

# Intelligent Temperature Controller User Manual

Applied for ST311A-A version



## Features

- Multi input signal and multi models for option.
- With measured display, control output function
- Multi PID algorithms for option, with auto tune function.
- This product can be used in industrial machinery, machine tools, general measuring instruments and equipment.

National High-tech Enterprise/ National Standard Drafting Unit



Hotline: 400-8866-986

Version: KKST311A-A01E-A/0-20250710

The instruction explain instrument settings, connections,name and etc, please read carefully before you use the temperature controller. Please keep it properly for reference when necessary.

## I. Safe Caution

### ⚠ Electric-shock

- Please don't plug in before completing all the wire. Otherwise it may lead to electric shock, fire, fault.
- Don't touch power terminal and other high voltage part when the power on, otherwise you may get an electric-shock.
- Don't remove, repair and modify this product, otherwise it may lead to electric shock, fire, fault and electrical Danger

### 🚫 Forbiddance

- Not allow to use outside the scope of product specification, otherwise it may lead to fire, fault.
- Don't use it in places with flammable and explosive gases.
- This product should not be used in atomic energy equipment and medical devices related to human life.

### ⚠ Attention

- When the failure or abnormality of this product may lead to serious system accidents, please set proper protection circuits in the external.
- The product may occur radio interference when it used at home. You should take adequate countermeasures.
- The product get an electric shock protection through reinforced Insulation. When the product is embedded in the devices and wiring, please subject to the specification of embedded devices.
- In order to prevent surge occurs, when using this product in the place of over 30m indoor wiring and wiring in outdoor, you need to set the proper surge suppression circuitry.
- The product is produced based on mounting on the disk. In order to avoid to touch the wire connectors, please take the necessary measures on the product.
- Be sure to observe the precautions in this manual, otherwise there is a risk of a major injury or accident.
- When wiring, please observe the local regulation.
- To prevent to damage the machine and prevent to machine failure, the product is connected with power lines or large capacity input and output lines and other methods please install proper capacity fuse or other methods of protection circuit.
- Please don't put metal and wire clastic mixed with this product, otherwise it may lead to electric shock, fire, fault.
- Please tighten screw torque according to the rules. If not, it may lead to electric shock and fire.
- In order not to interfere with this products to dissipate heat, please don't plug casing around the cooling vent hole and equipment.
- Please don't connect any unused terminal.
- Please do the cleaning after power off, and use the dry cleaning cloth to wipe away the dirt. Please don't use desiccant, otherwise, it may cause the deformation or discoloration of the product.
- Please don't knock or rub the panel with rigid thing.
- The readers of this manual should have basic knowledge of electrical, control, computer and communications.
- The illustration, example of data and screen in this manual is convenient to understand, instead of guaranteeing the result of the operation.
- In order to use this product with safety for long-term, regular maintenance is necessary. The life of some parts of the equipments are by some restrictions, but the performance of some will change for using many years.
- Without prior notice, the contents of this manual will be change. We hope these is no any loopholes, if you have questions or objections, please contact us.

### ⚠ Caution of Installation

#### 1. Installation

- This product is used in the following environmental standards.  
(IEC61010-1) [Overvoltage category II, class of pollution 2]
- This product is used in the following scope: environment, temperature, humidity and environmental conditions. Temperature: 0~50°C; humidity: 45~85%RH; Environment condition: Indoor. The altitude is less than 2000m.

#### 3) Please avoid using in the following places:

The place will be dew for changing temperature; with corrosive gases and flammable gas; with vibration and impact; with water, oil, chemicals, smoke and steam facilities with dust, salt, metal powder; and with clutter interference, static electric and magnetic fields, noise; where has air conditioning or heating of air blowing directly to the site; where will be illuminated directly by sunlight; where accumulation of heat will happen caused by radiation.

#### 4) On the occasion of the installation, please consider the following before installation.

In order to prevent heat saturated, please open enough ventilation space. Please consider connections and environment, and ensure that the products below for more than 50mm space.

Please avoid to installed over the machine of the calorific value (Such as heaters, transformer, semiconductor operations, the bulk resistance). When the surrounding is more than 50°C, please using the force fan or cooling fans. But don't let cold air blowing directly to the product.

In order to improve the anti-interference performance and security, please try to stay away from high pressure machines, power machines to install.

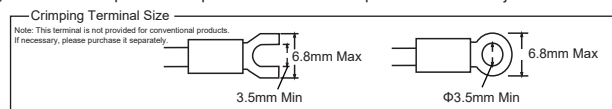
Don't install on the same plate with high pressure machine and the product.

The distance should be more than 200mm between the product and power line.

