TP Series Temperature Controller Manual

Features:

- ⊙ TC / RTD / Analog signal universal input, selected by software menu.
- ⊙ With display, alarm and adjusting function
- ⊙ Advanced Two Degrees of Freedom PID Arithmetic.
- ⊙ Auto-tuning function suitable to different system (Quick heating / cooling and Slow heating system)
- ⊙ Optional control output, modularization design.
- ⊙ Good anti-interference.
- ⊙ Switching power supply 100-240VAC.
- ⊙ Applied to system temperature control application.

For your safe, please read the below content carefully before you use the temperature controller!

▣ Safe Caution

※ Please read the manual carefully before you use the temperature controller.

※ Please comply with the below important points.

⚠ Warning An accident may happen if the operation does not comply with the instruction.

⚠ Notice An operation that does not comply with the instruction may lead to product damage.

※ The instruction of the symbol in the manual is as below.
⚠ An accident danger may happen in a special condition.

⚠ Warning

1. A safty protection equipment must be installed or please contact with us for the relative information if the product is used under the circumstance such as nuclear control, medical treatment equipment, automobile, train, airplane, aviation and equipment etc. Otherwise, it may cause serious loss, fire or person injury.
2. A panel must be installed, otherwise it may cause creepage (leakage).
3. Do not touch wire connectors when the power is on, otherwise you may get an electric shock.
4. Do not dismantle or modify the product. If you have to do so, please contact with us first. Otherwise it may cause electric shock and fire.
5. Please check the connection number while you connect the power supply wire or input signal, otherwise it may cause fire.

⚠ Caution

1. This product cannot be used outdoors. Otherwise the working life of the product will become shorter, or an electric shock accident may happen.
2. When you connect wire to the power input connectors or signal input connectors, the moment of the No.20 AWG (0.50 mm2) screw tweaked to the connector is 0.74n.m - 0.9n.m. Otherwise the connectors may be damaged or get fire.
3. Please comply with the rated specification. Otherwise it may cause electric shock or fire, and damage the product.
4. Do not use water or oil base cleaner to clean the product. Otherwise it may cause electric shock or fire and damage the product.
5. This product should be avoid working under the circumstance that is flammable, explosive, moist, under sunshine, heat radiation and vibration. Otherwise it may cause explosion.
6. In this unit it must not have dust or deposit, otherwise it may cause fire or mechanical malfunction.
7. Do not use gasoline, chemical solvent to clean the cover of the product because such solvent can damage it. Please use some soft cloth with water or alcohol to clean the plastic cover.

1. Model

TP □ — □ □ □

- Signal input: 10: One signal input
- Alarm function: B: 1 alarm output C: 2 alarm output
- Output function: R: Relay S: Logic (SSR) D: Current (4-20mA)
- Dimension: 4: 48Wx48H 6: 48Wx96H 9: 96Wx96H 7: 72Wx72H 8: 96Wx48H
- TP series temperature controller

2. Model Indication

Model	Alarm No.	Output	Dimension(mm)
TP4-RB10	1	Relay	48Hx48WX105L
TP4-SB10	1	Logic (SSR)	48Hx48WX105L
TP4-DB10	1	Current	48Hx48WX105L
TP6-RC10	2	Relay	96Hx48WX112L
TP6-SC10	2	Logic (SSR)	96Hx48WX112L
TP6-DC10	2	Current	96Hx48WX112L
TP9-RC10	2	Relay	96Hx96WX118L
TP9-SC10	2	Logic (SSR)	96Hx96WX118L
TP9-DC10	2	Current	96Hx96WX118L
TP7-RC10	2	Relay	72Hx72WX112L
TP7-SC10	2	Logic (SSR)	72Hx72WX112L
TP7-DC10	2	Current	72Hx72WX112L
TP8-RC10	2	Relay	48Hx96WX112L
TP8-SC10	2	Logic (SSR)	48Hx96WX112L
TP8-DC10	2	Current	48Hx96WX112L

3. Technical Parameters

1) Meter Parameters

Power Supply	100-240V AC/DC
Total Current	＜30mA（220VAC）
Ambient Temperature	0-50℃
Ambient Humidity	45-85RH%

