

Intelligent Temperature Controller User Manual

Apply to TCX-B version series



Features

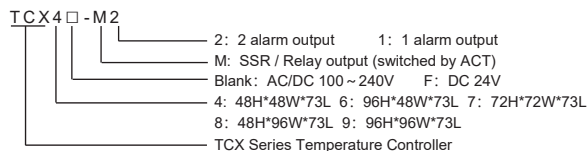
- Support multiple TC & RTD signal input.
- Adopt Fuzzy PID algorithm control, self-tuning has no overshoot.
- Multiple control modes are optional, please refer to OT parameter.
- RUN/STOP function one-click switching.
- Support heating and cooling dual output.

National High-tech Enterprise / National Standard Drafting Unit

Hotline: 400-8866-986

Version code: KKTCX-B02E-A/2-20250919

I. Model Illustration



II. Ordering Information

No.	Model	Main control	Alarm channel
1	TCX-4/6/7/8/9-M2	RELAY / SSR	2

III. Specifications

1. Electrical parameters:

Sample rate	8 times/s
Relay capacity	AC 250V /3A Rated load life > 100,000 times
Power supply	AC/DC 100 ~ 240V (85-265V) ,DC 24V
Power consumption	< 10VA
Environment	Indoor use, temperature: 0~50°C no condensation, humidity < 85%RH, altitude<2000m
Storage environment	-10 ~ 60°C, no condensation
SSR output	DC 24V, load<30mA
Insulation impedance	Input, output, power to housing > 20MΩ
ESD	IEC/EN61000-4-2 Contact ±4KV /Air ±8KV perf.Criteria B
Pulse train immunity	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
Dielectric strength	Signal input, output and power: 1500VAC 1min, <60V low voltage circuit: DC500V, 1min
Total weight	About 400g
Shell material	The shell and panel frame PC/ABS (flame class: UL94V-0)
Panel material	PET(F150/F200)
Power-off protection	10 years, can write data for 1 million times
Panel protection level	IP65(IEC60529)
Safety Standard	IEC61010-1 Overvoltage category II Pollution level 2, class II (reinforced insulation).

2. Measurement signal parameters:

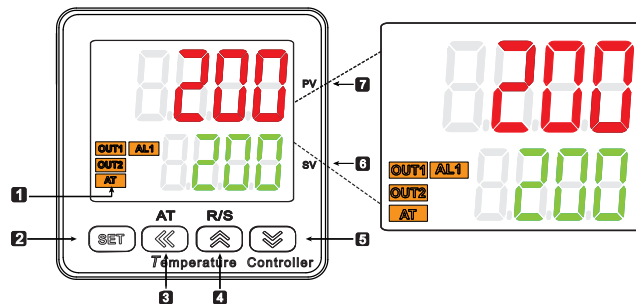
Input type	Symbol	Measuring range	Resolution	Accuracy (25°C±5°C)	Input impedance / auxiliary current
K		-50 ~ 999	1°C	0.3%F.S±1°C	> 500kΩ
J		0 ~ 999	1°C	0.3%F.S±1°C	> 500kΩ

E		0 ~ 850	1°C	0.3%F.S±1°C	> 500kΩ
T		-50 ~ 400	1°C	0.3%F.S±1°C	> 500kΩ
PT100		-199 ~ 600	1°C	0.3%F.S±1°C	0.2mA
CU50		-50 ~ 150	1°C	0.5%F.S±3°C	0.2mA
CU100		-50 ~ 150	1°C	0.5%F.S±3°C	0.2mA

Temperature drift: 150ppm/°C

Note 1: additional 2°C allowable error should be added when using internal cold-end compensation for TC input.