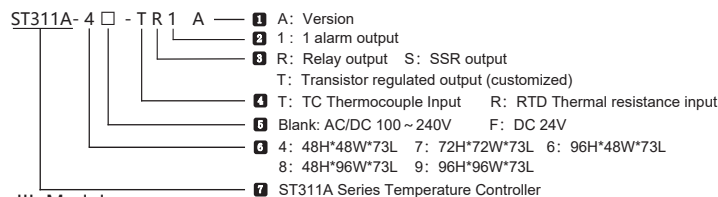
Please install the power machine as far apart as possible.

### ⚠ Caution of Connection

- Please use specified compensation wire in the place of TC input; Please use insulated TC if the measured device is heated metal. The influence of external resistance is about 0.3 μV/Ω.
- Please use the cable with small wire resistance in the place of RTD input, and the cable (3 wire) must be no resistance difference. The wire should be run in parallel and the resistance of a single wire should be less than 10 Ω.
- In order to avoid the effect of noise, please put the input signal away from meter cable, power cable, load cable to wiring.
- In order to reduce the power cables and the load power cables on the effect of this product, please use noise filter in the place where easy to effect. You must install it on the grounding of the disk if you use the noise filter, and make the wiring to be shortest between noise filter output side and power connectors. Don't install fuse and switch on the wiring of noise filter output side, otherwise it will reduce the effect of noise filter.
- It takes 5s from input power to output. If there is a place with interlocking actions circuit signal, please use timer relay.
- Please use twisted pair with a shield for analog output line, can also connect the common-mode coil to the front-end of the signal receiving device to suppress line interference if necessary, to ensure the reliability of signal.
- Please use twisted pair with a shield for remote RS485 communication cable, and deal with the shield on the host side earth, to ensure the reliability of signal.
- This product don't have the fuse; please set according to rated voltage 250V, rated current 1A if you need; fuse type: delay fuse.
- Please use suitable screw force and suitable crimping terminal  
Terminal screw size: M3X8 (with 6.8X6.8 square meson)  
Recommended terminal tightening torque: 0.4N.m.  
Proper cables: 0.25 ~ 1.65mm single cable/multiple core cable
- Please don't put the Crimp terminal or bare wire part contact with adjacent connector.



## II. Model Illustration



## III. Models

No.	Model	Input		Control Output		Alarm output	Power Supply	
		TC	RTD	RELAY	SSR	AL1 (OUT2)	AC/DC 100 ~ 240V	DC 24V
1	ST311A-□-TR1	●		●		●	●	
2	ST311A-□-TS1	●			●	●	●	
3	ST311A-□-RR1		●	●		●	●	
4	ST311A-□-RS1		●		●	●	●	
5	ST311A-□F-TR1	●		●		●		●
6	ST311A-□F-TS1	●			●	●		●
7	ST311A-□F-RR1		●	●		●		●
8	ST311A-□F-RS1		●		●	●		●

## IV. Specifications

### 1. Electrical parameters:

Sample rate	2 times per second
Relay capacity	AC 250V /3A lifespan of rated load>100,000 times
Power supply	AC/DC 100 ~ 240V (85-265V) ,DC 24V
Power consumption	< 6VA
SSR output	DC 24V pulse voltage, load<30mA
Insulation impedance	Input, output, power VS meter cover > 20MΩ
ESD	IEC/EN61000-4-2 Contact ±4KV /Air ±8KV perf.Criteria B
Pulse triaip anti-interference	IEC/EN61000-4-4 ±2KV perf.Criteria B
Surge immunity	IEC/EN61000-4-5 ±2KV perf.Criteria B
Voltage drop & short interruption immunity	IEC/EN61000-4-29 0% ~ 70% perf.Criteria B
Isolation voltage	Signal input, output, power: 3000VAC 1min, <60V low voltage circuit: DC500V, 1min
Power failure memory	10 years, times of writing: 1 million times

### 2. Non Electrical parameters:

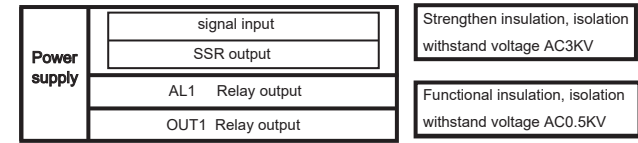
Protection level	IP65(IEC60529)
Safety Standard	IEC61010-1 Overvoltage category II, pollution level 2, level II (Enhanced insulation)
Shell material	Shell and panel base frame PC / ABS (flame retardant UL94V-0)
Panel Material	PC
Total weight	About 400g
Storage Environment	-10 ~ 60°C, no condensation
Environment	Indoor use only, temperature: 0~50°C no condensation, humidity < 85%RH, altitude<2000m

