TX-800 series multi-loop independent self-tuning PID controller Operation Manual [Software Edition](TX2...TX8)

⚠ Warning

1. Wiring warning
If the controller fails or malfunctions, it may cause a system failure. Install an external protection circuit to prevent such accidents.
To prevent the controller from being damaged or failing, appropriate fuses should be selected to protect the power lines and input/output lines from current surges.

2. Power supply for the controller
To prevent damage or failure of the controller, when powered by a DC power supply, the voltage must not be lower than 21.6VDC and must not be higher than 26.4VDC. When powered by an AC supply, the voltage must not be lower than 85VAC and must not exceed 264VAC.
To prevent electric shock or controller failure, please check the wiring after all wiring work is completed. Only after confirming that there are no errors can the power be connected.

3. Do not use near flammable gases
For fire prevention, explosion prevention or to prevent damage to the controller, it is prohibited to use in places with flammable and explosive gases or where steam is discharged.

4. Do not touch the interior of the controller
To prevent electric shock or combustion, it is strictly forbidden to touch the interior of the controller.. There are high-voltage and high-temperature parts inside the controller. Touching them without authorization is extremely dangerous!

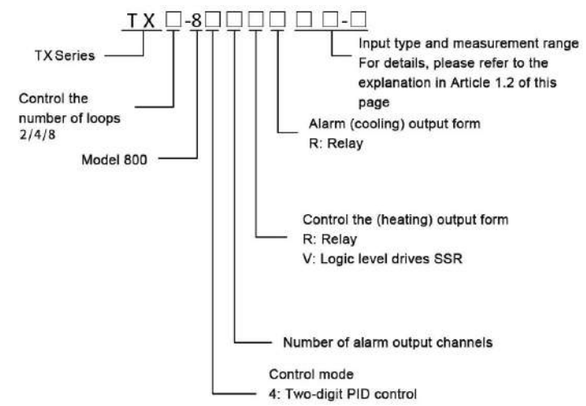
5. It is strictly prohibited to modify the instrument
To prevent accidents or controller failure, it is strictly prohibited to modify the controller.

6. Maintenance
To prevent electric shock, if the controller is scrapped or fails.
To ensure the long-term safe use of the controller, regular maintenance is necessary. Some components inside the controller may be damaged as the usage time increases.

7. Cleaning
The controller can be wiped only after the power is cut off.
Please use a soft cloth or cotton paper to remove stains from the monitor.
The monitor is prone to scratches. Do not wipe or touch it with hard objects.
Do not operate the panel keys with hard objects such as screwdrivers or writing pens, otherwise the keys may be damaged or scratched.

1. Product confirmation

1.1. Please refer to the following selection code to confirm whether the delivered product is exactly the same as the model you have chosen.



1.2. List of Common Input Types and Measurement Ranges

Serial number	Input type	SN	Graduation number	Maximum measurement range	
				Celsius（℃）	Fahrenheit（℉）
1	Thermocouple	1	E	-270～1000	-454～1832
2	Thermocouple	2	J	-210～1200	-346～2192
3	Thermocouple	3	K	-270～1372	-454～2501
4	Thermocouple	4	N	-270～1300	-454～2372
5	Thermal resistance	15	Pt100	-200～0850	-328～1562
6	Other sensors	Customizable		-500～4000	

1.3. Main technical indicators

1) Measurement accuracy: ±0.5%FS±1db;
2) Cycle control period: 0.2 seconds for 8 loops
3) Operating environment: 86 to 106kPa, -10 to 50°C, 45 to 85% RH
4) Pay attention to avoiding:
Condensation may be caused by sudden changes in ambient temperature.
Directly vibrate or impact the main structure.
Pollution from water, oil, chemicals, smoke or steam. Corrosive and flammable gases.
Excessive dust, salt or metal powder.