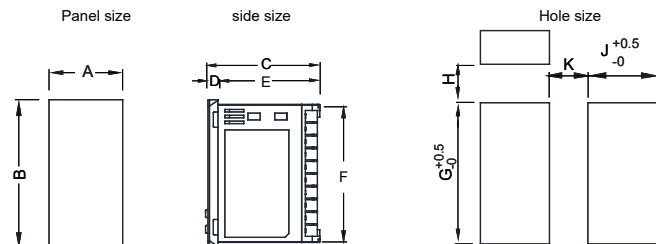
IV. Panel Illustration



No.	Symbol	Name	Function
1	OUT1	OUT1 (Orange)	Main control output indicator, lights on when output ON.
	OUT2	OUT2 (Orange)	Cooling output indicator, lights on when output ON.
	AL1	Alarm 1# (Orange)	1st alarm output indicator, lights on when alarm output, lights off when no alarm output.
	AT	AT (Orange)	Auto-tuning indicator, lights on when it is on auto-tuning status.
2	SET	SET key	Menu key / confirm key, to enter / exit the modification mode, or to confirm / save the modified parameter.
3	⬅	Shift / AT key	Activate key / shift key / AT auto-tuning key (long press to enter / exit auto-tuning in measurement control mode)
4	⬆	Up key/R/S	Add key, in measurement control mode, long press it to switch RUN / STOP mode, or check the menu in reverse order.
5	⬇	Down key	Reduce key, check the menu in sequence.
6	SV	Display (green)	Display window of set value / parameter, displays "STOP" when control is stopped.
7	PV	Display (red)	Display window of measurement value / parameter code.

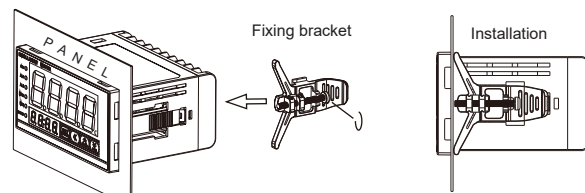
V. Dimensions & installation

1. Dimension



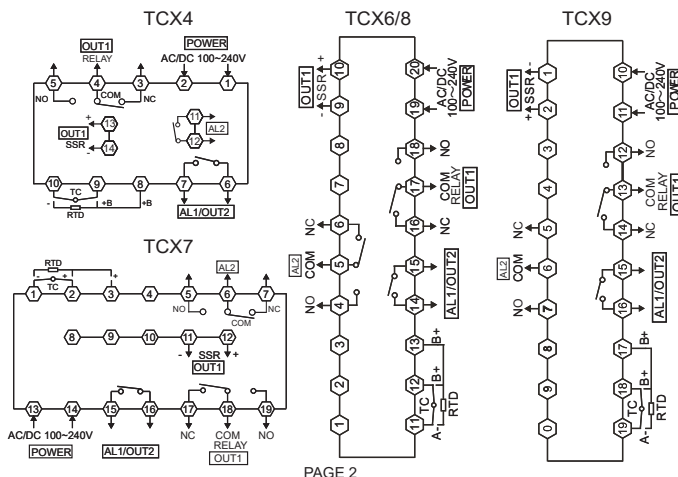
Model	A	B	C	D	E	F	G	H(Min)	J	K(Min)
4:(48*48)	48	48	73	6.5	66.5	44	45	25	45	25
6:(48*96)	48	96	73	6.5	66.5	90	91.5	25	45	25
7:(72*72)	72	72	73	6.5	66.5	66	67.5	25	67.5	25
8:(96*48)	96	48	73	6.5	66.5	44	45	25	91.5	25
9:(96*96)	96	96	73	6.5	66.5	90	91.5	25	91.5	25

2. Installation



Installation method: Put the instrument into the cutout hole, and then place the fixing bracket on the installation slot of the instrument housing, push the bracket towards the panel until the instrument is fixed (the operation is as shown in the above)

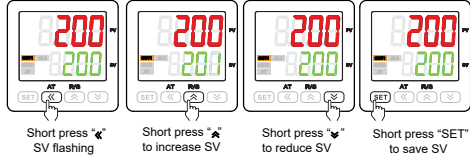
VI. Connections



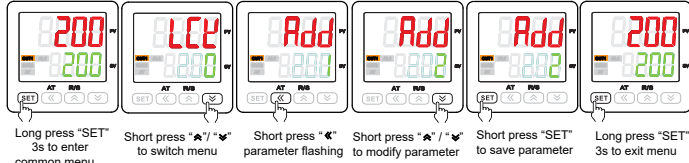
VII. Operation process & menu illustration