3. Measured signal specifications :

Model	Input type	Symbol	Measuring range	Resolution	Accuracy (25°C±5°C)	Input impedance/auxiliary current
T311A-□ -T□□	K1		-50 ~ 1200	1°C	0.3%F.S±1°C	>500KΩ
	K2		-50.0 ~ 999.9	0.2°C	0.3%F.S±1°C	>500kΩ
	J1		0 ~ 1200	1°C	0.3%F.S±1°C	>500KΩ
	J2		0.0 ~ 999.9	0.2°C	0.3%F.S±1°C	>500KΩ
	E1		0 ~ 850	1°C	0.3%F.S±1°C	>500KΩ
	E2		0.0 ~ 850.0	0.3°C	0.3%F.S±1°C	>500KΩ
	T1		-50 ~ 400	1°C	0.3%F.S±1°C	>500KΩ
	T2		-50.0 ~ 400.0	0.4°C	0.3%F.S±1°C	>500KΩ
	B		250 ~ 1800	1°C	0.5%F.S±2°C	>500KΩ
	R		-10 ~ 1700	1°C	0.5%F.S±2°C	>500KΩ
	S		-10 ~ 1600	1°C	0.5%F.S±2°C	>500KΩ
	N1		-50 ~ 1200	1°C	0.3%F.S±1°C	>500KΩ
	N2		-50.0 ~ 999.9	0.2°C	0.3%F.S±1°C	>500KΩ
	PT100-1		-200.0 ~ 600.0	0.2°C	0.3%F.S±1°C	0.2mA
T311A-□ -P□□	PT100-2		-200 ~ 600	1°C	0.3%F.S±1°C	0.2mA
	JPT100-1		-200.0 ~ 500.0	0.2°C	0.3%F.S±1°C	0.2mA
	JPT100-2		-200 ~ 500	1°C	0.3%F.S±1°C	0.2mA
	CU50-1		-50.0 ~ 150.0	0.2°C	0.5%F.S±3°C	0.2mA
	CU50-2		-50 ~ 150	1°C	0.5%F.S±3°C	0.2mA
	CU100-1		-50.0 ~ 150.0	0.2°C	0.5%F.S±3°C	0.2mA
	CU100-2		-50 ~ 150	1°C	0.5%F.S±3°C	0.2mA
	CU100-2		-50 ~ 150	1°C	0.5%F.S±3°C	0.2mA

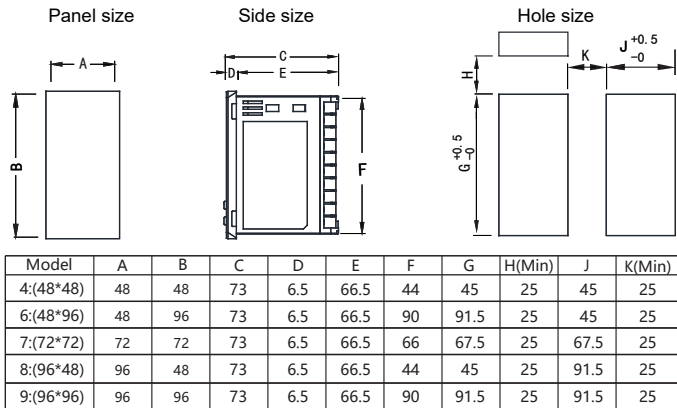
\*: Need to choose the input signal requirement when make the order.

4 . Isolation diagram:



V. Dimension

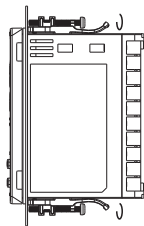
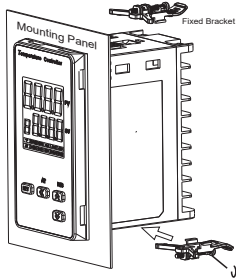
1. Overall dimensions and hole dimensions



2. Installation of fixed bracket (take size 6 as an example)

Installation Diagram

Finished Installation Diagram



● Installation method: You need to embed the instrument in the pre-opened installation hole, then place the fixing bracket on the installation slot of the instrument shell, and push the bracket toward the panel until the instrument is clamped (the operation is as shown in the installation diagram). If it is not tight enough, tighten the fixing screws.

● Disassembly method: Loosen the fixed screws first, tilt up the tail of fixed frame, and let the fixing frame's clamping teeth separate from the shell clamping teeth; then exit the fixing frame. Remove the meter from the hole embedded in the meter housing.