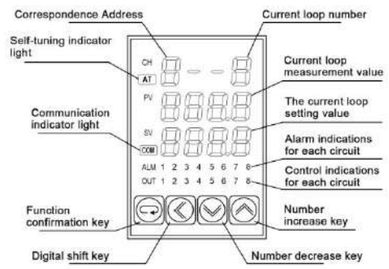
2. Appearance and Installation

2.1. Controller Appearance

The maximum height of the controller (including the terminal blocks) is 112mm.
The controller widths are available in three types: 56mm, 76mm and 116mm.
The depth of the controller is 78mm.

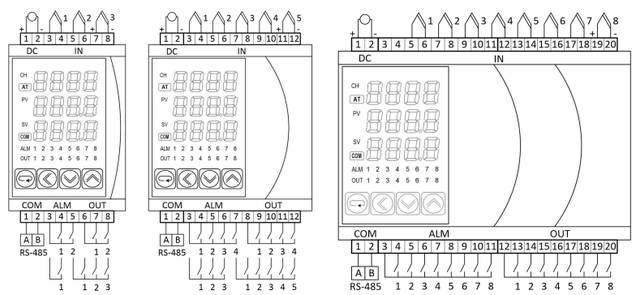
2.2. Controller Installation
M3 screw installation, the installation hole is a 102mmX(width -10mm) rectangular diagonal point.
IN46277 rail (35mm wide) rail installation. When disassembling, simply pull down the assembly hook of the guide rail to remove the controller.

2.3. Display and Operation Panel

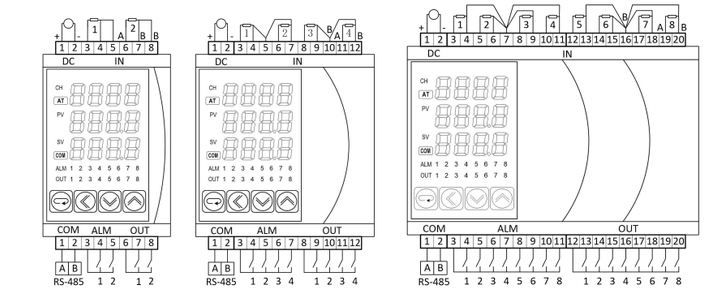


3. Terminal wiring

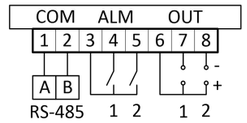
3.1. Wiring diagram of the thermocouple (or standard signal) input controller



3.2. Wiring diagram of the thermal resistance input controller



3.3. Logic level output drives Solid State Relay (SSR)
When the controller outputs logic level (NPN transistor), the common terminal is the positive terminal of 24VDC, and the negative terminal is the output terminal, as shown in the right figure：



4. Control parameter Settings

4.1. Startup information
Full-screen display >>>TX (where N represents the number of channels) >>>V40 (software version number) >>> Normal state.

4.2. hannel Selection

Tap the ⌃ or ⌄ key to quickly view each channel. The N+1 th channel shows the ambient (cold end of the thermocouple) temperature display.

4.3. Control Parameter Settings

Press and hold the SET key for 4 seconds to enter the control parameter setting state. At this time, the upper row displays the parameter prompt "SV", and the lower row displays the control parameters. At this time, the units digit flashes. Briefly press the ◁ key to move the number of flashing digits. After selecting the number of digits to be modified, briefly press the ⌃ or ⌄ key to modify the control parameter. Continue to briefly press the SET key. The upper row will display the prompt symbols of each parameter in sequence. After finding the parameter that needs to be modified, continue to briefly press the SET key to move the number of flashing digits. After selecting the number of digits that need to be modified, briefly press the ⌃ or ⌄ key again to modify the control parameter.

Press the long key SET for more than 4 seconds, and the controller will automatically return to the normal control state (if there is no key operation within 60 seconds, the controller will automatically return to the normal control state).

Tap the function key to confirm the current parameter and jump to the next one. If you press the shift key first and then tap the function key, you will confirm the current parameter and jump to the previous one.

