User Manual for the T2 Series Temperature Controller

INS1850001 --V3.3

Compatible with the following models：

WS-T24

WS-T25

WS-T26

WS-T27

WS-T29

WS-T240

WS-T250

WS-T260

WS-T270

WS-T290

Catalogue

Chapter1 Product Overview

*To directly proceed to the operation, please skip to Chapter 9 menu operation process.

1.1 Product Introduction

T24: 1-channel temperature controller, 2 power supply options, supports multiple thermocouple/RTD signal inputs, 5 output types, 2 control outputs, with optional signal transmission and second alarm function;

T240: Programmable temperature controller, equivalent to the T24 but with the addition of a 32-segment temperature curve control function;

(The T240 supports only certain input types and does not support signal transmission, cooling mode, or a second alarm channel)

Applications: Both types of temperature controllers can be used in various scenarios requiring constant temperature, such as furnace temperature control, constant-temperature chambers, and agricultural cultivation;

Note: The T25, T26, T27, and T29 differ from the T24 only in size and wiring; they are collectively referred to as T24 and T240;

1.2 Product Features

1.2.1Compatible with various input signals, allowing flexible switching of menu parameters

1.2.2 RS485 interface, Bluetooth, and Modbus RTU protocol communication

1.2.3 T24 With cooling mode

WS- ① ② - ③ ④ ⑤ ⑥ ⑦ ⑧		
Serial number	Name	Description
①	Outline dimension (see table 1)	4: 48×48
		5: 48×96
		6: 96×48
		7: 72×72
		9: 96×96
②	Multi-segment program model	0
③	Power supply model	38: 380VAC
		22: 220VAC
		24: 24VACDC
		12: 12VACDC
④	Communication mode	N: null
		M: RS485 communication
		B: Bluetooth communication
⑤	Input type	0: thermocouple
		Z: thermal resistance
⑥	Main output	R: 5A relay
		Q: SSR driver
		I: 4-20mA output
		V: 0-10V output
		H: 30A relay
⑦	Auxiliary output	N: null
		Q: SSR driver
		I: 4-20mA output
		V: 0-10V output
⑧	Alarm mode	1: 1-channel alarm
		2: 2-channel alarm

Model	Face frame (W * H)	Outline dimension (W *H * D)	Panel cutout size (W * H)
T24	48*48	48*48*75	45±1×45±1
T25	48*96	48*96*75	45±1×92±1
T26	96*48	96*48*75	92±1×45±1
T27	72*72	72*72*75	68±1×68±1
T29	96*96	96*96*75	92±1×92±1

Tabel 1

Chapter 2 Specifications

2.1 Rated Specifications

Supply voltage		220VAC model：100VAC~240VAC，50/60Hz，rated power 5W 24VACDC model ： 24VAC/DC，50/60Hz，rated power 5W
Sensor input		Thermocouple：K、J、L(*2)、T(*2)、R(*2)、S(*2)、E PRT：PT100、CU50(*2)
Control method		PID control，manual control(*2)，ON/OFF control(*2)，process control（*1）
Control output	Relay output	Relay(5A 250VAC，electrical life：100000 operations)
	High-current relay output	Relay(30A 250VAC，electrical life：100000 operations)
	Voltage output for driving SSR	12VDC±20%，Maximum load current 20mA
	Analog current output	DC 4~20mA，Load below 500Ω，Resolution:1/1000
	Analog voltage output	DC 0~10V，Resolution:1/1000
Alarm output		Relay(5A 250VAC，electrical life:100000 operations)
Set method		Front panel button configuration and Modbus communication settings
Display mode		The front panel features two 4-digit display tubes and four status indicator lights.
RS485	Baud rate	Support 1200、2400、4800、9600、19200、38400
	Parity bit	Fixed without verification

	Data bit	Fixed 8
	Stop bit	Fixed 1
	Communication protocol	ModbusRTU
The use of ambient temperature		-5 ～ 40℃

(Note: *1: Specific to T240; *2: Specific to T24.)

2.2 Performance Parameter

Measurement range and accuracy	**Thermocouple Measurement Range** Type K: -50°C to 1200°C (+ cold-junction compensation temperature) Type J: -30°C to 800°C (+ cold-junction compensation temperature) Type L: -40°C to 800°C (+ cold junction compensation temperature) Type T: -50°C to 400°C (+ cold junction compensation temperature) Type R: 0°C to 1700°C (+ cold junction compensation temperature) Type S: 0°C to 1700°C (+ cold junction compensation temperature) Type E: -50°C to 800°C (+ cold junction compensation temperature) **Thermocouple Measurement Accuracy:** ±0.5% FS, excluding cold junction compensation error
	PT100 measurement range: -50~450°C; **PT100 measurement accuracy:** ±0.5%. **FSCU50 measurement range:** -50~200°C; **CU50 measurement accuracy:** ±0.5%.
Input sampling period	100ms
Proportional gain P	0.1 ～ +999.9（Unit: %）
Integration time I	0 ～ +999.9（Unit: seconds）
Rate time D	0 ～ +999.9（Unit: seconds）
Control cycle	0.1～ 99.9 Unit:S
Set alarm range	Determine based on the temperature range of the input type
Withstand voltage	AC3000V，(between the power terminal and other terminals of the 220V model) AC1500V，(between the power terminal and other terminals of the 24V model)
Memory protection	Non-volatile memory (Write cycles: 100,000 times)

