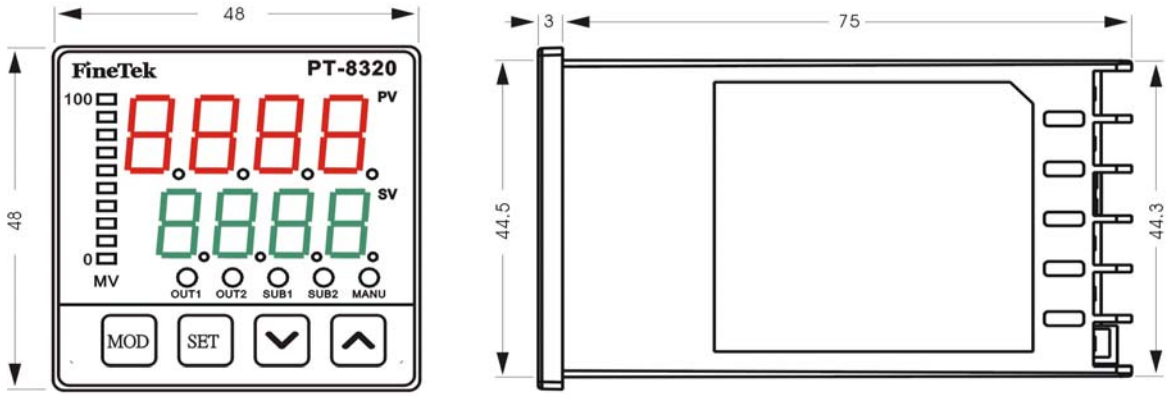
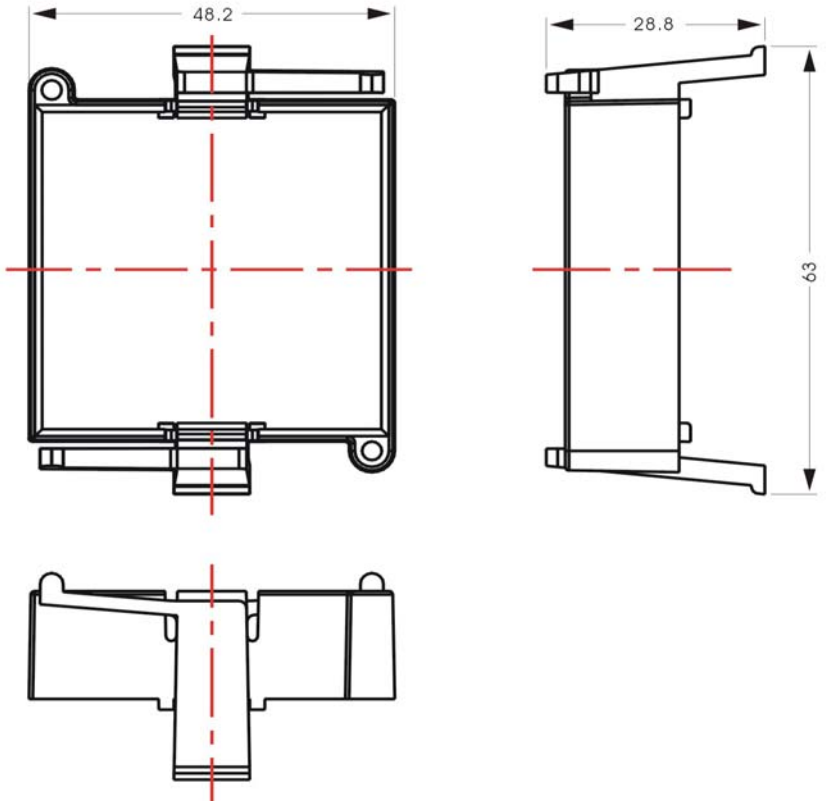
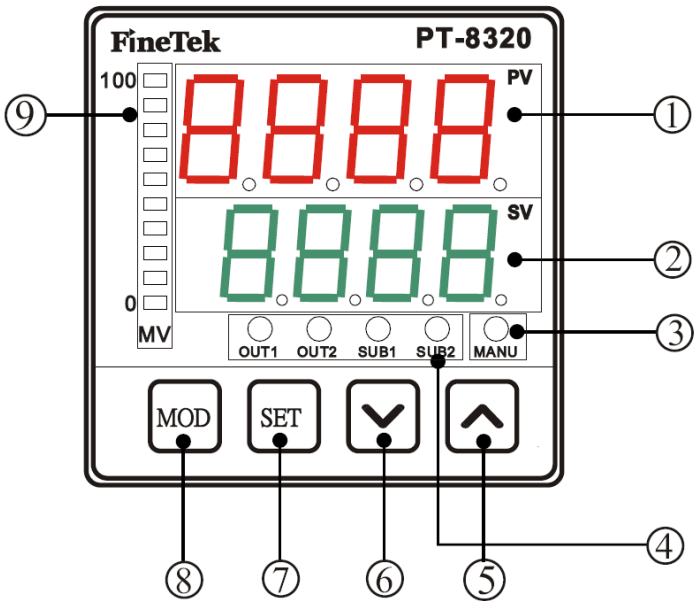
PT-8320
User Manual