4.4. List of Control Parameter Settings

sequence number	Parameter name	operator number	Data range	single position	Explanation	Initial value
1	Set value	SV	SVL～SVH	℃	Set the target value of the controller for this loop.	100
2	Lower limit alarm 1	AL1	-500～4000	℃	For details, please refer to 4.5 Alarm Output Instructions.	50
3	Lower limit alarm 2	AL2	-500～4000	℃	It has the same function as AL1, but can only be output through communication.	50
4	Upper limit alarm 1	AH1	-500～4000	℃	For details, please refer to 4.5 Alarm Output Instructions.	50
5	Upper limit alarm 2	AH2	-500～4000	℃	It has the same function as AH1, but can only be output through communication.	50
6	Alarm type	SA	00～66	—	The units digit of XX represents the selection of alarm type 1, and the tens digit represents the selection of alarm type 2: X= 0: No alarm; 1: Upper limit deviation value alarm; 2: Lower limit deviation value alarm; 3: Alarm when the upper and lower limit deviation values are exceeded; 4: Alarm within the upper and lower limit deviation values; 5: Upper limit absolute value alarm; 6: Lower limit absolute value alarm.	01
7	Forward and reverse action control and the first power-on alarm enable	EA	000～111	—	The hundreds digit of XXX is selected for both forward and reverse action control: X=0: Reaction control (heating type); Positive action control (cooling type). The tens digit of XXX represents the first alarm enable selection of alarm 2, and the units digit of XXX represents the first alarm enable selection of alarm 1: X=0: After power-on, if the alarm conditions are met, no alarm will be triggered; thereafter, if the alarm conditions are met, an alarm will be triggered. All conditions that meet the alarm requirements will trigger an alarm.	011
8	Proportional band	P	0～9999	℃	Proportional effect regulation: The larger the P, the smaller the proportional effect, and the lower the system gain. 0: Switch to on-off control mode. At this point, the integral time I becomes 0.1 times the upper limit of the insensitive region, and the differential time D becomes 0.1 times the lower limit of the insensitive region.	30

Continue from the above table

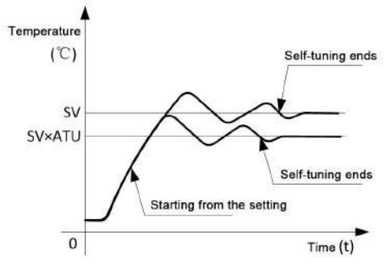
Serial number	Parameter name	Symbol	Data range	Unit	Explanation	Initial value
9	Integral time	I	0～9999	S	The integral action time constant: The larger I, the weaker the integral action. It is mainly used to eliminate static aberration. 0: Switch to PD control mode. At this point, the integral suppression Ar is RESET, and Ar is set to zero, with the unit being ℃, to eliminate static error.	240