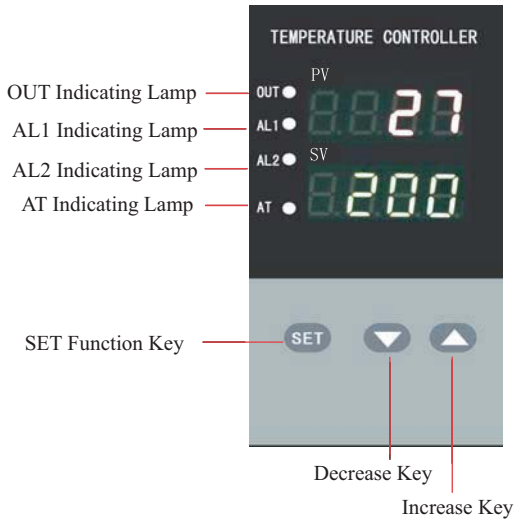
2) Input Signal

Code	Input type	Measuring range	Resolution	Accuracy	Input Impedance
0	S type TC	0-1600℃	1℃	0.5%FS±3digits	＞100KΩ
1	B type TC	200-1800℃	1℃	0.5%FS±3digits	＞100KΩ
2	K type TC	0-1300℃	1℃	0.5%FS±3digits	＞100KΩ
3	E type TC	0-600℃	1℃	0.5%FS±3digits	＞100KΩ
4	T type TC	0-300℃	1℃	0.5%FS±2digits	＞100KΩ
5	J type TC	0-800℃	1℃	0.5%FS±3digits	＞100KΩ
6	Reserved				
7	PT100 High Temperature	-200-800 ℃	0.1℃	0.5%FS±2digits	（0.2mA）
8	PT100 Low Temperature	-200-200 ℃	0.1℃	0.5%FS±1digits	（0.2mA）
9	CU50	-50-150 ℃	0.1℃	0.5%FS±1digits	（0.2mA）
10	0-20mV	0-20mV	10 digits AD	0.5%FS±3digits	＞100KΩ
11	0-50mV	0-50mV	10 digits AD	0.5%FS±3digits	＞100KΩ
12	Linear Resistance	0-400Ω	10 digits AD	1%FS±3digits	

3) Output control

Output Type	Capacity
Relay	Relay output, 3A/220VAC
Current	Current output, 4-20mA, load resistance Max.600Ω
Logic	DC 24V voltage, drive load 30mA