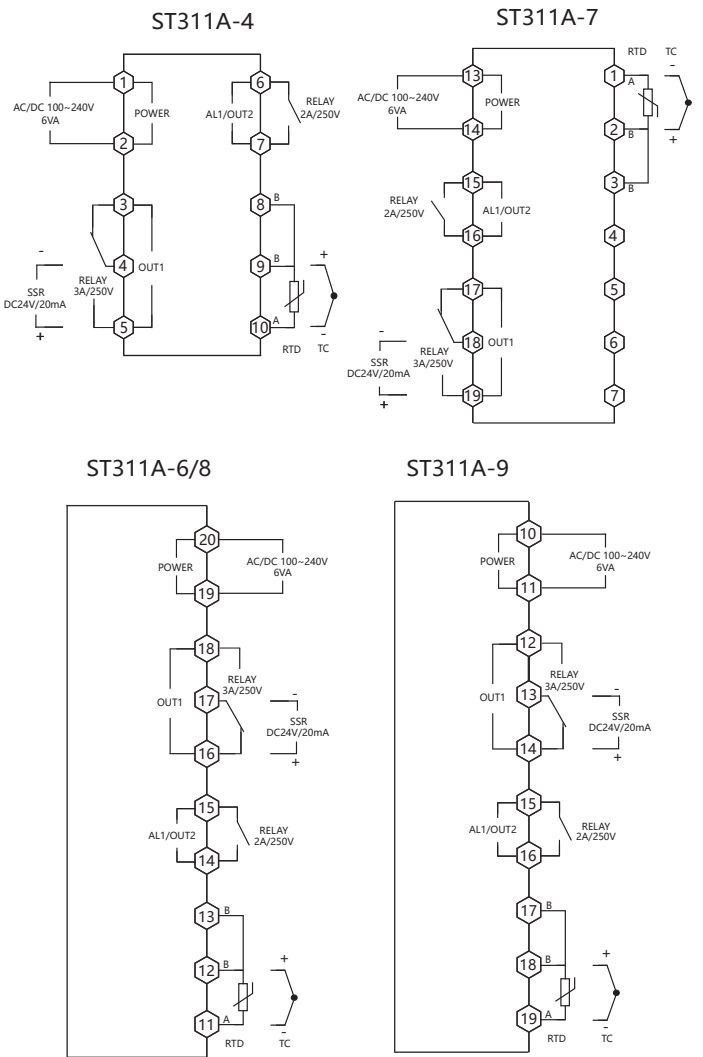
3. Installation protection instructions: (take size 6 as an example)

Waterproof gasket



The product is equipped with a waterproof gasket. Make sure the front panel protection grade reaches IP54 protection level, waterproof gasket must be installed on the product.

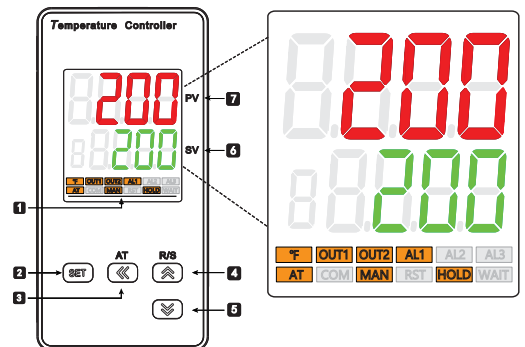
VI. Connection



Wiring diagram symbols and function descriptions

Type	Symbol	Explain	Function Description
Input	TC	thermocouple	Thermocouple input. Distinguish positive and negative. Supports K, J, E, T, N, R, S, B thermocouples etc., and it can be switched through the INP menu.
Input	RTD	thermal resistance	Thermal resistance input. Generally, it is a three wire, two B wires is the same color. A and B wires connect with thermistors. When using a two wire sensor, it is necessary to short circuit B to B. Supports PT100, CU100, CU50, and INP menu switching.
Alarm 1/ Second output	AL1/OUT2	COM Port NO normally open	When acting as AL1, adjust the AL1, AD1, and HY1 parameters. When acting as OUT2 cooling output, set the OT to 3PID for heating and cooling, the AL1 function does not work during cooling control, and the related alarm 1 menu is hidden.
Relay output	OUT1 RELAY	COM Port NO normally open NC normally Close	OUT1 use as the control terminal for relay output, set through OT and ACT. COM common terminal, NO normally open, NC normally closed.
SSR output	SSR	+Positive - Negative	OUT1 use as the control terminal for SSR output, set through OT and ACT

VII. Panel Illustration



No.	Symbol	Name	Function
1	°F/°C	°F/°C (orange)	Temperature unit selection
	OUT1	OUT1 (orange)	Main control output indicator, lights on when output ON
	OUT2	OUT2 (orange)	Cooling output indicator, lights on when output ON.

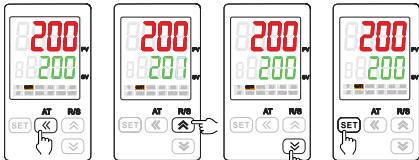
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No.	Symbol	Name	Function
1	AL1	Alarm 1# (orange)	1st alarm output indicator, lights on when alarm output, lights off when no alarm output.
	AT	AT indicator (orange)	Auto tune indicator, lights on when it is under auto tune status.
	MAN	MAN(orange)	Manual mode light, when light on, it is manual control mode (some sizes do not have this light)
	HOLD	HOLD(orange)	Hold light, and when it is light on, it is in a thermal insulation state (some sizes do not have this light)
2	SET	SET key	Menu key/confirm key, to enter or exit the modification mode, or to confirm and save the modified parameter.
3	⏪	Shift/AT key	Activate key/ shift key/ AT auto tune key (in measure and control mode, long press to enter/exit auto tune)
4	➡	Add key/R/S	Add key, in measure and control mode, long press to shift RUN/STOP mode, or check the menu in reverse order.
5	⏩	Reduce key	Reduce key, check the menu in sequence
6	SV	Display (green)	Set value / parameter display window, the control is stopped when it displays "STOP"
7	PV	Display (white)	Measured value/ parameter code display window