					When the proportional band P=0, see the explanation of the proportional band P.	
10	Differential time	d	0～9999	S	Differential action time constant: The larger the D, the stronger the differential action, mainly used to suppress overshoot of the measured value. When the proportional band P=0, see the explanation of the proportional band P.	60
11	Integral suppression	Ar	0～100	%	Integral suppression ratio: The larger the Ar, the greater the possible overshoot; if the Ar is too small, static tolerance may occur. When the integration time I=0, see the description of the integration time I.	100
12	Positional hysteresis	HY	Full range	Degree of	It is effective when P=0 bit control is applied	2
13	Sensor correction	Pb	-500～4000	℃	It is used to correct the measurement errors caused by sensors and thermocouple compensating wires.	0.0
14	Self-tuning	At	nO or YES	—	YES: Start self-tuning. After self-tuning is completed, resume nO. If self-tuning is not completed within 4 hours, it is considered a failure and the original P, I, and D values are still used for control.	nO
15	Self-tuning limit	AtU	0～100	%	To overcome the overshoot phenomenon during self-tuning, the self-tuning control point can be lowered to SV×ATU.	100
16	Filtering coefficient	FIL	0～250	—	The smaller this value is, the faster the response speed of the measurement value will be, but there may be fluctuations. The larger this value is, the slower the response speed of the measured value will be, and the more stable the display will be.	125
17	Alarm 1 Switching difference	FH1	-500～4000	℃	The switching difference is 0.1 times that of FH1.	4
18	Alarm 2 Switching difference	FH2	-500～4000	℃	The switching difference is 0.1 times that of FH2.	4
19	Upper limit of the sensor	RH	Full range	Degree of	Measure the upper limit of the range according to the type of goods or sensor	500
20	Lower limit of the sensor	RL	Full range	Degree of	The lower limit of the measurement range is determined by the type of goods or sensor	0
21	Upper limit of temperature control value	SVH	RL—RH	℃	Set the maximum temperature control value according to the heating load	300
22	Lower limit of temperature control value	SVL	RL--RH	℃	Set the minimum temperature control value according to the heating load	0
23	Control output Switch	SSt	0～1	—	0: The control output is turned off (SV displays 0FF under normal conditions), and only the output is turned off. Other functions such as alarms operate normally. 1: Output enabled.	1
24	Lower output limit	OPL	0—30%	%	Generally, when heating at 4- 20mA, set and adjust the maximum heating percentage. For example, if set to 50, then the maximum heating percentage of 50 means the maximum output is 12mA.	0
25	Output upper limit	OPH	50—100%	%	Generally, when heating from 4 to 20mA, set and adjust the minimum heating percentage. For example, if set to 5, the minimum heating will be 5%, that is, the minimum output will be 4.8mA.	100
26	Slope heating	SPR	0～9999	0	Reserved. Not in use yet	0
27	Soft start percentage	BUF	0--30%		After power-on, heat the BUF percentage for the BUT time and then enter the normal control temperature.	20
28	Soft start time	BUT	0--9999	S	There is no soft start function when BUT=0.	0

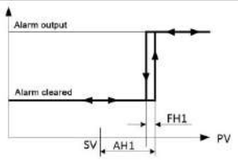
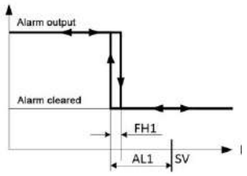
Self-tuning PID parameter function

Press 4.4. Control Parameter setting operation, find the self-tuning start parameter AT. The upper row shows the AT prompt, and the lower row shows the nO prompt, indicating that the limit tuning or self-tuning function has not been enabled yet. Press the ◠ key to make the lower row display the YES prompt, indicating that the user is ready to start the self-tuning function of this circuit. If the loop system does not allow the temperature to exceed the set value SV by too much, the next parameter, the self-tuning limit ATU, can be set. Generally, the ATU can be set between 70% and 80% (i.e., self-tuning is performed within 70% to 80% of the set value). Then, press the ◠ key for more than 1 second to exit the parameter setting. AT this point, the AT indicator will flash, indicating that the controller is in the process of tuning. After two to three fluctuations in temperature, the self-tuning process is completed. The AT indicator light goes out, and a set of P, I, and D parameter values suitable for the control of this loop is obtained. Control is then carried out according to the new P, I, and D parameters, which will be permanently saved in the controller.

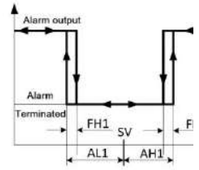
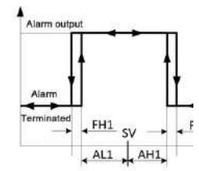
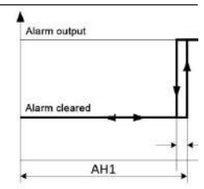
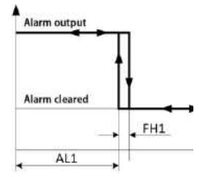
If it is necessary to interrupt the self-tuning process during the tuning process, you need to re-enter the control parameter menu, set the self-tuning start parameter AT to nO, and then exit the control parameter menu. AT this time, the AT indication goes out, and the controller will control according to the original P, I, and D parameters.