4. Panel



PV Value or Parameter Code

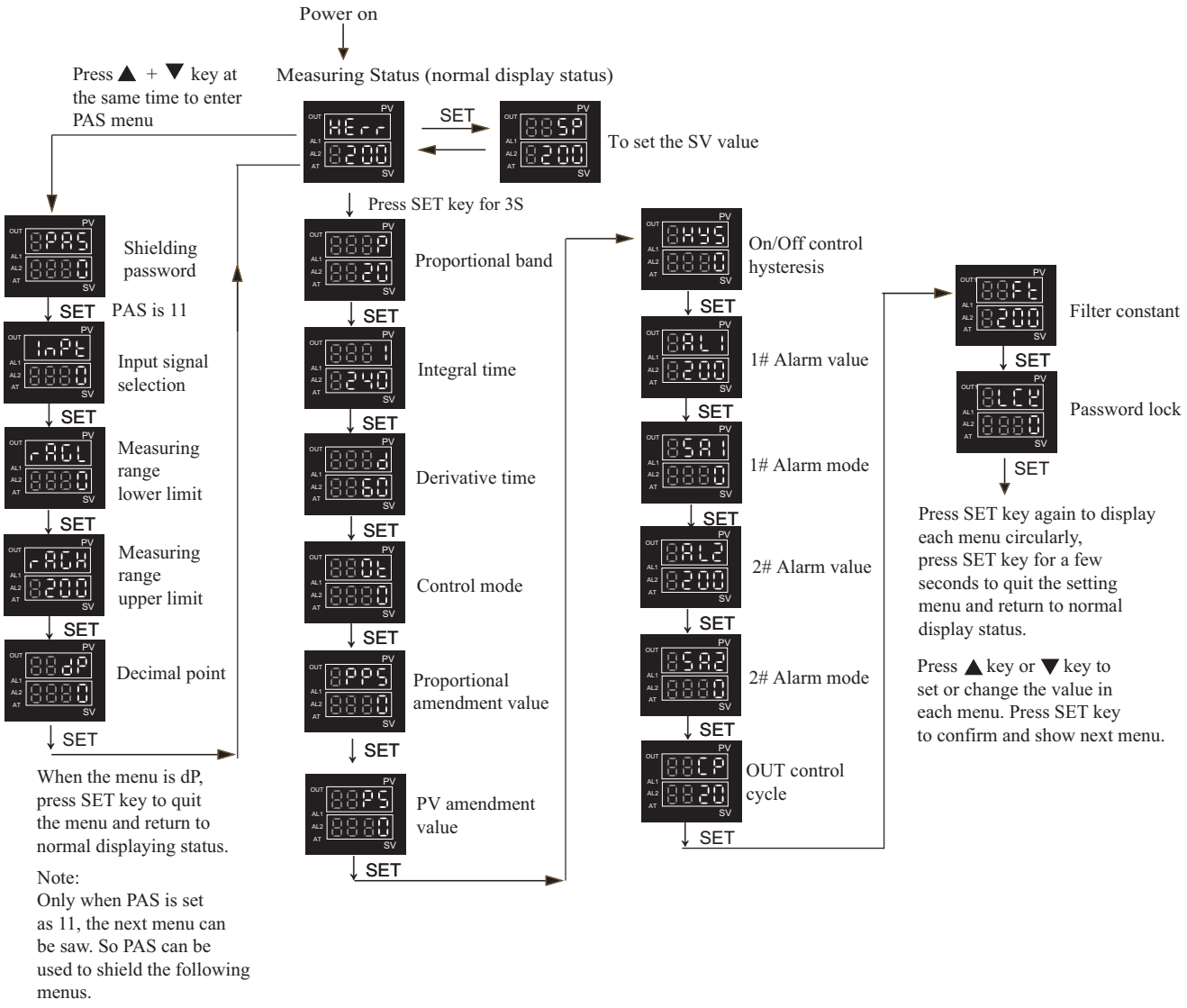
SV Value or Parameter Code

PV Display Window: Measuring Value Display Window
SV Display Window: Setting Value Display Window
AL1: Alarm #1 Output Indication. On: Alarm Active, Off: No Alarm
AL2: Alarm #2 Output Indication. On: Alarm Active, Off: No Alarm
AT: Auto-tuning Indication, Flashing: Auto-tuning Active
OUT: Control output Indication Lamp, On: Output Active,
Off: No Output.
SET: Setting Mode Shift Key

5. Panel Key Operation

（1）SET Key：In normal display status, press SET Key to show SV modifying menu; press SET key for a few seconds to show setting menu.
（2）“▲”, “▼” Key：Press ▲ or ▼ to set the value in SV value menu or setting menu.
（3）“▲” Key: In normal display status, press it for a few seconds to start Auto-tuning applied to quick heating / cooling system (For raising temperature quickly).
（4）“▼” Key: In normal display status, press it for a few seconds to start Auto-tuning applied to slow heating / cooling system (For small overshoot).

6. Operation Sequence



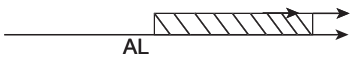
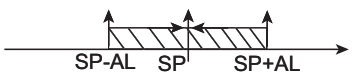
7. PID Control Menu

Parameter	Indication	Setting Range	Ex-Factory setting
P	Proportional Band. The smaller the proportional band is, the faster the system heats. Instead, the slower the system heats. Increase proportional band will decrease the oscillation, but increase control bias. Decrease proportional band will decrease control bias, but cause oscillation.	0-Upper Limit	20
I	Integral Time. The smaller the integral time is, the stronger the integral action is and better for eliminating the bias between it and the setting value. If the integral time is too short, it may not eliminate the bias.	0-3600	240
d	Derivative Time. To decrease the derivative time to a proper value can prevent the system from oscillating. The bigger the D is, the stronger the derivative action is.	0-3600	60
ot	0: On / Off control 1: Heating control 2: Cooling control	0-2	1
PPS	Proportional amendment value for amending static bias.	0-10	0
PS	PV amendment value for amending the bias caused by the measuring process.	-50-50	0
HYS	On / Off control hysteresis (It is effective when ot is set as 0.)	0-25	0
AL1	Alarm #1 (Alarm hysteresis value is fixed at 0.6)	Lower limit - Upper limit	200
SA1	Alarm #1 mode (Please refer to alarm parameter table)	0-12	0
AL2	Alarm #2 (Alarm hysteresis value is fixed at 0.6)	Lower limit - Upper limit	200
SA2	Alarm #2 mode (Please refer to alarm parameter table)	0-6	0
CP	OUT control cycle. For relay output, it is bigger than 4; for logic or pulse output, it is 2; for current output, it is 1.	1-120S	20
Ft	Filter constant. The smaller Ft is, the faster response is, but it may cause fluctuation.	0-255	60
LCt	0: Allowed to change all parameters; 1: Only for SV value change; 2:Any change prohibited	0-2	0