## VIII. Operation process and menu illustration

## 1. Operation process &amp; method

## 1). Modify SV Value



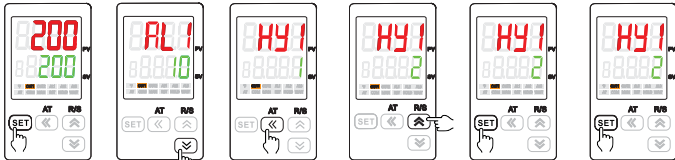
Press "K"  
SV value twinkle

Press "▲"  
increase SV value

Press "▼"  
reduce SV value

Press "SET"  
Save SV value

## 2). Set Common menu



Press "SET" > 3s  
enter to Common menu

Press "▲" or "▼"  
switch menu

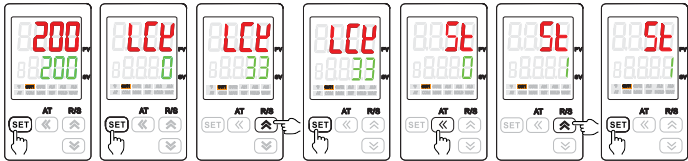
Press "K"  
parameter twinkle

Press "▲" or "▼"  
modify parameters

Press "SET"  
save parameters

Press "SET" > 3s  
Exit the menu

## 3). Set Advanced menu



Press "SET" > 3s  
enter to Common menu

Press the "SET"  
switch to LCK menu

SET LCK=33

Press "SET"  
enter to Advanced menu

Press "K"  
parameter twinkle

Press "▲" or "▼"  
modify parameters

Press "SET"  
save parameters

## 2. Operation examples

## 1) Example 1, ON/OFF control:

Sensor: K type, measure range -50~1300°C; target temperature: 100°C; control mode: heating; control requirement: ON/OFF control, when current temperature PV reaches 100°C, stop heating; when PV is lower than 98°C, start heating again; control output: relay; alarm: 1 alarm, when PV>110°C, alarm output on; when PV<105°C, alarm output off.



1. Set target temperature SV=100

2. Set menu INP=K1

3. Set menu OT=0

4. Set menu DB=2

5. Set menu AL1=110

6. Set menu HY1=5

7. Set menu AD1=1

## 2) Example 2, PID control:

Sensor: PT100, measure range -200~600°C; target temperature: 150°C; control mode: heating; control requirement: PID control (note: in order to get stable temperature control, please use the auto-tuning function when the controller is powered on for the first time; if the temperature control is stable after the auto tuning, there is no need to repeat this step in the future.); control output: SSR; alarm: 1 alarm, when PV>SV+5°C, alarm output on, when PV<SV-2°C, alarm output off.



1. Set target temperature SV=150

2. Set menu INP=pt

3. Set menu OT=1

4. Set menu OVS=5

5. Set menu AL1=5

6. Set menu HY1=7

7. Set menu AD1=3

## IX. Menu Illustration

□ No matter what model, what control mode it is, it will always display these parameters.

■ According to different model, control mode, there are some hidden parameters.

## 1. Regular Menu

No.	Symbol	Name	Illustration	Setting range	Factory setting
1	AL1	AL1	1st alarm value, attached (1) alarm parameters and output logic diagram	FL ~ FH	10
2	HY1	HY1	1st alarm hysteresis, attached (1)	0 ~ 1000	1
3	AD1	AD1	1st alarm mode, note: when AL1 is used as OUT2 (cooling output), this menu is invalid. When AD1>7, the 1st alarm needs to be used with AL2 and HY2. Attached (1)	0 ~ 13	3
4	ATH	ATH	The alarm triggering condition for insulation mode, when AD1=7; alarm output turns on 0001: Alarm when insulation is completed; 0100: Alarm when the temperature exceeds the effective range [SV-THR, SV+THR] during the insulation process. 0100: Alarm at the beginning of insulation, can be used for feeding reminders after preheating; The above alarm methods can be freely combined, and alarm function will be triggered when any condition is met.	0, 1, 10, 11, 100, 101, 110, 111	1