4.5. Alarm Output Description

Serial number	Type	Action conditions		Schematic diagram (Taking Alarm 1 as an example only)
		Alarm 1	Alarm 2	
1	No alarm	The units digit of SA =0.	The tens digit of SA =0.	——
2	Upper limit deviation alarm	The units digit of SA =1; An alarm is triggered when PV exceeds SV+AH1. The alarm is cleared when PV≤SV+AH1-FH1.	The tens digit of SA =1; An alarm is triggered when PV exceeds SV+AH2. The alarm is cleared when PV≤SV+AH2-FH2.	
3	Lower limit deviation alarm	The units digit of SA =2; An alarm is triggered when PV<SV-AL1. The alarm is cleared when PV≥SV-AL1+FH1.	The tens digit of SA =2; An alarm is triggered when PV<SV-AL2. The alarm is cleared when PV≥SV-AL2+FH2.	

Continue from the above table

Serial number	Type	动作条件		示意图（仅以报警 1 为例）
		报警 1	报警 2	
4	Alarm for deviation outside the upper and lower limits	The units digit of SA =3; An alarm is triggered when PV exceeds SV+AH1. When PV≤SV+AH1-FH1, the alarm is cleared. An alarm is triggered when PV<SV-AL1. The alarm is cleared when PV≥SV-AL1+FH1.	The tens digit of SA =3; An alarm is triggered when PV exceeds SV+AH2. When PV≤SV+AH2-FH2, the alarm is cleared. An alarm is triggered when PV<SV-AL2. The alarm is cleared when PV≥SV-AL2+FH2.	
5	Alarm within the deviation of the upper and lower limits	The units digit of SA =4; Sv-al1 <PV<SV+AH1 alarm; PV≥SV+AH1+FH1 Or when PV≤SV-AL1-FH1, the alarm is lifted.	The tens digit of SA =4; Sv-al2 <PV<SV+AH2 alarm; PV≥SV+AH2+FH2 Or when PV≤SV-AL2-FH2, the alarm is lifted.	
6	Upper limit absolute value alarm	The units digit of SA =5; An alarm is triggered when PV exceeds AH1. The alarm is cleared when PV≤AH1-FH1.	The tens digit of SA =5; An alarm is triggered when PV exceeds AH2. The alarm is cleared when PV≤AH2-FH2.	
7	Lower limit absolute value alarm	The units digit of SA =6; An alarm is triggered when PV<AL1. The alarm is cleared when PV≥AL1+FH1.	The tens digit of SA =6; An alarm is triggered when PV<AL2. The alarm is cleared when PV≥AL2+FH2.	

4.6. Error message

When the measured value PV is lower than the lower limit of the range RL, it will be displayed as

(communication output -16666), indicating that the thermocouple is connected in reverse, the thermal resistance is short-circuited, the three-wire system is connected incorrectly, or the ambient temperature (cold end temperature) is too low, etc. Please check whether the sensor wiring is correct or if the sensor is damaged. When the ambient temperature is too low, you can try lowering the lower limit of the range RL.

When the measured value PV is higher than the upper limit of the range RH, it is displayed as (communication output is 18888), indicating that the thermocouple is open-circuited, the thermal resistor is open-circuited, the actual measured temperature is higher than the upper limit of the range (the sensor and the heating unit do not form the same circuit, resulting in long-term heating), etc.

4.7 Enter the internal copy menu

(Press the plus and minus keys simultaneously to modify LoCK=1120) The parameters are the same as those in Table 4.4

As long as the modified value is different from the original value, the new number will be copied by default. For example, if AL1 was originally 100 and is modified to 110, then the alarm 1s from 1 to 16 will all be changed to 110.