Chapter 3 Product Display

Figure 3-1: Front view of the T2 series

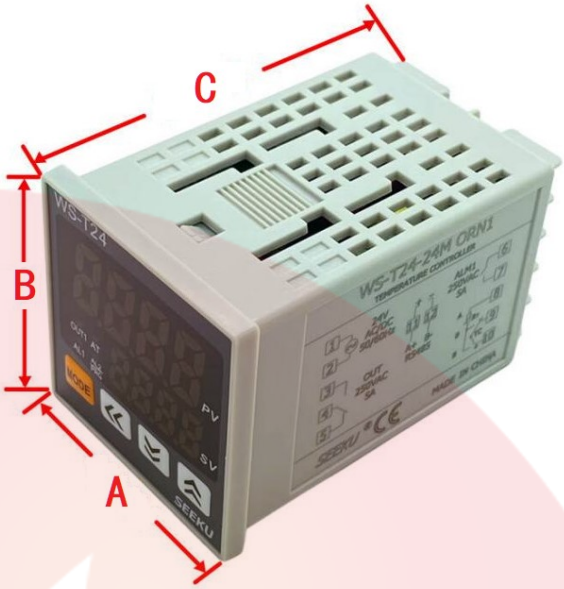


Figure 3-2 Thermostat Dimension Diagram

Model	A	B	C
T24	48	48	75
T25	48	96	75
T26	96	48	75
T27	72	72	75
T29	96	96	75

Figure 3-3 Thermostat Dimension Table (unit: mm)

Chapter 4 PID Self-Tuning and Temperature Control Curve Example

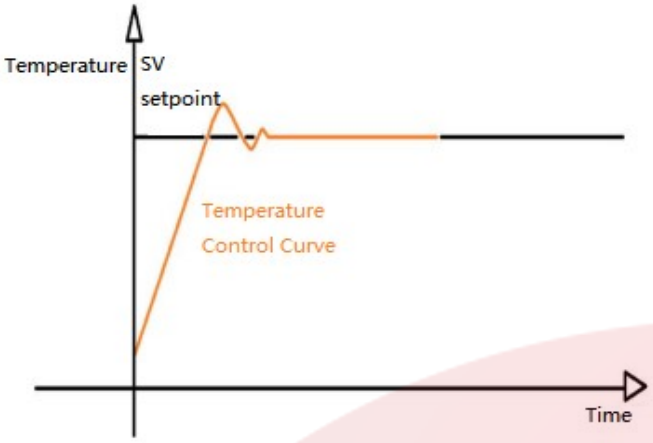


Figure 4-1 PID self-tuning demonstration curve

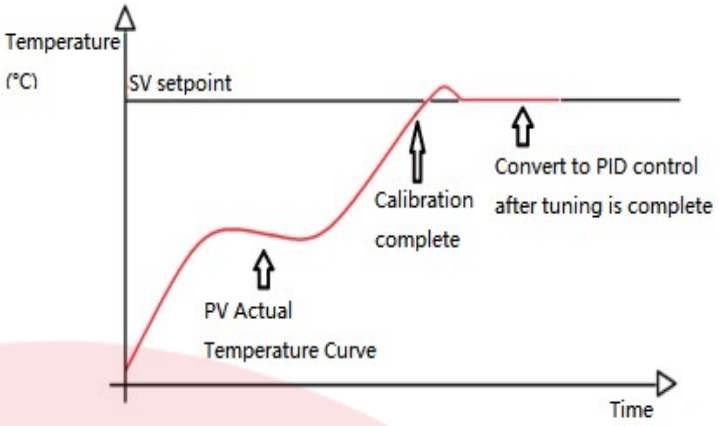
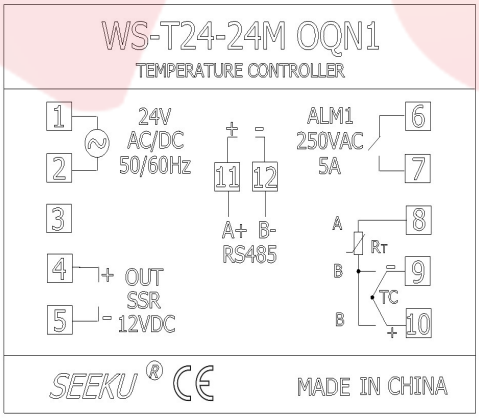
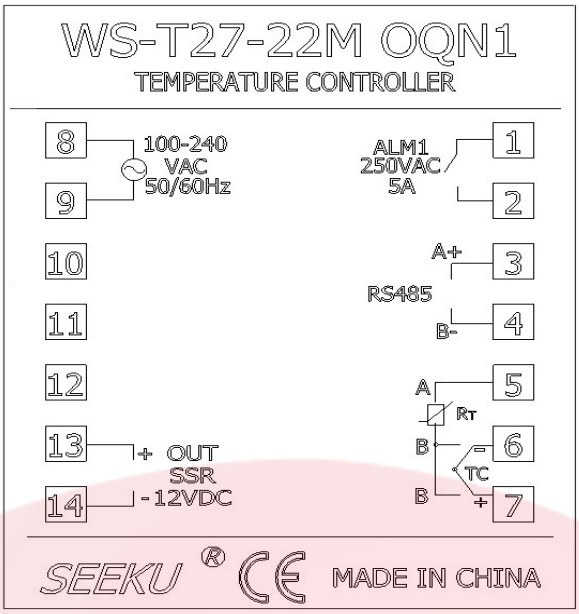


