T110A Series Temperature Controller User Manual

Features

⊙Support multi thermcouple and thermal resistance signal input
⊙Adopt Fuzzy PID algorithm control , self-tuning has no overshoot
⊙ Multi control modes are optional, please refer to OT parameter
⊙RUN/STOP function One-click switching
⊙Heating-cooling dual outputs

I. Model Illustration

T110□-□□-□-□

- Extention function code
- 001-999: Functional specification configuration code (tell us your function requirement, we will offer you the code)
- P1: AC/DC 100～240V P2: DC 24V
- A1: 96W*96H C1: 48W*48H D1: 72W*72H
- E1: 48W*96H F1: 96W*48H
- A: Three digits display
- T110A Series intelligent temperature controller

Note 1: The buzzer alarm is a customized model;
Note 2: 48 * 48 size without buzzer selection
Note 3: The models with RS485 communication, no alarm 2 and SSR output

II. Function configuration selection table

	Code	Function
Power Supply	P1	AC/DC 100-240V
	P2	DC 24V
Signal Input	W2	Tc/Rtd input (support long cable compensation)
	W3	Tc/Rtd input
	T1	Thermocouple input
	P1	Rtd input (support long cable compensation)
	P2	Rtd input
	X1	linear (mA/V) input
Main control output 1	M1	Relay+SSR Output
	R1	Relay output
	G1	SSR Output
Main control output 2 / Alarm 1	R1	Relay output
	N	No Alarm 1
Alarm 2	R1	Relay alarm 2
	B1	Buzzer alarm 2
	N	No Alarm 2
Communication	C1	RS485 Communication (Not isolated)
	C3	RS485 Communication (DC-DC isolated)
	N	No Communication
Shell material	F1	White HB Flame retardant grade
	F2	White V0 Flame retardant grade

Model example: ① T110A-C1P1-W2R1R1NC3F1
Function description: 48W * 48H/three digit display/100-240V power supply/Tc/Rtd input (support long cable compensation)/ relay output/ relay alarm 1/no alarm 2 / RS485 communication (DC-DC isolation) / white HB flame retardant

III. Specifications

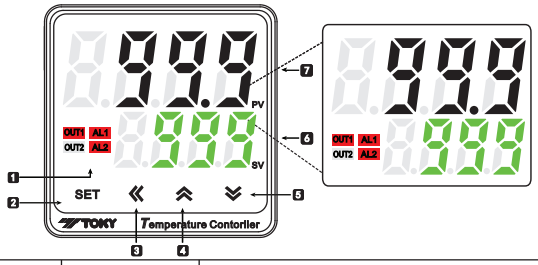
1. Electrical parameters:

Sampling rate	8 times per second
Relay capacity	AC 250V /3A Life of rated resistive load>100,000 times
Power supply	AC/DC 100 ~ 240V (85-265V) ,DC 24V
Power consumption	< 2VA
Environment	Indoor use only, temperature: 0~50℃ no condensation, humidity < 85%RH, altitude<2000m
Storage environment	-10 ~ 60℃,no condensation
SSR output	DC 5V pulse voltage, load<30mA
Communication port	RS485 port Modbus-RTU protocol
Insulation impedance	Input, output, power to meter cover > 20MΩ (excluding SSR output)
ESD	IEC/EN61000-4-2 Contact ±4KV /Air ±8KV perf.Criteria B
Pulse traip 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 and output and power supply 1500VAC for 1 minute Note: Solid state relays with isolation protection are required for SSR output

2. Measured signal specifications :

Input type		Symbol	Measure range	Resolution	Accuracy(25±5℃)	Input impedance/ auxliary current	Comm. parameter code
Tc	K	E	-50～999	1℃	0.3%F.S±1℃	>500kΩ	0
	J	J	0～999	1℃	0.3%F.S±1℃	>500kΩ	1
	E	E	0～850	1℃	0.3%F.S±1℃	>500kΩ	2
	B	b	250～999	1℃	0.5%F.S±2℃	>500kΩ	3
	R	r	-10～999	1℃	0.5%F.S±2℃	>500kΩ	4
	S	S	-10～999	1℃	0.5%F.S±2℃	>500kΩ	5
	N	n	-50～999	1℃	0.3%FS±1℃	>500kΩ	6
	T	t	-50～400	1℃	0.3%F.S±1℃	>500kΩ	7
	0～50mV	nU	-199～999	12bit	0.3%F.S±3digits	>500kΩ	11
Rtd	PT100	Pt	-200～600	1℃	0.3%F.S±1℃	0.2mA	8
	CU50	CU50	-50～150	1℃	0.5%F.S±3℃	0.2mA	9
	CU100	CU00	-50～150	1℃	0.5%F.S±3℃	0.2mA	10
	0～400Ω	rt	-199～999	12bit	0.3%F.S±3digits	0.2mA	12
linear input	4～20mA	nA	-199～999	12bit	0.3%F.S±3digits	<50Ω	13
	0～10V	U	-199～999	12bit	0.3%F.S±3digits	>1MΩ	14