Continued

No.	Symbol	Name	Illustration	Setting range	Factory setting
5	AL2	AL2	1st alarm value 2, when AD>7, it is turned on, attached (1)	FL ~ FH	5
6	HY2	HY2	1st alarm hysteresis 2, when AD>7, it is turned on, attached (1)	0 ~ 1000	1
7	PS	PS	Amend value, display value= actual measured value + amend value	-1999 ~ 9999	0
8	INP	INP	Optional input signal. Note: after selecting the signal, please properly set below relevant parameters: SV,AL1,HY1,AL2,HY2,P,OVS,DB.	refer to input signal parameters table (Page 3)	K1(PT1)
9	OT	OT	Control mode, 0:ON/OFF heating control, relevant parameter: DB. 1: PID heating control, relevant parameters: P,I,D,OVS,CP,ST,PDC,OLL,OLH. 2: ON/OFF cooling control, relevant parameter DB; need to set PT when it is used for compressor control. 3:PID heating & cooling control(cooling control OUT2 will output through AL1 relay), relevant parameters: P, I,D,P1,I1,D1,OVS, CP,CP1,PC,ST,PDC,OLL,OLH, OLL1,OLH1. 4: Over temperature cooling output, relevant parameter: DB 5: PID cooling, relevant parameter: P,I,D,OVS,CP,ST,PDC,OLL,OLH	0 ~ 5	1
10	P	P	Proportional band, the smaller the value is, the faster the system responds, otherwise, it is slower. When P=0, no PID control, unit same as PV	0 ~ 9999	30
11	I	I	Integral time, the smaller the value is, the stronger the integral action is, otherwise, it is weaker. When I=0, no integral action, unit: s.	0 ~ 9999	120
12	D	D	Differential time, the greater the value is, the stronger the differential action is, otherwise, it is weaker. When D=0, no differential action. Set D=0 when controlling fast systems, e.g., pressure, speed; unit: s	0 ~ 9999	30
13	P1	P1	Cooling PID, When OT=3 (PID heating and cooling), the PID parameters of OUT2;	0 ~ 9999	30
14	I1	I1	Same description as above	0 ~ 9999	120
15	D1	D1	Same description as above	0 ~ 9999	30
16	OVS	OVS	Overshoot limit, during PID control process, when PV(measured value) > SV(set value) + OVS (overshoot limit), force to close output. The smaller this value is, the smaller the PID adjustment range is, the worse the control stability is. Please set the appropriate value according to the actual situation.	0 ~ 9999	5
17	DB	DB	ON/OFF control hysteresis (positive and negative numbers work the same); After changing INP, please change this parameter according to the decimal point position.	-1000~1000	5
18	CP	CP	OUT1 control cycle, 1: SSR control output, 4-300: relay control output. Unit: s	0.1 ~ 300.0	20.0
19	CP1	CP1	OUT2 relay output cycle. Unit: s	4.0 ~ 300.0	20.0
20	PC	PC	OUT2 cooling proportionality coefficient, the higher of value, the stronger of cooling	0.1 ~ 100.0	10.0
21	LCK	LCK	Lock function. 0001:SV value can't be modified. 0010: menu SV can be checked only, can't be modified. 0033: can enter to advanced menu. 0123: menus reset to factory setting.	0~9999	0

## 2. Advanced menu illustration

No.	Symbol	Name	Illustration	Setting range	Factory setting
22	ST	ST	Power on operation mode, 0: After power-on, execute the RUN control operation, reset it to the state before starting insulation in insulation mode; 1: automatically enter PID parameters auto-tune status after power-on; press and hold AT key to exit auto-tune. 2: After power-on, execute the STOP operation; 3: After power-on, it can maintain the RUN/STOP status before power-off; 4: After power-on, maintain the current temperature and use the current measured temperature as the target temperature, but do not save the SV value that was set last time. 5: In insulation mode is valid, inherits the insulation time before power-off. The countdown starts when PV reaches [SV-THR, SV+THR]. If insulation is completed before power-off, it is in the STOP state.	0~5	0
23	PDC	PDC	PID algorithm selection, 0 (FUZ): Advanced fuzzy PID algorithm; 1 (STD): common PID algorithm	0~1	FUZ
24	ATE	ATE	PID auto-tune expansion function: Menu option: ATE=A×1+B×1000  1. A: auto-tune timeout (unit: minutes) When the auto-tune exceeds the setting value, will retreat auto-tune and retain the PID parameters before auto-tune. Setting range: A∈[1,999]; 2. B: auto-tune algorithm selection (when PDC selects FUZ, it is valid) B=0, 90% tuning algorithm; B=1, 50% tuning algorithm	1~1999	180
25	SPC	SPC	Convenient application of PID parameters; The instrument is equipped with nine commonly used PID parameters in factory setting. Customers can provide industry information or equipment information to after-sales personnel for consult, and can directly use PID parameters in this menu	NULL, PID0~PID9	NULL
26	OLL	OLL	Output low limit, PID limit the output low limit current amplitude. Set value must be less than high limit.	0.0~OLH	0.0
27	OLH	OLH	Output high limit, PID limit the output high limit current amplitude. Set value must be greater than low limit.	OLL~100.0	100.0
28	OLL1	OLL1	When OT=3 (PID heating and cooling), Output limiting of OUT2	0.0~OLLH1	0.0
29	OLH1	OLH1	Same description as above	OLL1~100.0	100.0
30	PT	PT	Compressor start delay time, unit: s	0~9999	0