Figure 4-2 PID temperature control curve

Chapter 5 Wiring Diagram

The following wiring diagram represents a single model; refer to the actual casing wiring for specific details.





Chapter 6 Panel Description

6.1 Description of Each Point on the Panel

T24/T240	
	
①	Pilot lamp OUT1(First output) AT(Self-tune) AL1(First Channel Alarm) AL2/PRG(Second Channel Alarm/Program Mode)
②	PV (Actual temperature), displayed on the left digital display, in °C
③	PV(Actual temperature), corresponding to the left digital tube,

	unit: ℃
④	SV(Set temperature), corresponding to the left digital tube, unit: ℃
⑤	The multi-functional button, long press to enter 1 or 2 groups of menus, is used for saving and selecting menu parameters
⑥	Function key, set numerical carry for use
⑦	Value Decrease Button

Chapter 7 Alarming Parameter Description

7.1 Schematic diagram of alarm parameters

Both alarm configurations offer the same functionality, with two sets of parameters and output terminals.

Single-wire detection: Upper deviation alarm, lower deviation alarm, upper absolute value alarm, lower absolute value alarm.

Two-wire detection: Upper/lower deviation alarm, upper/lower deviation reverse alarm.

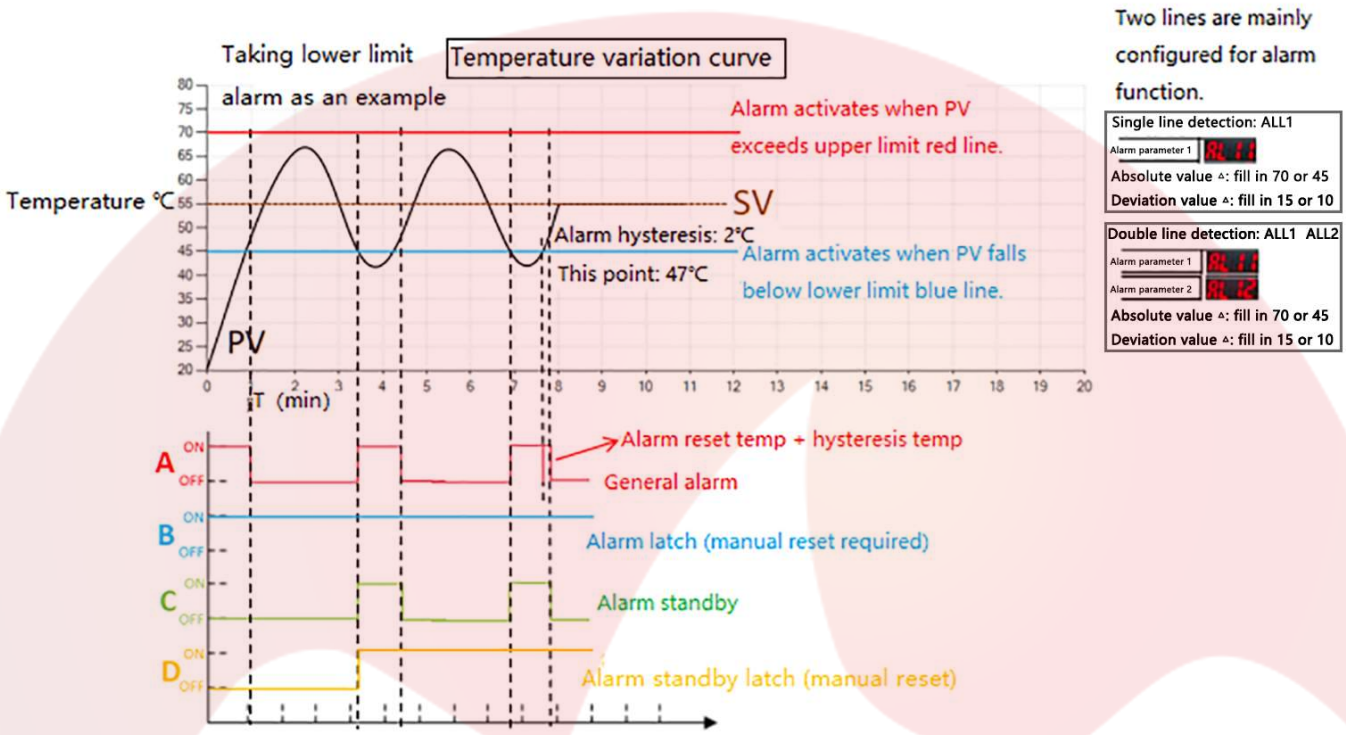
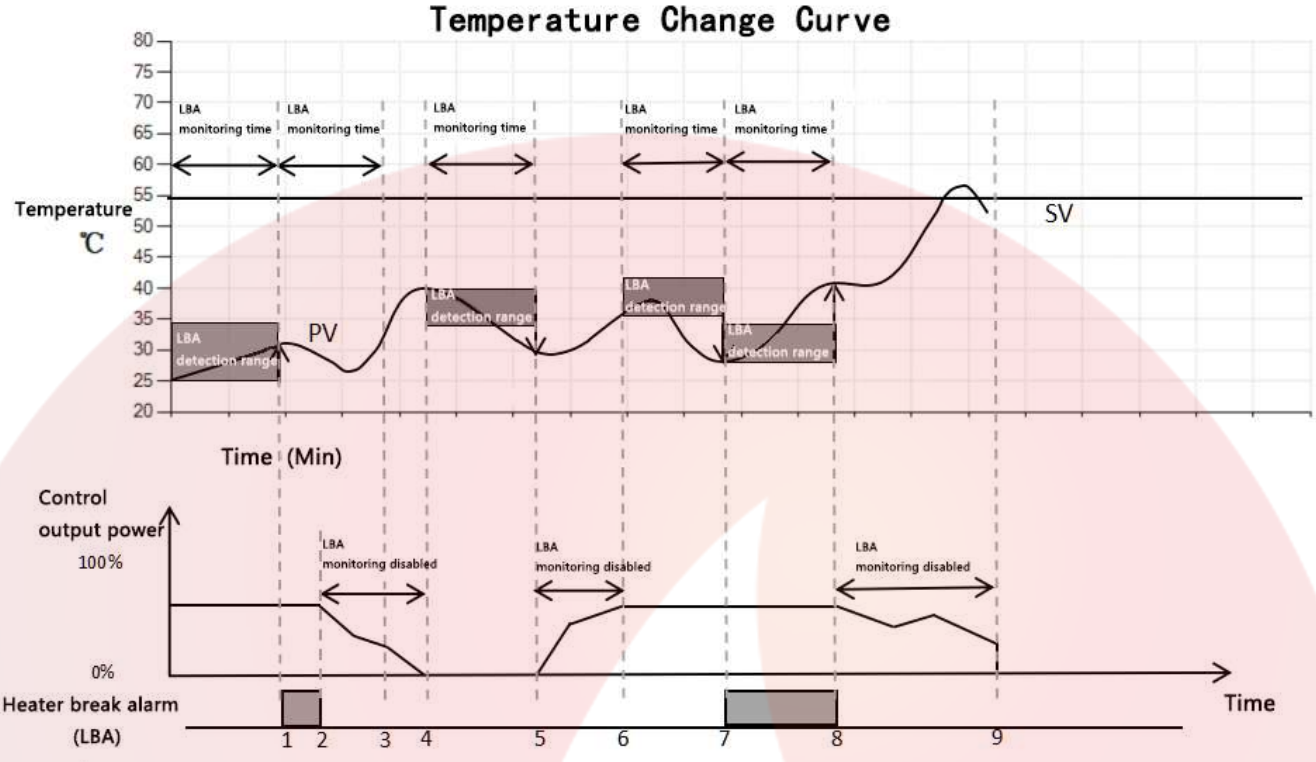


Figure 7-1 Schematic diagram of alarm parameters

7.2 Circuit Breaker Alarm

Based on changes in temperature and output, determine whether the control circuit is malfunctioning—for example, a damaged temperature sensor causing the heater to operate without raising the temperature, or a faulty heater preventing the temperature from increasing after activation.