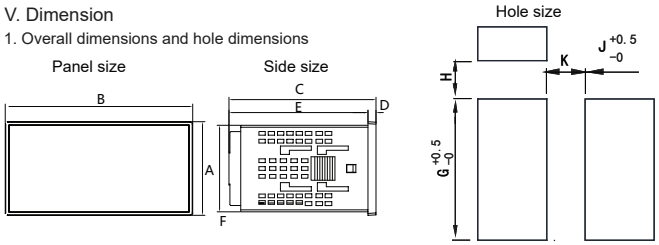
IV. Panel Illustration



No.	Symbol	Name	Function
1	OUT1	OUT1 (red)	Main control output indicator, lights on when output ON
	OUT2	OUT2 (red)	Cooling output indicator, lights on when output ON.
	AL1	Alarm 1# (red)	1st alarm output indicator, lights on when alarm output, lights off when no alarm output.
	AL2	Alarm 2# (red)	2nd alarm output indicator, lights on when alarm output, lights off when no alarm output.
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	Add key, in measure and control mode,long press to shift RUN/STOP mode, or check the menu in reverse order.
5	v	Reduce key	Reduce key, check the menu in sequence
6	SV	Display (green)	Set value / parameter display window, When it displays " STOP" , it means stop controling.
7	PV	Display (white)	Measured value/ parameter code display window

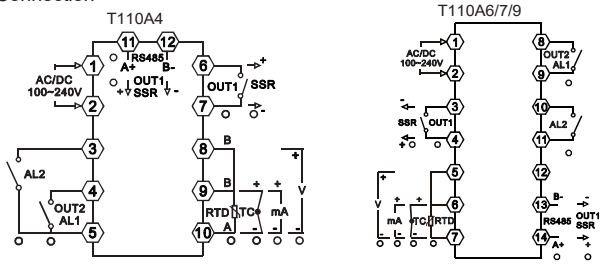
V. Dimension

1. Overall dimensions and hole dimensions



Model	A	B	C	D	E	F	G	H(Min)	J	K(Min)
A1:(96*96)	96	96	79	4.3	74.7	91	91.5	25	45	25
C1:(48*48)	48.5	48.5	73	4.2	72.8	45	45.5	25	45	25
D1:(72*72)	72	72	79	4.3	74.7	67	67	25	67.5	25
E1:(48*96)	48.5	95.5	78.5	4.1	74.4	45	91.5	25	91.5	25
F1:(96*48)	95.5	48.5	78.5	4.1	74.4	91.5	45	25	45	25

VI. Connection

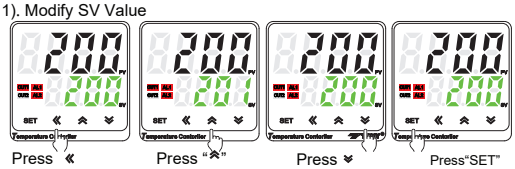


Note: In actual wiring diagram, solid circles indicate have the function, while hollow circles means no this function. Solid or hollow dots will be marked according to the actual function.

