Instructional Manuel

TET-7100 Intelligent Temperature Controller

Figure 1.

1. Product Highlight

Thermocouple: T, R, J, B, S, K, E, Wre3-Wre25.

Thermo Resistor: Pt100, Cu50.

1 Relay output, 1 SSR controlled output.

Time proportional PID controlled output to either Relay or SSR

Built-in 3 algorithms that fit most of control objects and various applications.

Temperature can be set to display in either Fahrenheit or Celsius.

2. Specifications

Operating supply voltage: AC18-265V or DC18-360V.

Power consumption: =< 2 Watt.

Sampling speed: 4/sec.

SSR activated voltage: open circuit: 10V; short circuit:40mA.

Accuracy: 0.2% of full scale.

LED Display: 0.28 inch; Red color.

Out of range indication: “EEEE”.

Ambient temperature requirement: 0~+50 Deg C.

Humidity requirement: =< 85% RH.

Relay Contact volume: AC220V; 3A.

Controller dimension: 48x24x75(mm).

Opening for installation: 44x20(mm).

3. Panel Illustrations and Descriptions

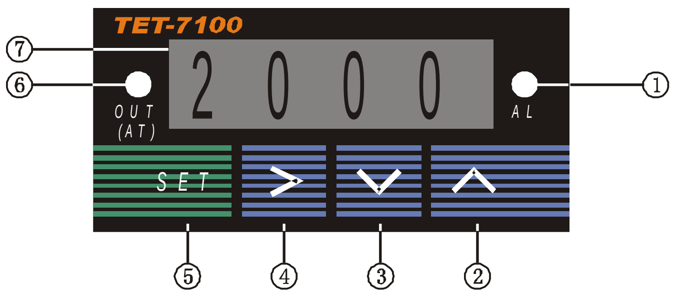

Figure 2.

1 -- AL, Relay J1 Indicator.

2 -- Select next parameter / value increment.

3 -- Selection previous parameter / value decrement.

4 -- Digit select / Auto tuning.

5 -- Setting / Confirm.

6 -- Output, controlled output indicator. (AT) Blanking during auto-tuning process.

4. Parameter Setting

i Press (SET) to enter setting mode.

ii Press (>), (v) and/or (^) to enter and select parameters.

iii Press (SET) to confirm entry or selection.

a) To enter initialization parameter setting mode press (SET), then enter code "**0089**", press (SET) again.

Table 1. Initialization Parameters:

Symbol	Description	Range	Default	Comment
Inty	Temp. sensor	See table 2	Pt100	
Outy	Method of controlled output	0,1,2	2	Note 1
Caty	PID algorithm	0,1,2	0	Note 2
PSb	Temp sensor error correction coefficient	-100~100 deg C	0	
Rd	Heating=0;Cooling=1	0,1	0	
CorF	Celsius=0;Fahrenheit=1	0,1	0	
End	Exit			

Table 2. Temperature Sensor Type:

Symbol	Description	Range	Comment
T	T Thermocouple	0 ~ 4000	Internal Resistant 100k
R	R Thermocouple	0 ~ 1600	Internal Resistant 100k
J	J Thermocouple	0 ~ 1200	Internal Resistant 100k
WRe	WRe Thermocouple	0 ~ 2300	Internal Resistant 100k
B	B Thermocouple	350 ~ 1800	Internal Resistant 100k
S	S Thermocouple	0 ~ 1600	Internal Resistant 100k
K	K Thermocouple	0 ~ 1300	Internal Resistant 100k
E	E Thermocouple	0 ~ 900	Internal Resistant 100k
P10.0	P100 Thermo Resistor	-200.0 ~ 600.0	Constant Output 0.2mA
P100	Pt100 Thermo Resistor	-200 ~ 600	Constant Output 0.2mA
Cu50	Cu50 Thermo Resistor	-50.0 ~ 150.0	Constant Output 0.2mA

Note 1:

0: Relay J1 Alarm output; SSR Disabled, normally used for upper lower limit alarm trigger control.

1: Relay J1 PID controlled output: SSR Disabled. Contact controlled output.

2: Relay J1 as alarm output; SSR PID controlled 12 Volt output. Know as No Contact controlled output.

Note 2:

This controlled has 3 type of auto-tuning control methods already built-in.

0: Universal PID control suitable for increase/decrease fast speed of change of temperature application.

1: Gradual change PID control is suitable for applications that require steady change of temperature and speed of temperature change is not critical.

2: Fussy logic control suitable for system with oscillation and sensing signal delay.