Control Start – 1	Under 100% control output power state, PV temperature rise amplitude is lower than LBA detection threshold within LBA monitoring duration. After LBA monitoring duration elapses, Heater Break Alarm (LBA) is activated (ON).
1 – 2	Control Output Power is maintained at 100%, therefore Heater Break Alarm (LBA) remains ON.
2 – 4	Control Output Power Transition Status (LBA Monitoring Duration Reset)
4 – 5	Under 0% control output power state, PV temperature drop amplitude is higher than LBA detection threshold within LBA monitoring duration.
5 – 6	Control Output Power Transition Status (LBA Monitoring Duration Reset)
6 – 7	Under 100% control output power state, PV temperature rise amplitude is lower than LBA detection threshold within LBA monitoring duration. After LBA monitoring duration elapses, Heater Break Alarm (LBA) is activated (ON).
7 – 8	Under 100% control output power state, PV temperature rise amplitude is higher than LBA detection threshold within LBA monitoring duration. After LBA monitoring duration elapses, Heater Break Alarm (LBA) is deactivated (OFF).
8 – 9	Control Output Power Transition Status (LBA Monitoring Duration Reset)

Figure 7-2 Schematic diagram of alarm parameters

Chapter 8 Description of Multi-Stage Temperature Control Parameters

8.1 Composition and Parameters of Multi-stage Temperature Control Program

As shown in the figure below, a program consists of three types of segments: ramp, constant, and step. Each segment has two parameters: SP (the setpoint for the segment) and t (the duration of the segment).

Ramp segment: The SP value differs from the previous segment, and the duration is not zero. [Note: Segment 0 uses the PV at the start as its initial value.]

Constant-temperature segment: The SP value is the same as the previous segment, and the duration is not 0.

Step-change temperature segment: The SP value is different from the previous segment, and the duration is 0.

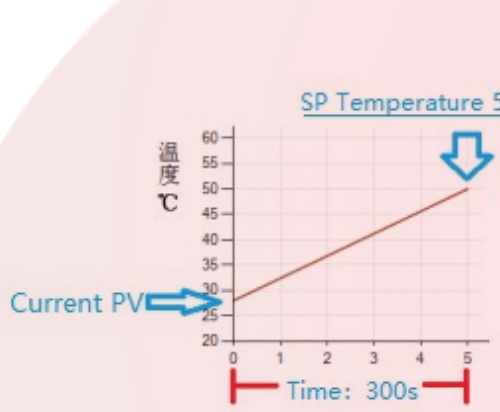


Figure 8-1-1 Slope

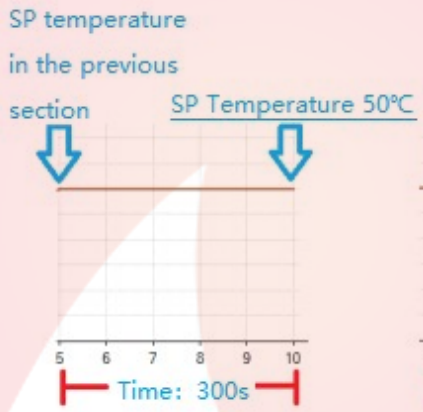


Figure 8-1-2 Constant Temperature

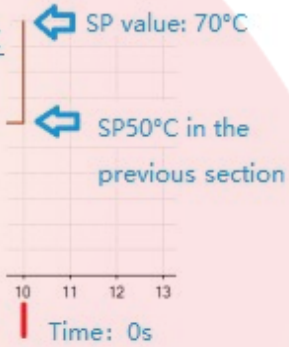


Figure 8-1-3 Step

8.2 According to the parameter settings shown in Figure 8-2-1, the set curve composed of the three aforementioned figures can be obtained as shown in Figure 8-2-2.

[Note: The companion host computer can be used for quick parameter setup.]

Used segments	4		
Time type	0		
SP0	500	T0	300
SP1	500	T1	300
SP2	700	T2	0
SP3	700	T3	300

Figure 8-2-1 Parameter Settings

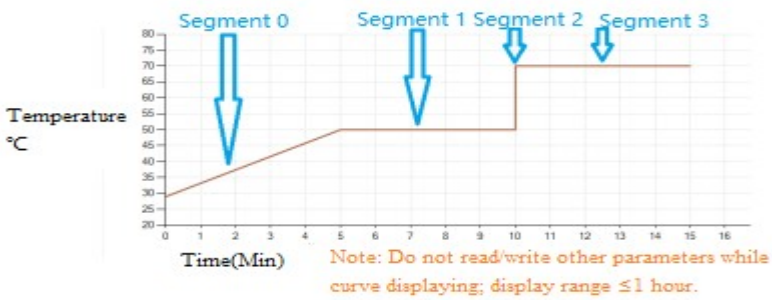


Figure 8-2-2 Set Temperature Curve

8.3 Explanation of poor multi-stage temperature control performance

[The red line is the actual temperature curve, and the blue line is the set curve.]