VII. Operation process and menu illustration

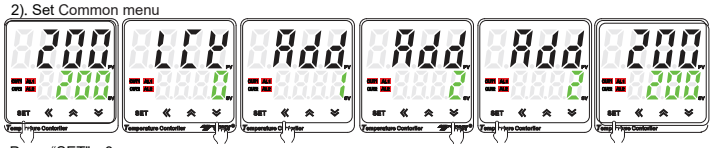
1. Operation process & method

1). Modify SV Value



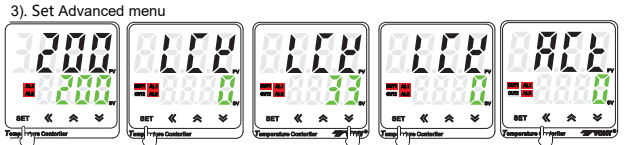
Press « SV value twinkle | Press "^" increase SV value | Press « reduce SV value | Press"SET" Save SV value

2). Set Common menu

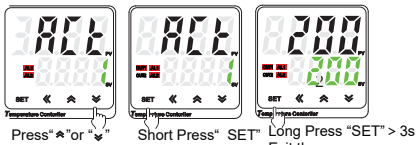


Press "SET" > 3s to enter common. menu | Press "^"or "v" switch menu | Press "«" parameter twinkle | Press "^"or "v" modify parameters | Press "SET" save parameter | Press "SET" > 3s Exit the menu

3). Set Advanced menu



Long Press "SET" > 3s enter to Common menu | Press the "SET" switch to LCK menu | SET LCK=33 | Short Press"SET" to enter advanced menu | Press "«" parameter twinkle



Press"^"or "v" modify parameters | Short Press" SET" save parameters | Long Press "SET" > 3s Exit the menu

VIII. Checking methods of simple fault

Display	Checking methods
LLLL/HHHH	Check whether the sensor is in poor contact or wrong wiring, Check the FH/ FL value, Check whether the environment temperature is out of range, Check the input signal set correctly or not.(INP menu)

VIII. Menu Illustration

Note: The instrument will automatically hide irrelevant parameters based on the working mode selected by the OT parameters. It is recommended to set the OT parameters before the first use.

▭: No mater what model, what control mode it is, it will always display these parameters.

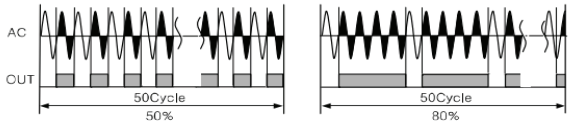
▭: According to different model, control mode, there are some hidden parameters.

1. Regular Menu

No.	Symbol	Name	Illustration	Setting range	Factory setting
1	AL1	AL1	1st alarm value, note: the minus is dealed as absolute value when it is as a deviation value.	FL ~ FH	10
2	HY1	HY1	1st alarm hystersis	0 ~ 100	1
3	AD1	AD1	1st alarm mode,note: when AL1 is used as OUT2, should set the value AD1=0 (close alarm function). When AD1>6, AD2 should be set to 0 (except for LBA alarms).Refer to the alarm function logic diagram	0 ~ 14	3
4	AL2	AL2	2nd alarm value, note: the minus is dealed as absolute value when it is as a deviation value.	FL ~ FH	5
5	HY2	HY2	2nd alarm hystersis	0 ~ 999	1
6	AD2	AD2 (1)	2nd alarm mode,7-12 Reserved with no function, see table 1	0 ~ 14	4
7	LBA	LBA	Control circuit fault alarm time, unit: seconds (After self-tuning, it will become twice the I value)	0 ~ 999	10
8	LBD	LBD	Control circuit fault alarm does not sense temperature band, unit: ° C or ° F	0 ~ 999	10
9	LBF	LBF	Control circuit fault alarm judgment amplitude, unit: ° C/LBA or ° F/LBA	0 ~ 999	2
10	PS	PS	Display correction value, display value= actual measured value + display correction value	-199 ~ 999	0