No.	Symbol	Name	Illustration	Setting range	Factory setting																		
31	报警	AE1	<div>1st alarm extensions function Manu option : AE1=A×1+B×10+C×100</div> <div><div><div></div><div>C</div><div>B</div><div>A</div></div></div> <div>1. A: Over limit alarm and power on alarm suppression</div> <table><tr><td>A</td><td>Alarm handling method</td><td>Power on, alarm inhibition</td></tr><tr><td>0</td><td>Alarm status remains the same</td><td rowspan="2">no alarm inhibition</td></tr><tr><td>1</td><td>Forced alarm output</td></tr><tr><td>2</td><td>Forced alarm close</td><td rowspan="3">alarm inhibition</td></tr><tr><td>3</td><td>Alarm status remains the same</td></tr><tr><td>4</td><td>Forced alarm output</td></tr><tr><td>5</td><td>Forced alarm close</td><td></td></tr></table> <div>2. B: Alarm indication B=0, no alarm indication; B=1, when an alarm is triggered, the lower row digital tube flashes to display alarm information</div> <div>3. C: Alarm reset C=0, no alarm reset; C=1, alarm reset function is on in insulation mode, When the alarm is triggered at the beginning or end of insulation, press any button to clear the alarm status</div>	A	Alarm handling method	Power on, alarm inhibition	0	Alarm status remains the same	no alarm inhibition	1	Forced alarm output	2	Forced alarm close	alarm inhibition	3	Alarm status remains the same	4	Forced alarm output	5	Forced alarm close		0~5、 10~15、 100~105、 110~115	110
A	Alarm handling method	Power on, alarm inhibition																					
0	Alarm status remains the same	no alarm inhibition																					
1	Forced alarm output																						
2	Forced alarm close	alarm inhibition																					
3	Alarm status remains the same																						
4	Forced alarm output																						
5	Forced alarm close																						
32	FL	FL	Measure range low limit, the set value must be less than measure range high limit	Refer to measured signal parameter table	-50 (-200.0)																		
33	FH	FH	Measure range high limit, the setting value must be more than measure range low limit.	Refer to measured signal parameter table	1200 (600.0)																		
34	FT	FT	Filter coefficient, the higher of value, the stronger of filter function	0 ~ 255	10																		
35	UNIT	UNIT	Temperature unit: °C: Celsius degrees, °F: Fahrenheit degrees.	°C, °F	°C																		
36	DTR	DTR	PV fuzzy tracking value. Properly set this value on some occasions, it can get a more stable control display value, this value is unrelated with actual measured value. Note: after setting this value, when the alarm set value is equal to SV set value, alarm output operation is subject to actual measured value. Set as 0 to close this function.	0.0 ~ 2.0 (0~20)	1.0 (10)																		
37	SSM	SSM	Key to switch RUN/STOP operation. 0: Forbidden 1: Open	0 ~ 1	1																		
38	A-M	A-M	Manual - AUTO switch, AUTO: Automatic constant temperature operation mode; MANU: Manual operation mode; AM: Manual automatic switching mode; TH: Insulation timing mode	AUTO、 MANU、 AM、 TH	AUTO																		
39	TH	TH	Temperature holding process time (Unit:minutes)	0 ~ 9999	0																		
40	THR	THR	Temperature holding process activation interval. When PV value reaches the temperature range SV±THR for 5 seconds, the temperature holding process will be activated at once.	0 ~ 9999	0																		
41	THC	THC	Action after the timing is done. STP(0): control output turns off after the timing is done. HLD(1): control output stays turning on after the timing is done.	STOP、 HOLD	STOP																		
42	VER	VER	Software version, Only read	—																			

(1) Alarm parameters and output logic diagram:

Symbol description: "☆" means HY, "▲" means alarm value, "△" means SV value

Alarm code	Alarm mode	Alarm output (AL1 & AL2 are independent from each) Image:the hatched section means the alarm action
0	Alarm Close	
1	High limit absolute value alarm	
2	Low limit absolute value alarm	
3	High limit deviation value alarm	
4	Low limit deviation value alarm	
5	High/low limit deviation value alarm	
6	High/low limit interval value alarm	
7	Temperature holding mode relevant alarm	

Alarm code	Alarm mode	The below two alarm parameters(AL1,AL2) are used in combination, AL1 alarm output, AD2 must be set as 0
8	High and low limit absolute value interval alarm	
9	High and low limit deviation value interval alarm	
10	High limit absolute value and low limit deviation value interval alarm	
11	High limit deviation value and low limit absolute value interval alarm	
12	High/low limit absolute value alarm	
13	High/low limit deviation value alarm	

## X. Checking methods of simple fault

Display	Checking methods
LLLL/HHHH	Checks whether the input disconnection and check the FH/ FL value whether is normal, working environment temperature normal or not, and whether input signal is selected correctly.

