuring 80cm in length and 4.5cm in diameter, hollow interior, featuring inlet and outlet ports at both ends.
- **Temperature Sensor:** Accompanying NTC 10K B3950 temperature sensor provided by our company.
- **Heating/Cooling Device:** Thermoelectric cooler (TEC) supplied by our company operating at 12V and 6A.
- **Temperature Controller Brand and Model: *SenseFuture*™ TEC215.**
- **Target Temperature:** 45°C.
- **Temperature Controller Settings:** Power supply voltage is 12V with a maximum output voltage percentage of 80% (equivalent to 12V × 80% = 9.6V).

For Temperature Controller 1: PID parameters set as P = 100,000, I = 400, D = 0.
For Temperature Controller 2: PID parameters set as P = 50,000, I = 150, D = 0.

- **Measured Results:**

Achieved temperature control stability : ±0.001°C (over a 24-hour test period, with an ambient temperature variation of ±2°C.)
Temperature measurement stability : ±0.002°C (over a 24-hour test period, also under an ambient temperature fluctuation of ±2°C.)

(Need a specific solution? Please consult technical support for quotation at +86 191 2054 5883)



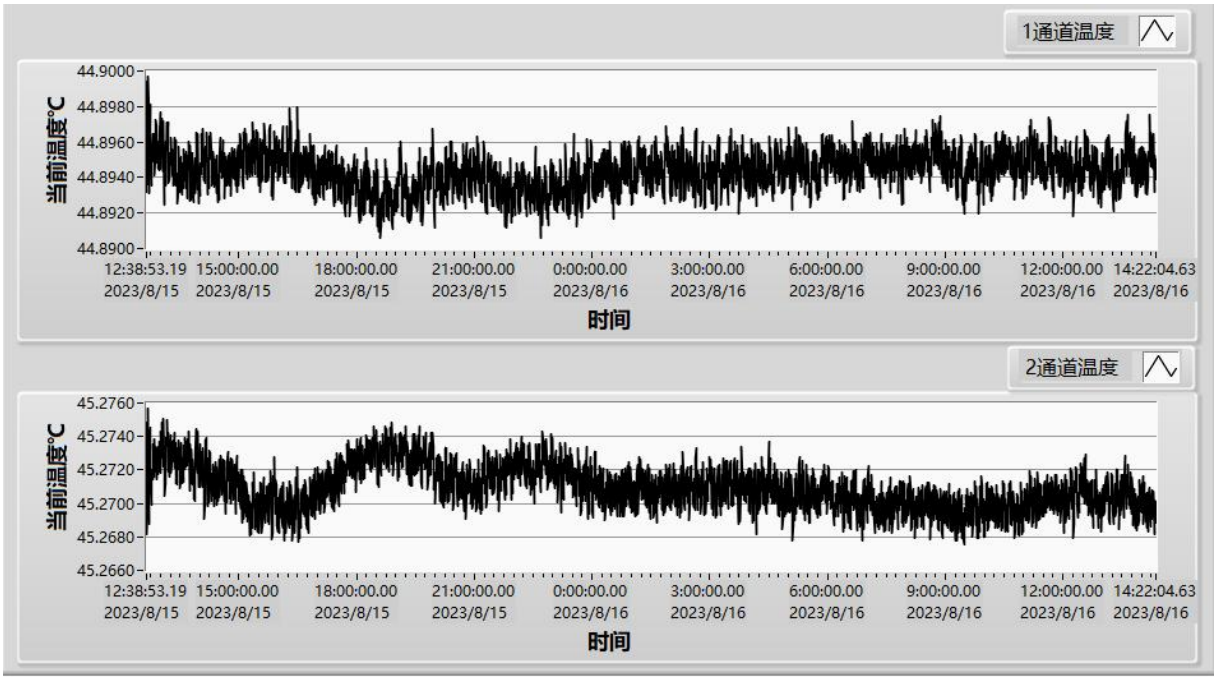


Figure Attached1.1 Temperature Control Data for the 80cm Gas Absorption Chamber (Top: Temperature Control Data; Middle and Bottom: Temperature Measurement Data for Inlet and Outlet Ports)