11	INP	INP	Optional input measured signal type: refer to input signal parameters table. Note: after the setting, need to modify other relevant parameters too.	K ~ RT	K
12	LGT	LGT	Brightness adjustment, selectable from 1 to 8, the higher the value, the brighter the brightness, default to 4	1 ~ 8	4
13	CLE	CLE	The maximum variable period of the cycle is 0:2000ms, 1:4000ms, 2:6000ms, as shown in Appendix (1)	0 ~ 2	0
14	ot	OT	Control method. 0: ON/OFF heating control, related parameters: DB; 1: PID heating, related parameters: P, I, D, OVS, CP, ST, PDC; 2: ON/OFF cooling control, related parameter DB; PT needs to be set during compressor control 3: PID heating and cooling (cooling control OUT2，it will be output through AL1 relay), related parameters: P, I,D,P1,OVS, CP,CP1,PC,ST,PDC; 4: Overtemperature cooling output, related parameters: DB; 5: PID cooling, related parameters: P, I, D, OVS, CP, ST, PDC	0 ~ 5	1
15	P	P	Proportional band. The smaller the value is, the faster the system responds, otherwise, it is slower.Increasing proportional band can reduce the oscillation, but it will increase the control deviation. Reducing proportional band can reduce control deviation, but it will cause oscillation	0 ~ 999	30
16	I	I	Integral time. The smaller the value, the stronger the integral action, the better performance on eliminating the deviation between PV and SV. If the integral action is too week, the deviation might not be eliminated. Unit: sec.	0 ~ 999	120
17	d	D	Differential time. Reducing it to a suitable value can prevent the oscillation of the system. The greater the value, the stronger the differential actiontion. Unit: sec	0 ~ 999	30
18	P1	P1	Cooling PID, when OT=3 (PID heating and cooling), the PID parameter of OUT2; Description as above	0 ~ 999	30
19	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. Note: This function does not work when set to 0	0 ~ 999	0
20	db	DB	ON/OFF control hystersis(negative hysteresis position control);or cooling control and compressor cooling control dead zone. ,after change the INP setting, please change this parameter according to the decimal point position.	0 ~ 100	5
21	CP	CP	OUT1 control cycle, 1: SSR control output, 4-200: relay control output. 0.1-99.9 can be set to one decimal place, 100-150 are integers, Unit: s	1 ~ 150	20.0
22	CP1	CP1	OUT2 relay output cycle. 4.0-99.9 can be set to one decimal place, 100-150 are integers, Unit: s	4.0 ~ 150	20.0
23	PC	PC	OUT2 cooling proportionality coefficient. The higher of value,the stronger of cooling effect.	1 ~ 999	100
24	LCK	LCK	Lock function. 001:SV value can’ t be modified. 010: menu set value can be checked only, can’ t be modified. 033: enter the advanced menu. 123: menus reset to factory setting.	0 ~ 999	0