Initiallzation parameter setting

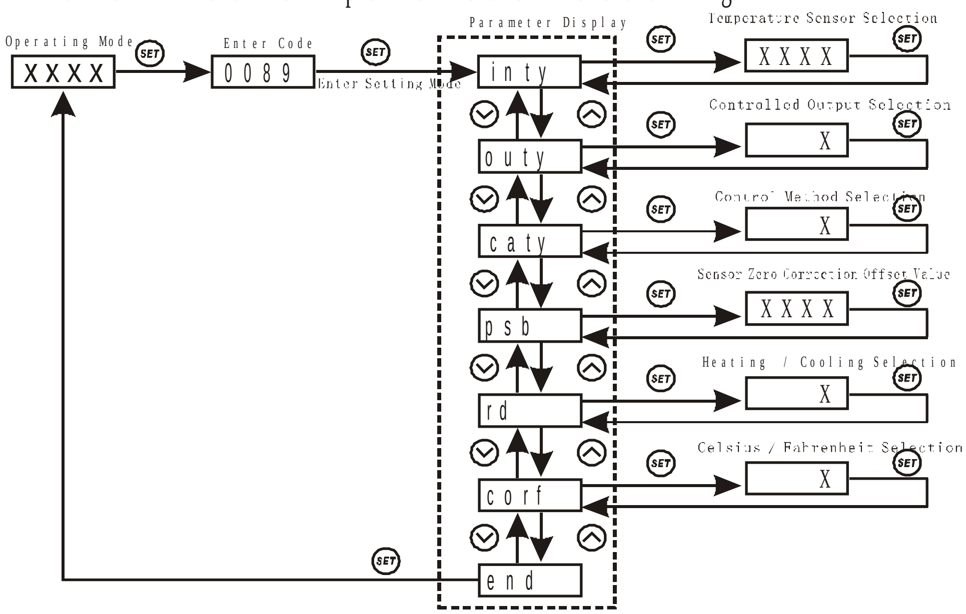

Figure 3.

b) To enter PID parameter setting mode press (SET), then enter code “**0036**”, press (SET) again.

Table 3. PID and Relevant Parameters:

Symbol	**Description**	**Range**	**Default**	**Comment**
P	Proportional Band	0.1 ~ 99.9 (%)	5.0	Note 4
I	Integration Time	2 ~ 1999 (Sec)	100	Note 5
D	Diffenciation Time	0 ~ 399 (Sec)	20	Note 6
SF	Integration Range	1 ~ 999 (Deg)	40	Note 7
Bb	On/Off Control Range	1 ~ 999 (Deg)	40	Note 8
Ot	Control Period	2 ~ 199 (Sec)	2	Note 9
Filt	Digital Filtering Strength	0 ~ 3	0	Note 10
End	Exit			

P,I and d parameters control the accuracy and respond time of the temperature controller. Auto-tuning is recommended for user who do not familiar PID control theory. P, I and d values should only be adjusted by professionals.

Note 4

Proportional Band (P): When P increases, fluctuation of object being controlled decreases. When P decreases, fluctuation of object being controlled increases. When P value is too small, system may become non-converge.

Note 5

Integration time (I): its purpose is to reduce static error. When I decrease, respond speed is faster but system is less stable. When I increase, respond speed is slower, but system is more stable.

Note 6

Differentiation time (d): its purpose is to control in advance and compensate delay. Setting d-value too small or too large would decrease system stability, oscillation or even non-converge.

Note 7

Integration control range (SF): It defines integration range limits. When |SV-PV|<SF, integration control is activated.

Note 8

Full power/complete off range (bb): It defines temperature range limits that the heating/cooling element is either fully on or fully off. When |SV-PV|>bb, heating/cooling element could be either full power heating or complete not power.

Note 9

Control Period (ot): When ot gets smaller, heating/cooling cycle is drive faster, system respond speed is faster. But when using contact control (Relays), contacts wear out faster.

When contact control (Relay) is used, normally set ot=5~30.

When non-contact control (SSR) is used, normally set ot=2.

Note 10

Digital Filtering (Filt): Filt=0, filter disabled; Filt=1, weak filtering effect; Filt=3, strongest filtering effect; Stronger the filtering, more stable the readout, but has more readout display delay.

c) To enter temperature and alarm parameter setting mode press (SET), then enter code “**0001**”, press (SET) again.

Table 4. Temperature Setting and Alarm Related Parameters:

Symbol	**Description**	**Range**	**Default**	**Comment**
SV	Target Temperature	With testing range	80.0	
AH1	Relay Closed	With testing range	80.0	
AL1	Relay Opened	With testing range	90.0	
End	Exit			

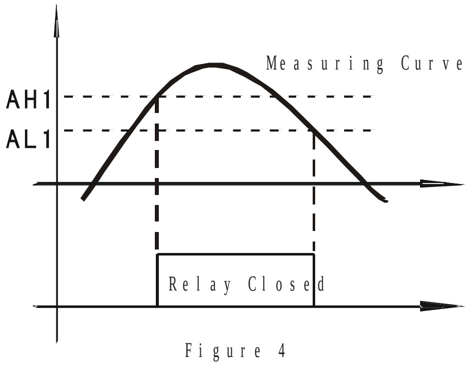

Figure 4

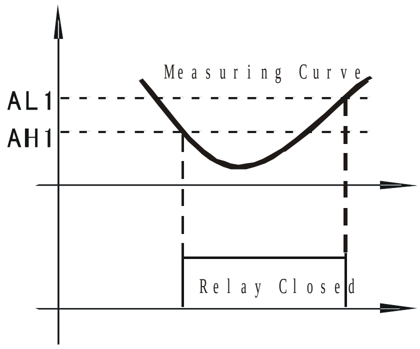

Figure 5

d) During Normal Operation mode, pressing (^) or (v), the display would show SV. Press (^) or (v) again increase or decrease SV by 1 degree.

a) Set AH1=AL1, relay is disabled.

b) Set AH1>AL1: Normally used for upper limit alarm trigger. See Figure 4.

c) Set AH1<AL1: Normally used for lower limit alarm trigger. See Figure 5.