02 Copper Block Temperature Control Case

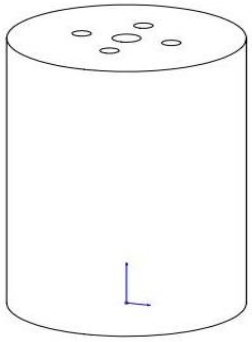


Figure Attached1.2 Uniform Temperature Copper Block

- **Temperature Control Object Information:** Uniform temperature copper block measuring 7cm in length and 5cm in diameter.
- **Temperature Sensor:** Accompanying NTC 10K B3950 temperature sensor provided by our company.
- **Heating/Cooling Device:** Heating film.
- **Temperature Controller Brand and Model: *SenseFuture*™ TEC215.**
- **Target Temperature:** 50°C.
- **Temperature Controller Settings:** Power supply voltage is 12V with a maximum output voltage percentage of 90% (equivalent to 12V × 90% = 10.8V).

For Temperature Controller 1, PID parameters are set as P = 80,000, I = 500, D = 0.

- **Measured Results:**

Achieved temperature control stability : ±0.0002°C (over a 6-hour test period, with an ambient temperature variation of ±2°C.)

Temperature measurement stability : ±0.001°C (over the same 6-hour test period, also under an ambient temperature fluctuation of ±2°C.)

(Need a specific solution? Please consult technical support for quotation at +86 191 2054 5883)

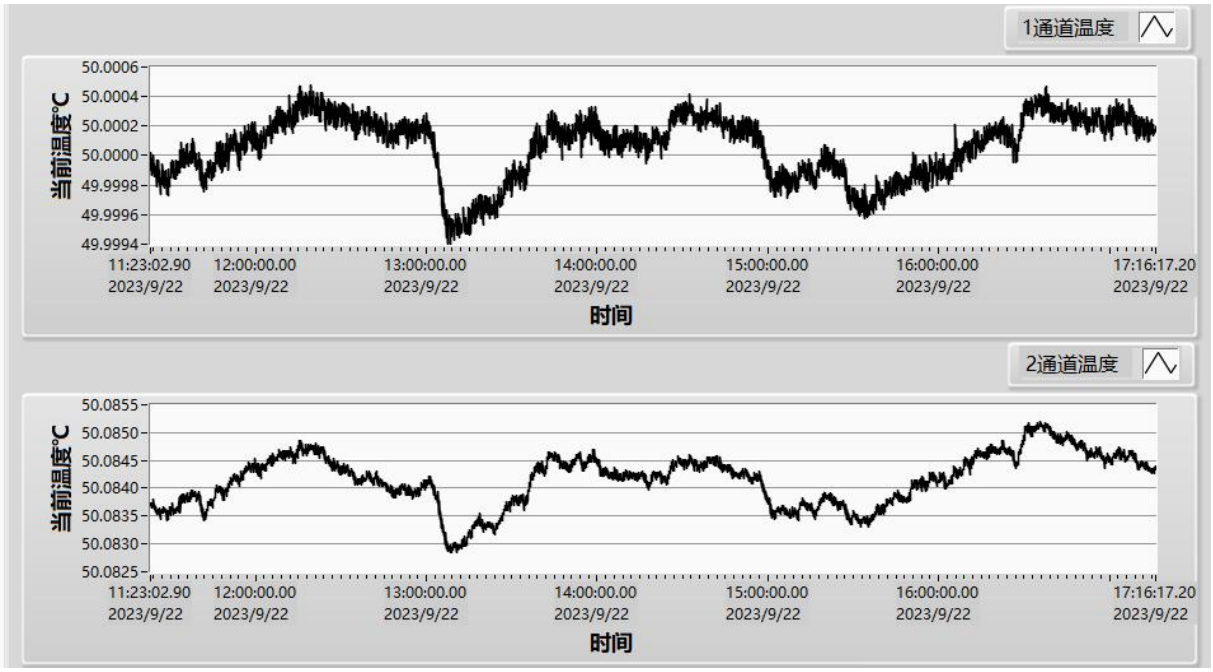


Figure Attached 1.3 Temperature Control and Measurement Data for the Uniform Temperature Copper Block (Top: Temperature Control Data; Bottom: Temperature Measurement Data)