1. Operation process & method

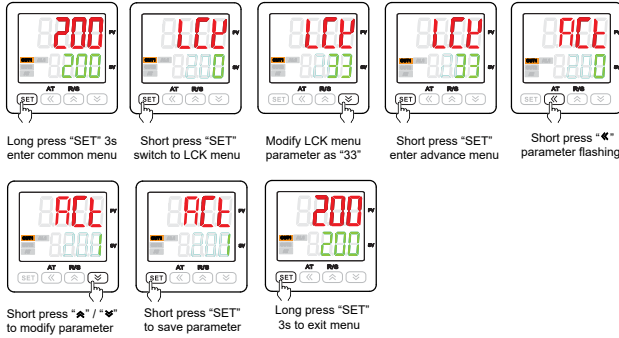
1) Modify the set value



2) Common menu



3) Advanced menu



VIII. Menu Illustration

Note: the meter will hide some unrelated parameters according to OT parameter setting mode. It is recommended to set the OT parameter before using the meter for the first time.

□: Parameters that are always displayed no matter under what model or control mode.
■: Some parameters that will be hidden according to different model and control mode.

1. Common menu

No.	Symbol	Name	Illustration	Setting range	Factory setting
1	AL1	1st alarm value.		FL-FH	10
2	HY1	1st alarm hysteresis		0-100	1
3	AD1	1st alarm mode. Note: set AD1=0 when AL1 is used as OUT2, all the alarm will be closed except LBA. SET AD2 = 0 when AD1 > 6. Refer to alarm function logic diagram.		0-14	3
4	AL2	2nd alarm value.		FL-FH	5
5	HY2	2nd alarm hysteresis		0-999	1
6	AD2 (1)	2nd alarm mode, without alarm function of code 7-12, refer to alarm function logic diagram.		0-14	4
7	LBA	Loop break alarm time, unit: second		0 - 999	0
8	LBD	loop break alarm not sensing temperature band, unit :°C/F		0 - 999	0
9	LBF	loop break alarm judgment amplitude, Unit:°C/LBA,°F/LBA		0 - 999	0
10	PS	Display correction value, display value= actual measured value + display correction value		-199-999	0
11	INP	Input signal type selection: refer to input signal parameters table. Note: relevant parameters need to be changed after modification.		K-CU100	K
12	OT	Control mode. 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 for compressor control 3: PID heating and cooling (cooling control OUT2 is through AL1 relay), related parameters: P, I, D, P1, OVS, CP, CP1, PC, DB, ST, SPD, PDC; 4: Overtemperature cooling output, related parameters: DB; 5: PID cooling, related parameter P, I, D, OVS, CP, ST, SPD, PDC		0-5	1
13	P	Proportional band. The smaller the value is, the faster the system respond. Otherwise, it is slower. When P=0, PID control is invalid; Resolution keep the same with PV value.		0-999	30
14	I	Integral time. The smaller the value, the stronger the integral , action. Otherwise, it is weaker. Unit: second		0-999	120
15	D	Differential time. The larger the value, the stronger the effect. Reducing it to a suitable value can prevent the oscillation. Unit: s		0-999	30
16	P1	Cooling proportional band, works when OT=3 (PID heating & cooling), the smaller the value, the faster the system cools down, otherwise it will be slower.		0-999	30
17	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 suitable value according to actual situation.		0-999	5
18	DB	ON/OFF control hysteresis (positive and negative numbers have the same effect), please adjust decimal point position appropriately after modifying INP parameter.		0-100	5
19	CP	OUT1 heating control cycle. Set SSR control output as 1, relay control output as 4-200, set 0.1-99.9 as one decimal, 100-150 as integer. Unit: s.		1-150	20.0
20	CP1	OUT2 relay output cycle. 4.0-99.9 can set as one decimal, 100-150 as integer. Unit: s.		4.0-150	20.0
21	PC	OUT2 cooling proportional coefficient. The larger the value, the stronger the effect.		1-999	100
22	LCK	Password lock function; 0001: SV value cannot be modified; 0010: Menu settings can only be viewed, cannot be modified; 0033: Can enter the advanced menu; 0123: Menu reset to factory setting, need to power off and restart ,		0-999	0