Appendix (1): cycle control

After enabled, the controller will take a certain control cycle as the base, and repeatedly change the cycle according to the output ratio to control the power of the load

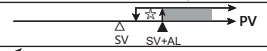
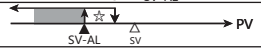
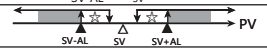
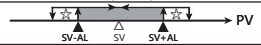
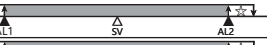
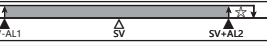
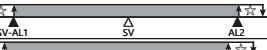
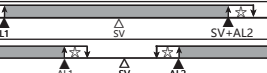
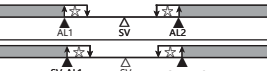
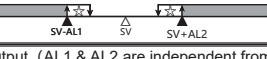


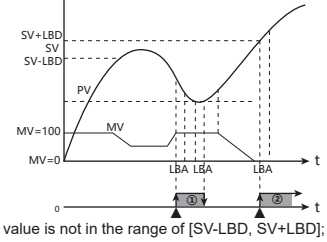
2. Advanced menu illustration

No.	Symbol	Name	Illustration	Setting range	Factory setting
25	ACt	ACT	Control execution mode, 0: relay output or SSR output 1: SSR output (when the main control is M1 or M2 model) 2. 3, 4, and 5 are reserved 6: Frequency circle control (when the main control is M1, M2, G1 models)	0 ~ 1,6	0
26	St	ST	Auto-tune switch 0: work normally after power-on 1; automatically enter PID parameters auto-tune status after power-on; press and hold《AT key to exit auto-tune.	0 ~ 1	0
27	AtE	ATE	Self tuning algorithm selection, 0:90% self-tuning algorithm; 1: 50% self-tuning algorithm	0 ~ 1	1
28	Att	ATT	Self setting timeout (Unit: minutes).If the self-tuning exceeds the set value, it will exit self-tuning and retain the PID parameters before self-tuning;	1~999	80
29	SPC	SPC	Application of Industry PID Parameters:The instrument is equipped with ten commonly used PID parameters in factory setting. Customers can provide industry, equipment, and other information to consult with after-sales personnel, and directly call the PID parameters from this menu	NUL, PD0-PD9	NUL
30	Pt	PT	Compressor start delay time, unit: sec	0 ~ 999	0
31/32	AE1/AE2	AE1/AE2	Alarm extension function: Menu options: AE1/AE2=A × 1+B × 10 [ ][ ][B][A] 1. A: overlimit alarm and power on alarm inhibition A: Alarm handling mode for display overlimit / Whether inhibit alarm when power on 0: alarm status remains the same / power on, no alarm inhibition. When meet alarm condition,alarm output immediately. 1: force alarm output 2: force alarm close 3: alarm status remains the same / After power on, the first time alarm will inhibit. After it, alarm will work normally. 4: force alarm output 5: force alarm close 2. B: Alarm indication B=0，No alarm indication; B=1，When the alarm is triggered, the lower line led flashes and display alarm information	0~15	10
33	FL	FL	Measure range low limit. The set value must be less than measure range high limit	refer to input signal table	-50
34	FH	FH	Measure range high limit. The set value must be more than measure range low limit.	refer to input signal table	999
35	SLL	SLL	Limit the low limit of the setting value range	FL~FH	FL
36	SLH	SLH	Limit the high limit of the setting value range	FL~FH	FH
37	dP	DP	Decimal point setting, it is effective below 100 When the input type is R, B, S, it can only be 0	0 ~ 1	0
38	Ft	FT	Filter coefficient. The higher the value, the stronger the filter function.	0~255	10
39	bAd	BAD	Communication baud 0 (4.8): 4800; 1 (9.6)：9600;	0~2	1
40	Add	ADD	Communication address	0~247	1
41	Pty	PTY	Communication checksum setting, 0: (NO) no checksum, 1: (ODD) odd checksum2: (EVENT) Even checksum	0~2	N0
42	dtC	DTC	Communication data transmission sequence setting 000; The first function is reserved, the second is byte order exchange, and the third function is reserved	refer to comm. protocol note ③	0

IX. 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	Close alarm	
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	High-low limit absolute value interval alarm	
8	※High-low limit deviation value interval alarm	
9	※High absolute and low deviation value interval alarm	
10	※High deviation and low limit absolute value interval alarm	
11	High-low limit absolute value alarm	
12	※ High-low limit deviation value alarm	

Alarm code	Alarm mode	Alarm output (AL1 & AL2 are independent from each) Image:the hatched section means the alarm action
AD1/AD2 =14	LBA Alarm	

When the PV value is not in the range of [SV-LBD, SV+LBD];

When MV(output percentage)=100, PV rise less than LBF in LBA time,① alarm

When MV=0, PV drop less than LBF in LBA time，② alarm

X. Key function operation

1. RUN/Stop mode

1)Under the measure mode, press and hold “R/S” key > 3 sec to enter STOP mode, SV window will display “STOP”. Under STOP mode, press and hold “R/S” key to exit STOP mode.
2)Under STOP mode, support to modify SV value and switch operation.
3)Under STOP mode, main control output will stop.

2. PID auto-tune operation:

1)Usually, the default PID parameters of this product are not suitable for all occasions; please use auto-tuning function to get a suitable PID parameter.
2)The meter will enter control output since the power on. please set the meter as STOP mode to not affect the auto-tuning result, or switch off the power of control output load. No matter how to operate, should ensure that the set value is greater than the current measured value; the greater the drop, the better.
3)Before auto-tuning, please set the proper alarm value, or remove the alarm condition to avoid the effect of alarm output.
4)Set SV value.
5)Set parameter OT as 1 (PID control).
6)Under the condition of PV value at normal room temperature, please exit STOP mode or input the load power,and keep pressing “AT” key to enter auto-tuning mode, then AT indicator turns on.
7)Auto-tuning need a period, to ensure the auto-tuning result, please don`t modify parameters or power-off during auto tuning.
8)When AT light is off , it will exit the auto-tuning mode. PID will update automatcially, and the meter will control automatically and precisely.
9)During auto-tuning procedure, press “AT” key, measure beyond the range, display abnormally, shift to “STOP” mode, power-off will stop the auto-tuning.
10)Experienced user can set the proper PID parameter with their rich experience.

3. PID heating & Cooling control operation (suitable for injection molding machine and extruder)

1)Set the control mode OT to 3. (heating and cooling control)
2) PID heating control act on OUT1； Cooling control act on OUT2.After the cooling function takes effect, the AL1 function becomes ineffective.
3) Please change the cooling control cycle CP1 to a more suitable value and adjust the cooling ratio coefficient PC to a more suitable value.