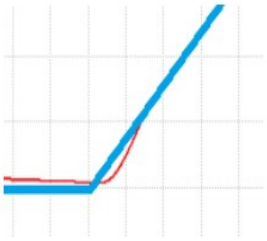


Figure 8-3-1: The Speed Is Too Fast

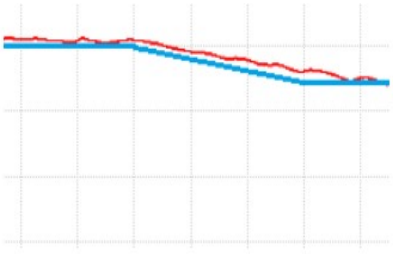


Figure 8-3-2: The Speed Of Descent Is Too Fast

Figure 8-3-1: When the heating response is slow or the set curve rises too rapidly, the temperature will not match the set curve.

Figure 8-3-2: When the set curve declines faster than the natural cooling rate, uncontrollable conditions may occur.

Chapter 9 Menu Operation Process

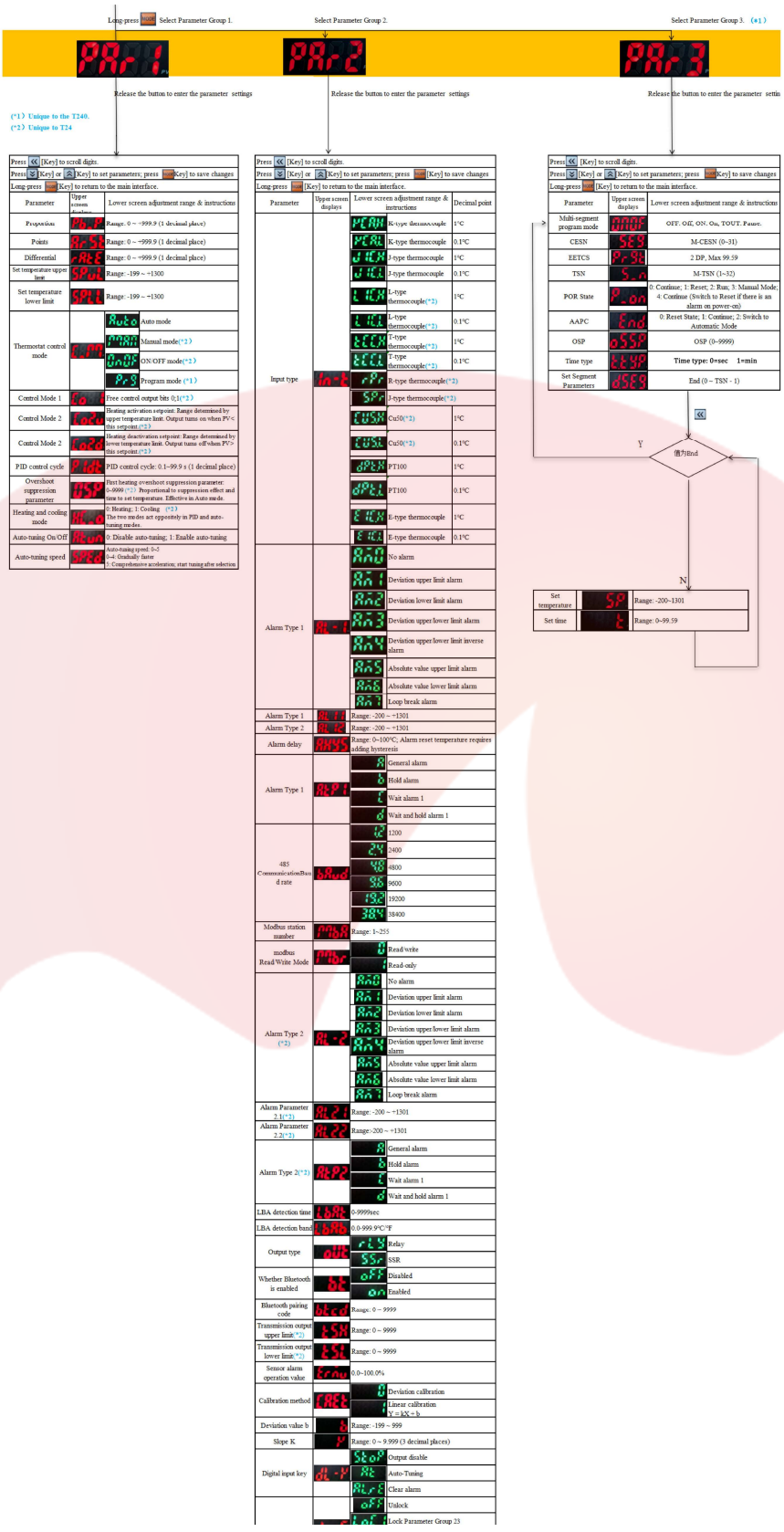


Figure 9-1 T24/T240 Menu Operation Flowchart

Chapter 10 Quick Use of Thermostat

10.1 Self-tuning operation[Before use, do not power on the heating device to prevent it from starting to heat before all parameters are set.]