If there are no changes, all will remain the original values.

4.8 Restore factory Settings

(simultaneously press the plus and minus keys to modify LoCK=2324)

5. Internal parameter Settings

5.1. Communication parameter Settings

(Under normal conditions, press the key ◠ for more than 3 seconds to enter the communication parameter Settings.)

Serial number	Parameter name	Parameter symbol	Data range	Explanation	Initial value
1	Correspondence Address	Addr	1～250	The address number of the lower server of the module	1
2	Communication rate（bps）	bAUd	1.2K—38.4K	19.2k indicates a baud rate of 19,200	19.2K
3	Communication stop bit	UAEP	1-2	Select 1 as one stop position and 2 as two stop positions	1
4	Communication check bit	PEPS	---	Select the communication parity bit, NONE for no parity bit, ODD for odd parity bit, and EUEN for even parity bit	NONE
5	Passage inspection time	CHLS	0～100	Check the waiting key between 0 conduction. The unit is seconds	4

5.2. Internal public parameter Settings (Simultaneously press the plus and minus keys to modify LOCK=88)

Serial number	Parameter name	Parameter symbol	Data range	Explanation	Initial value
1	Selection of graduation number	SNr	--	Select the sensor input type	K
2	Decimal point	DP	0-3	When using thermocouples or thermal resistors, set 0 to 1. When setting the standard signal, set 0-3. When the tens digit of OABY equals 5, the setting is invalid. At this time, PV has one decimal point and SP has no decimal point	0
3	Temperature unit	UINT	C/F	Select the temperature unit of Celsius (Fahrenheit)	C
4	Heating cycle	T	---	The heating cycle is set to 20 seconds when the relay is heating	3 秒
5	Room temperature correction	TXXX	-10.0—100.0	The upper row of thousands shows the temperature of the current room, and the lower row modifies the room temperature error	0. 0
6	Heating direction	DIR	---	-------	HEAT
7	Output type	OUT	--	The output type selection cannot be switched by software at present. It can only be specified as solid-state, relay or thyristor heating when placing an order	0
8	Control parameter 1	OABY	00--9999	The "ten, hundred, thousand" represents independent meanings. When the units digit is 1, the button will sound a buzzer as a prompt. When the tens digit equals 5, limit the decimal point of DP. The setting sequence is as follows: if DP=1, restore the factory Settings first, or set DP=0 and then set it to 5	0001
9	Control parameter 2	A3PY	00---9999	Dividing it into ten, hundred, and thousand represents independent meanings	0000
10	Overshoot coefficient	STPU	0.0—25.0	Power-on overshoot percentage coefficient	0.7
11	Display coefficient	STDT	0.0--100.0	Display stability coefficient	1. 0
12	Closure deviation	PHOF	0- Full range	Force off the heating deviation. This function is not available when set to 0 When PV>SV+PHOF, the heating is forcibly turned off	0
13	Lower display control	RLTO	0—30 分	When measuring the overflow within the RLTO time after power-on, display RL-50	10 分
14	Channel selection	SCH	1--8	It can be set to 1---- (number of ordered channels)	8
15	Parameter password lock	LCK	0--9999	=0 can modify any parameter, = others cannot be modified and can only be viewed	0

Change Record

When u47 adds RLTO and U48 removes automatic inspection, the room temperature is not displayed

The U49 has added the OABY ten-digit function to be compatible with the display of laptops. Partial communication read-only function

6. Maintenance and upkeep

6.1 Maintenance: Within eighteen months from the date of invoice issuance, if the instrument malfunctions due to manufacturing quality, our factory will be fully responsible for the warranty. If the damage is caused by improper use, our factory will charge the repair cost as appropriate. Our factory provides lifetime maintenance for the instrument.

6.2. Storage: The instrument should be stored in a dry, well-ventilated place free from corrosive gases when fully packaged.