2. Advanced menu

No.	Symbol	Name	Description	Setting range	Factory setting																		
23	ACT	ACT	Control execution mode. 0: relay output. 1: SSR output	0-1	0																		
24	ST	ST	Power-on auto-tuning switch. 0: control normally after power-on 1: turn on PID auto-tuning after power-on. Long press 《AT》 to exit auto-tuning.	0-1	0																		
25	ATE	ATE	Auto-tuning algorithm selection. 0: 90%. 1: 50%.	0-1	1																		
26	ATT	ATT	Auto-tuning timeout. It will exit auto-tuning and retain the PID parameters before auto-tuning when exceeding the SV. Unit: min.	1-999	80																		
27	SPC	SPC	Application of Industry PID Parameters. The instrument is equipped with 10 common PID parameters when factory setting. Customers can consult the after-sales by providing information of industry, equipment, etc., and directly call the PID parameters in this menu.	NUL, PDO-PD9	NUL																		
28	PT	PT	Compressor start-up delay. Unit: s	0-999	0																		
29/30	AE1/AE2	AE1/AE2	Alarm extension function: Menu options: AE1 / AE2 = A×1+B×10 B A 1. A: overlimit alarm & power-on alarm inhibition <table><tr><td>A</td><td>Over-limit alarm treatment</td><td>Suppression on / off</td></tr><tr><td>0</td><td>Alarm state unchanged</td><td rowspan="2">Suppression off (alarm output immediately when the alarm condition is met)</td></tr><tr><td>1</td><td>Forced alarm-on</td></tr><tr><td>2</td><td>Forced alarm-off</td><td rowspan="3">Suppression on (After power-on, alarm forced close before PV reaches the SV the first time, alarm will restore after that)</td></tr><tr><td>3</td><td>Alarm state unchanged</td></tr><tr><td>4</td><td>Forced alarm-on</td></tr><tr><td>5</td><td>Forced alarm-off</td><td></td></tr></table> 2. B: alarm indication B=0, no alarm indication B=1, measurement interface lower row digital tube flashing display alarm information when triggering alarm.	A	Over-limit alarm treatment	Suppression on / off	0	Alarm state unchanged	Suppression off (alarm output immediately when the alarm condition is met)	1	Forced alarm-on	2	Forced alarm-off	Suppression on (After power-on, alarm forced close before PV reaches the SV the first time, alarm will restore after that)	3	Alarm state unchanged	4	Forced alarm-on	5	Forced alarm-off		0~15	10
A	Over-limit alarm treatment	Suppression on / off																					
0	Alarm state unchanged	Suppression off (alarm output immediately when the alarm condition is met)																					
1	Forced alarm-on																						
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4	Forced alarm-on																						
5	Forced alarm-off																						
31	FL	FL	Measure range lower limit, it must be smaller than the upper limit.	Refer to signal table	-50																		
32	FH	FH	Measure range upper limit, it must be larger than the lower limit.		999																		
33	SLL	SLL	Lower limit of the target set value range.	FL-FH	FL																		
34	SLH	SLH	Upper limit of the target set value range.	FL-FH	FH																		
35	DP	DP	Decimal point of PV, effective within 0 - 99.9. 0: off. 1: on.	0-1	0																		
36	FT	FT	Filter coefficient.The higher the value, the stronger the effect	0-255	10																		
37	UT	UT	Temerature unit conversion. Celsius / Fahrenheit	℃, ℉	℃																		
38	DTR	DTR	PV fuzzy tracking value, properly set this value on some occasions to get a more stable control display value. This value is unrelated with actual process value. Note: when AL=SV after setting DTR, the alarm output is subject to the actual PV	0.0-2.0	1.0																		
39	SSM	SSM	RUN / STOP switch of panel key. This setting is only related to panel operation, not communication. 0: OFF 1: ON	0-1	1																		
40	VER	VER	Software version, read only.																				