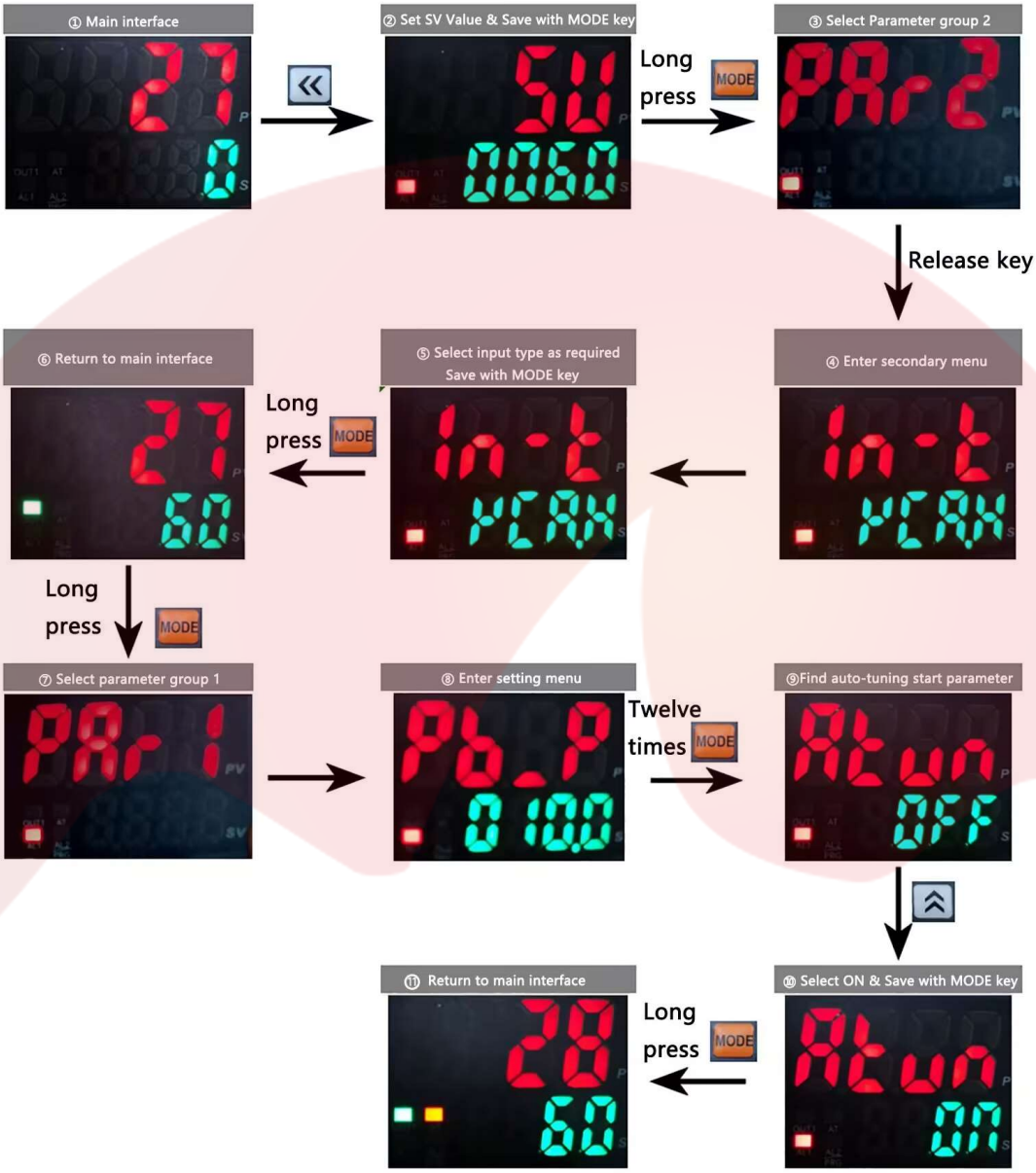


Figure 10-1 Self-tuning operation flowchart

Note: 1. The flowchart is based on T24; the number of MODE button presses in T240 may vary.

2. Calibration cannot initiate (i.e., the AT indicator does not illuminate). Refer to Section 11.5 of Chapter 11 on Common Abnormalities for solutions.

10.2 The T240 program mode has been changed to automatic mode. [This is the factory default program mode; self-calibration must be performed in automatic mode.]