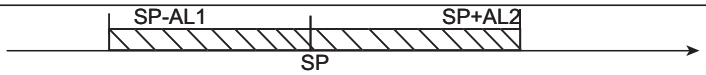
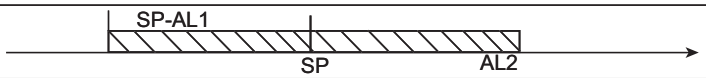
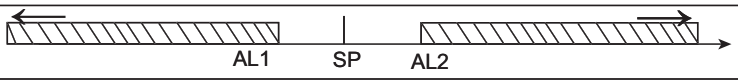
Measuring parameters setting menu

Parameter	Indication	Setting range
INPT	Input signal selection, please refer to Input parameter table	0-12
RAGL	Lower limit of measuring range	Lower limit of input signal-RAGH
RAGH	Upper limit of measuring range	RAGL-Upper limit of input signal
DP	0:No decimal point 1: 1 digit decimal point 2: 2 digit decimal point (Not effective for TC/RTD input)	0-2

Alarm parameters table

Alarm code	Alarm mode	Alarm output(AL1, AL2 has no relation with each other）
1	Upper limit absolute alarm	
2	Lower limit absolute alarm	
3	Upper limit relative alarm	
4	Lower limit relative alarm	
5	Upper / Lower limit relative alarm	
6	Upper / Lower limit zone alarm	

Alarm parameters table

Alarm code	Alarm mode	AL1, AL2 are used together，AL1 alarm output,AD2 must be set as 0
7	Upper and Lower limit absolute zone alarm	
8	Upper and Lower limit relative zone alarm	
9	Upper limit absolute and Lower limit relative zone alarm	
10	Upper limit relative and Lower limit absolute zone alarm	
11	Upper / Lower limit absolute alarm	
12	Upper / Lower limit relative alarm	

8. Advanced Function

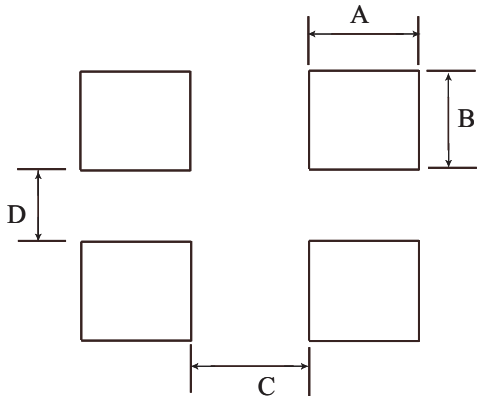
The setting of P.I.D parameters & Auto-tuning operation

1. To set P.I.D parameters manually：
   A default PID value has been set before the controller is ex-factory. This P.I.D value is applied to normal heating, cooling system for temperature control. If the performance is not so good with the default P.I.D，the value can be changed manually for the users who have some automation control theory and experience.
2. To set P.I.D parameters automatically：
   If users do not know how to set P.I.D parameters, they can use the Auto-tuning function of the controller. Auto-tuning function is that the controller calculates the P, I, D value according to the specific heating system, and then controls temperature automatically as per the P, I, D value it gets.

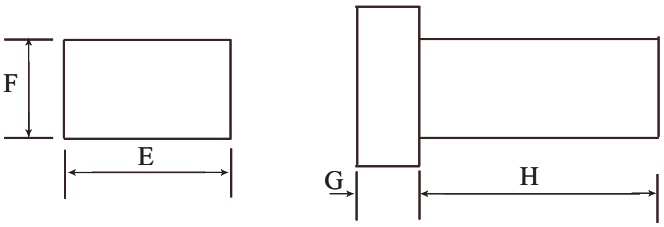
   Auto-tuning method: At first set the SV value, press ▲ key or ▼ key for 3 seconds until “AT” indicating lamp turns on,. “AT” lamp on means Auto-tuning is running. At this moment please don’t change the SV value or any parameters on the machines / equipments in order to make sure the Auto-tuning accuracy. After “AT” lamp turns off, the controller will refresh the P.I.D value automaticaly. At this moment, the controller can control temperature automatically and accurately.