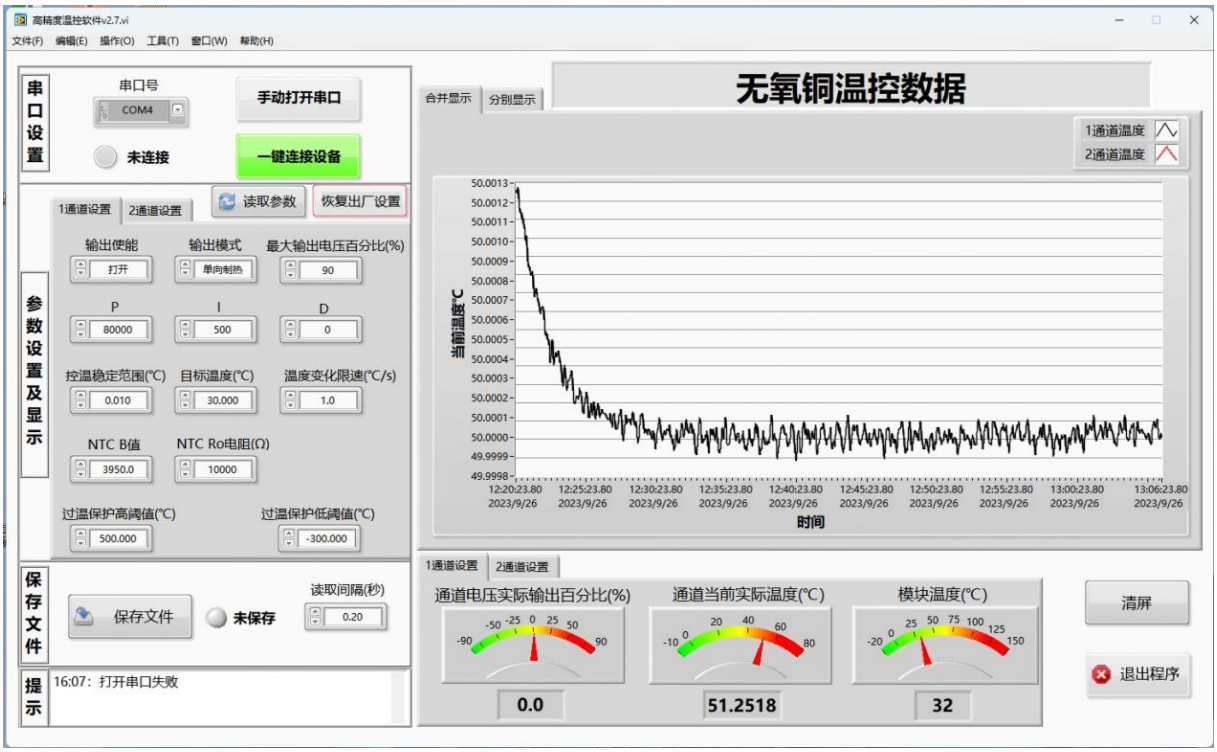


Figure Attached 1.4 Short-Term Temperature Control Data for the Uniform Temperature Copper Block

Partners

01 Universities and Research Institutes

清華大學 Tsinghua University
北京大學 PEKING UNIVERSITY
上海交通大學 SHANGHAI JIAO TONG UNIVERSITY
南方科技大学 SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY
中国科学院大学 University of Chinese Academy of Sciences
THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學
中国科学院半导体研究所 Institute of Semiconductors,Chinese Academy of Sciences
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SenseFuture

Original Aspiration Determines the Future, Innovation Creates Value, Sharing Unites Hearts.

Looking forward to achieving win-win cooperation with you!

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