5. Auto-Tuning

By simply press a single button the built-in artificial intelligent is activated to automatically calculate and set parameters (P,I,d,SF,bb,ot) that fit the condition to be controlled.

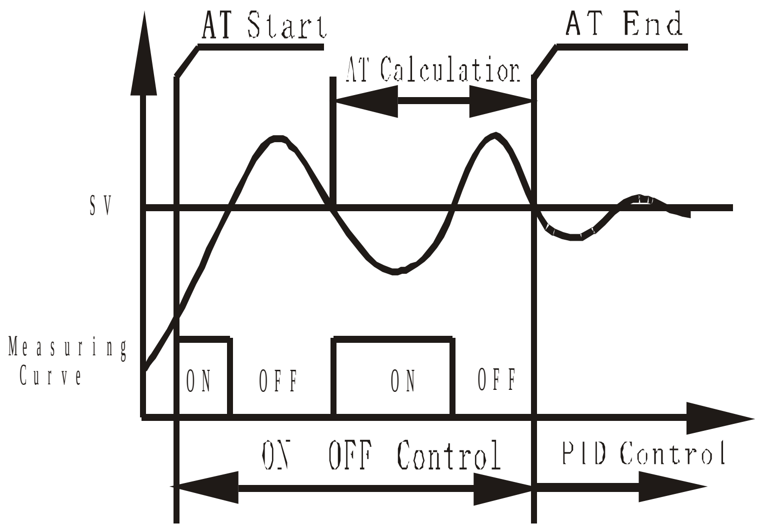

Figure 6.

a) How to Start and stop auto-tuning process:

i. To activate auto-tuning, press and hold (>) until "AT" indicator blinks, which indicates auto-tuning is in progress. When auto-tuning finish, "AT" indicator is off. Now newly calculated PID parameters are remembered and start to be used.

Ii To EXIT during auto-tuning process, press and hold (>) until "AT" indicator turns off. Then previous PID parameters values are resumed.

6. Connection Terminals (back view).

Polarity of power at terminal 1 and 2 do not matter

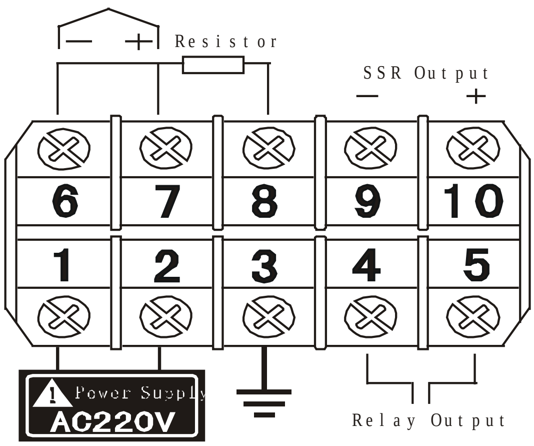

Figure 7.

7. Device Application Example

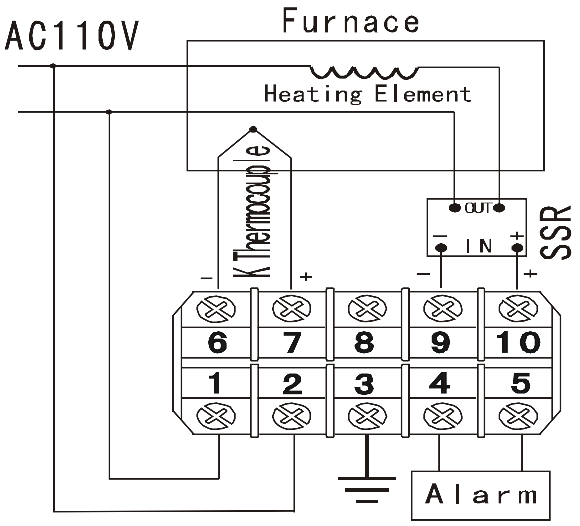

Figure 8.

User want to control temperature (T) of furnace, 0 ~ 1000 deg Celsius sensor range is required. Furnace is to be maintained at 800 deg C. Alarm will go off if T>850 deg C. System power supply is AC110V. Installation opening is 44x20(mm). SSR will be used to control the heating element.

a) Choose TET-7100 with K-type thermocouple.

b) See figure for connection diagram.

c) Parameter setting:

(Inty)=K

(outy)=2

(caty)=0

(psd)=0

(rd)=0

(filt)=0

(auto-tuning is used to set PID parameters)

(SV)=800 deg C

(AH1)=850 deg C

(AL1)=848 deg C

d) Power up the controller. Keep pressing (>) to activate auto-tuning. When “AT” stop blinking, new PID parameters are generated for the new system. The controller is in normal operation mode.