9. Mounting Dimension

1. Mounting



2. Dimension

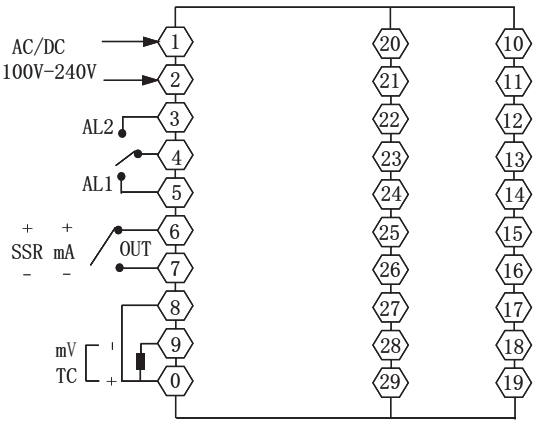


3. The dimension list of TP models：

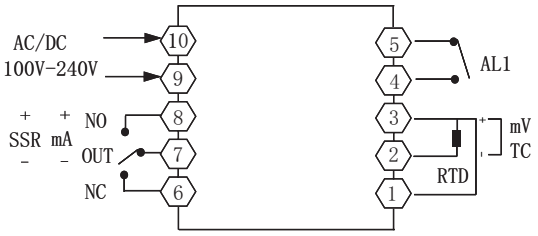
Model \ Size	A	B	C	D	E	F	G	H
TP4	44+0.5	44+0.5	30	25	48	48	5	100
TP6	44+0.5	91+0.5	25	30	48	96	12	100
TP7	67.5+0.8	67.5+0.8	30	25	72	72	12	100
TP9	91+0.5	91+0.5	25	25	96	96	18	100
TP8	91+0.5	44+0.5	25	30	96	48	12	100

10. Connection drawing

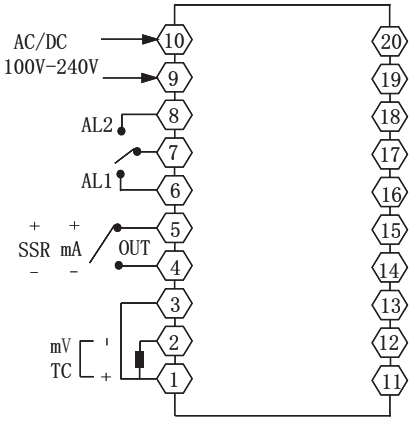
TP9 Power Supply: AC/DC 100V-240V
Alarm Output: AC 250V 1A
(Resistance Load)
Voltage Control Output: DC 24V 30mA
Current Control Output: 4-20mA
Relay Control Output: AC 250V 3A



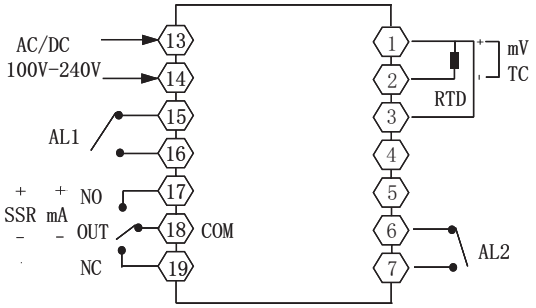
TP4 Power Supply: AC/DC 100V-240V
Alarm Output: AC 250V 1A
(Resistance Load)
Voltage Control Output: DC 24V 30mA
Current Control Output: 4-20mA
Relay Control Output: AC 250V 3A



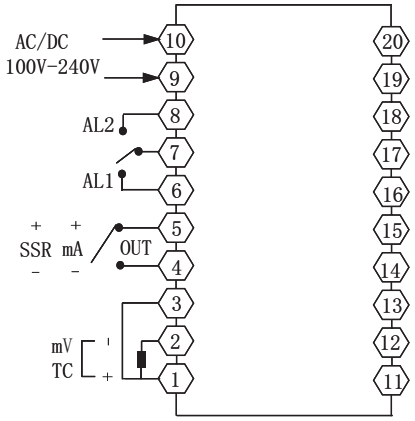
TP6 Power Supply: AC/DC 100V-240V
Alarm Output: AC 250V 1A
(Resistance Load)
Voltage Control Output: DC 24V 30mA
Current Control Output: 4-20mA
Relay Control Output: AC 250V 3A



TP7 Power Supply: AC/DC 100V-240V
Alarm Output: AC 250V 1A
(Resistance Load)
Voltage Control Output: DC 24V 30mA
Current Control Output: 4-20mA
Relay Control Output: AC 250V 3A



TP8 Power Supply: AC/DC 100V-240V
Alarm Output: AC 250V 1A
(Resistance Load)
Voltage Control Output: DC 24V 30mA
Current Control Output: 4-20mA
Relay Control Output: AC 250V 3A



11. Simple Problem Shooting

Display Message	Shooting Method
Display HERR	Input disconnect or over upper limit, please check input signal, RAGH value and ambient temperature.
Display LERR	Input disconnect or under lower limit, please check input signal, RAGL value and ambient temperature.