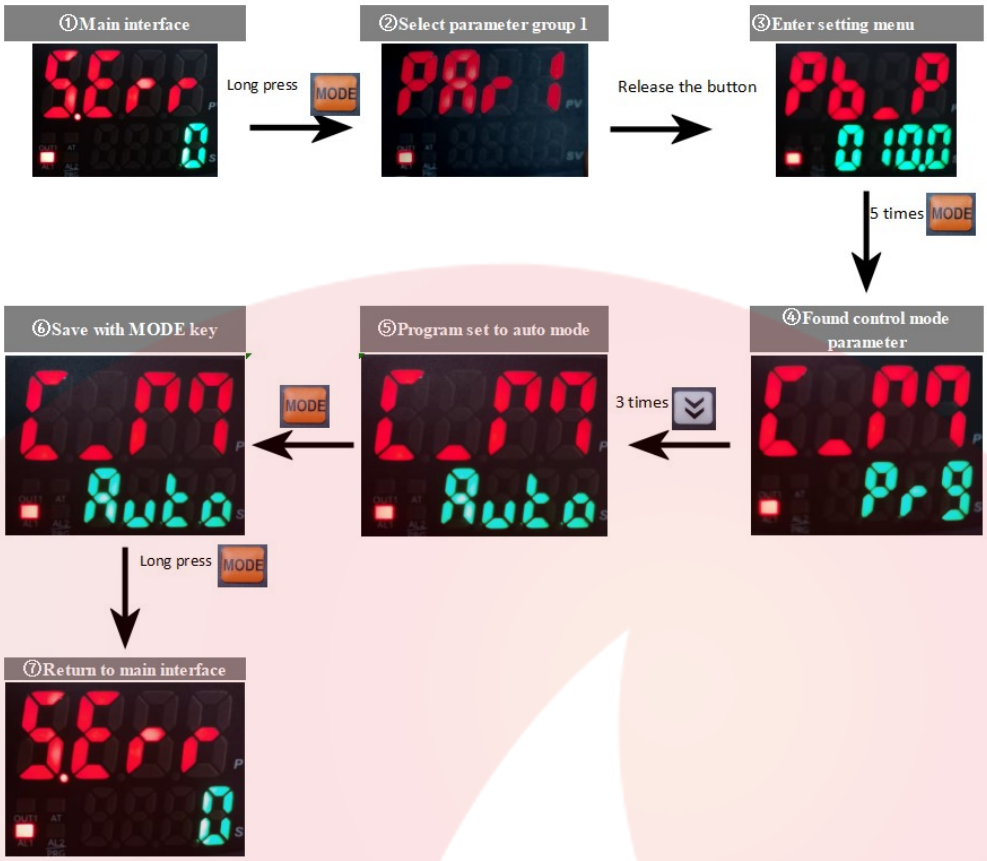


Figure 10-2 Flowchart of Changing Control Mode Operation

10.3 T240 Multi-Stage Parameter Settings [The process for modifying multi-stage parameters via the panel based on the temperature curve; rapid modification can also be performed through the host computer]

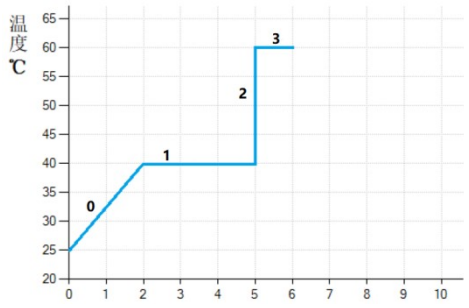


Figure 10-3-1 Temperature Curve

Figure 10-3-2 Upper PC: Multi-Segment Params Modify

Figure10-3-3 T240 Multi-Segment Params Setting Flowchart

Chapter 11 Common Abnormalities

11.1 The power-on device shows no response, and the digital display does not light up.

Solution: a. Check if the power port is connected incorrectly and ensure the power cable is securely connected;

b. For 24VDC, verify that the positive and negative terminals are connected correctly.

11.2 The power-on digital display shows S.ERR flashing

Solution: a. Check whether the input wiring is correct;

b. Check if the menu parameter 'inpt' is selected incorrectly; c. Check if the probe is damaged.

11.3 Test Data Jump

Solution: a. Check whether the input signal is stable;

b. Check if the terminals are loose;

11.4 Temperature fluctuations in thermocouples are normal; during operation, the heating of the plate causes minor fluctuations in cold-end compensation.

Solution: It will stabilize within 10 minutes.

11.5 Self-tuning cannot be initiated; the AT indicator light does not illuminate.

Solution: a. Check if the input signal is incorrect and verify for any line break alarms;

b. The temperature difference between PV and SV is too small—maintain at least a 15°C gap.

Chapter 12 Warranty Terms

12.1 Warranty period: 12 months

The product provides a one-year warranty period from the date of shipment, and our company will provide free repair service for the product during the warranty period.

12.2 Not covered by warranty

- Improper wiring, such as connecting the power cord to the wrong terminal;
- Use outside voltage range or environmental requirements;
- Use outside voltage range or environmental requirements;

For more product information,
scan the QR code to watch the video
or visit the official website.

Video QR Code

Official website QR code