## XI. Key function operation

- Stop mode
  - Under the measure mode, long press " R/S " key to enter the STOP mode, SV window will display "STOP", main control output will stop or keep the minimum output.
  - Under STOP mode, long press " R/S " key to exit STOP mode, press " " key to modify SV value.
  - Under STOP mode, alarm output and retransmission output work normally.
- PID auto-tune operation:
  - Before auto-tune, please switch off the control output load power, or set the meter as STOP mode.
  - Before auto-tune, PV value should meet below condition: when it is PID heating control, PV needs to be much smaller than SV; when it is PID cooling control, PV needs to be much larger than SV.
  - Before auto-tune, please set a proper alarm value or eliminate the alarm condition, in order to prevent the auto-tune procedure from being affected by alarm output.
  - Set PID type and SV value; the factory default setting is fuzzy PID.
  - Set as PID control, if there is OLL & OLH output limiting, please set the output to a proper range; factory default setting is OLL=0%, OLH=100%.
  - Exit STOP mode, or switch on the load Power, immediately long press " AT " key to enter auto-tune mode, then the AT indicator light is on.
  - The auto-tune procedure will take some time, in order not to affect auto-tune result, please don't modify the parameters or power-off.
  - When AT light goes out, it automatically exits auto-tune mode, PID parameters will be updated automatically, and then the meter will control automatically and exactly.
  - During the auto-tune procedure, below actions will cause the termination of the process, long press " AT " key, measure beyond the scope, abnormal display, switch to STOP mode, power-off, etc.
  - Note: In the occasions with output limiting operation, sometimes, even if the auto-tune is carried out, the best PID parameters still cannot be obtained.
  - Experienced users can set proper PID parameter according to experience.
- PID heating and proportional cooling control operation
  - Set the control mode OT as 3.
  - PID heating control acts on OUT1;proportional cooling control acts on OUT2.
  - Proportional cooling control OUT2 outputs via AL1 alarm function terminals.
  - Please change the cooling control cycle CP1 and the cooling proportionality coefficient to a proper value.
- Auto-manual switch function
  - Enter common manual, set parameter A-M as "AM".
  - After return back to measure control interface, press " " key to switch auto-manual operation.
  - When it is switched to manual control, lower line LED will display output percentage: M0~M100 (corresponding to 0%~100%), press Add Key or Reduce Key to modify the output percentage.
  - Before the switch from manual control to auto control, in order to ensure the smooth switch, please press Left Key to modify the SV value first.
  - After the meter is rebooted, the default setting is manual control and output 0.
- Temperature holding operation
  - Set the parameter A-M as "TH" in advanced menu.
  - Set the temperature holding time in "THT" menu, Set the temperature holding range in"THR" menu,Set the temperature holding finished in " THC " menu.
  - Short/long press the "R/S" button on the measurement interface to start or stop the temperature holding process. When the temperature reaches the [SV-THR, SV+THR] and stays for 5 seconds, the temperature holding process will be activated.
  - The 5 seconds that the target temperature stays when activating the temperature holding process will be included in the holding time
  - During the temperature holding process, you can briefly press the " " button to switch the displaying the target temperature and temperature holding time left on the lower row of digital tubes; After short pressing, when the upper row displays "SV" for one second, it means that the lower row displays the target temperature, display "TH " means the remaining time of the temperature holding process.
  - When the remaining time of the temperature holding process is displayed on the low row digital tubes, it can be modified through " " ( ) " ", After modification, the temperature holding time can be extended or shortened, and it only affects this temperature holding process.
  - When the temperature holding countdown needs to be triggered at the start of heating/cooling, the "THR" needs to be set large enough in order to the [SV-THR, SV+THR] interval includes the starting temperature.
  - Enter the common menu and set parameter AD1 to 7 to set temperature holding related alarms. Configure the required alarm triggering conditions in the "ATH" menu, and the alarm methods can be freely combined; For example, if an alarm needs to be triggered at the beginning and at the end of temperature holding , ATH=0101 needs to be set. If an alarm needs to be triggered at the temperature deviation and temperature holding finished, ATH=0011 needs to be set.
  - ATH is that selects temperature holding start or temperature holding completion, an alarm will on, and when AE1=xxx1 in the advanced menu, the alarm can be cleared by short pressing any button.

## XII.Version and Revision Record

Date	Vesion	Revision Record
2025.07.10	A/0	First edition