IX. Alarm function logic diagram

Attachment (1) alarm parameter & output logic diagram:

Symbol description: "☆" means alarm hysteresis. "▲" means alarm value. "△" means set value.

Alarm code	Alarm mode	Alarm output (AL1 & AL2 are independent from each other) Image: the hatched section means the alarm action
0	Turn-off the alarm	
1	Absolute value upper limit alarm	
2	Absolute value lower limit alarm	
3	Deviation value upper limit alarm	
4	Deviation value lower limit alarm	
5	Deviation value upper / lower limit alarm	
6	Interval value upper / lower limit alarm	

Alarm code	Alarm mode	The following two sets of alarm parameters are used in combination (AL1, AL2). AL1 is alarm output, AD2 must be set as 0
7	Absolute value upper & lower limit interval alarm	
8	※Deviation value upper & lower limit interval alarm	
9	※Deviation value upper limit & absolute value lower limit interval alarm	
10	※Absolute value upper limit & deviation value lower limit interval alarm	
11	Absolute value upper & lower limit alarm	
12	※Deviation value upper & lower limit alarm	

Alarm code	Alarm mode	Under OT=3 heating & cooling mode, only effective when AD2=14. At this point, LBA need to use 2nd relay alarm.
AD1/AD2=14	LBA alarm	 When PV is not within the range of [SV-LBD, SV+LBD] When MV=100 & PV rises less than LBF in LBA time, ① alarm. When MV=0 & PV drops less than LBF in LBA time, ② alarm.

X. Key function operation

1. RUN / STOP mode

- 1) In measurement mode, long press "R / S" key 3s to enter STOP mode, SV window displays "STOP", press "R / S" again to exit STOP mode.
 - 2) SV & mode can be changed even when displaying STOP.
 - 3) In STOP mode, main control will stop.
- ### 2. PID parameters confirmation & auto-tuning operation:
- 1) PID parameter is default as not applicable for all occasions when factory setting. Please use auto-tuning function to get a proper PID parameter.
 - 2) To ensure the effect of auto-tuning, please set the meter as monitor mode or cut off control output load power temporarily, for the meter will be on control output after power-on. Please ensure $SV > PV$, and larger the gap, greater the effect, no matter under what operation.
 - 3) Please set a proper AL or exclude the interference factor to avoid the effect of alarm interlock output.
 - 4) Set up SV.
 - 5) Set OT as 1 (PID control).
 - 6) When PV under normal room temperature, please exit monitor mode, or input load power, and long press AT key immediately to enter auto-tuning mode, AT indication light-on.
 - 7) The auto-tuning process takes time, in order not to affect the results, please do not modify parameters or power-off.
 - 8) When AT indicator lights off, it exits auto-tuning mode automatically, PID parameters will be updated automatically, and then the meter will control automatically and accurately.
 - 9) Long press AT key, measuring beyond the range, displaying abnormal, switching to STOP mode, power-off, etc., the above will all abort the auto-tuning process.
 - 10) Experienced users can set a proper PID parameter according to experience.
- ### 3. PID heating & cooling control operation (apply to infection machine, extruder, etc.)
- 1) Set the control mode OT as 3.
 - 2) PID heating control act on OUT1, PID cooling control act on OUT2.
 - 3) PID cooling control OUT2 will output by AL1 alarm function terminal.
 - 4) Please set the cooling control cycle CP1 & PC cooling proportional coefficient to a proper value.

XI. Troubleshooting method

Displaying	Action	Method
LLL	Output forced closed, LLL flashing in measurement interface	Check whether the sensor is poor contact / incorrect wiring or not, check the FH, check whether the working environment temperature exceeds the range or not, check whether the input signal is selected correctly or not (INP menu).
HHH	Output forced closed, LLL flashing in measurement interface, forced alarm on.	

XII. Version & history

Date	Version	Modification
2025.05.09	A/0 Version	1st edition
2025.08.07	A/1 Version	Modify menu parameter
2025.09.19	A/2 Version	