DIMENSION / PANEL CUTOUT



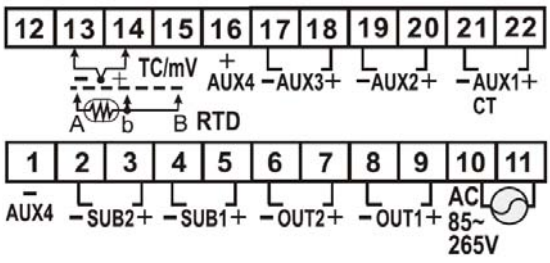


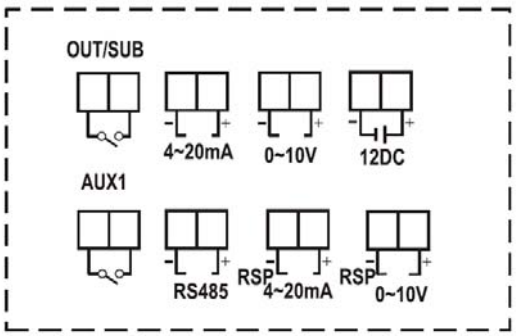
PANEL DESCRIPTION：



① Measured Value (PV) display
② Set Value (SV) display
③ Indicator for Manual Operation
④ Indicator for Output
⑤ "UP" key
⑥ "DOWN" key
⑦ Set key
⑧ MOD key
⑨ Bargraph indicator

EXPLANATION FOR TERMINAL WIRING：





★ Please use proper terminal.
★ If Electro-magnetic interference exists, please separate wire cable between sensor and power line or shield sensor's wire to ground.
★ Please use filter when there is power interference.
★ Stay away from Hi - frequency signal while using the equipment.
★ It is recommended to install power switch or circuit breaker near the equipment to control power of controller.
★ Fuse can be applied to prevent over-current.
★ Please use proper temperature compensation lead wire for termocouple transmission.

STANDARD SPECIFICATIONS		
Power Supply		85~265V AC 50/60 Hz
Power Consumption		7VA Maximum
Display		Upper：Red 4 digit of 7 segment display Bottom：Green 4 digit of 7 segment display 10 segment bar-graph display
Input Signal		Thermocouple：J, K, B, N, R, S, T, E RTD：PT100, JPT100 Direct Voltage：0~230mV
Control Output	Relay	Output SPST-NO,5A/250V AC
	Pulse Output(Drive SSR)	12VDC(NPN),20mA (MAX.)
	Analog	4~20mA ,0~10V DC (MAX.600Ω)
Alarm Output		SPST-NO,5A/250V AC
Alarm Delay Time		0 ~ 99 second
Alarm Output Hysteresis Adjustment		0 ~ 9999 degree C
Communication Interface		RS485(MODBUS)
Working Temperature		0 ~ 50℃ (20~85% RH)
Cycle Time of Output Control		0 ~ 50.0 seconds
Digital		0 ~ 3 digital
Digital Filter		1 ~ 100 times
Control Method		ON/OFF or PID+Fuzzy(Auto Tuning)
Input Compensation		-1999 ~ 9999
Fraction Value		0.0 ~ 999.9
Setting Range		-1999 ~ 9999
Accuracy		0.3%FS ± 1digit
Sampling Interval		400ms
Memory Retention		EEPROM

OTHER FUNCTIONS	
Sensor Error Detection	Error code displayed on PV, with sensor error alarm output ability.
Detect the loop break and Heater Break Alarm	HBA(Heater Break Alarm), Current error of heater can be detected via CT transformer. Or using LBA(Loop Break Alarm) to detect system failure via software.
Remote Set Point (RSP)	Remote Setting Voltage、Current signal in order to change SV value
EVENT function	Remote control for executing specific command
Re-transmission	Re-transmit the voltage、current after the exchange of PV、SV

A. ANUE DESCRIPTION

Main parameters selection

Main Parameters	Name of Parameter	Description of Parameter
	PV value SV value	Present value Setting value
LV-0	LV-0	Status information
LV-1	LV-1	PID setting
LV-2	LV-2	Advance setting for control
Prog	Prog	Ramp & Soak setting
ALM	ALM	Alarm setting
StUP	StUP	Hardware construction setting
EXPA	EXPA	Expansion function setting
CoMM	CoMM	Communication setting
LoCK	LoCK	Lock function
SCAL	SCAL	Analog auxiliary input setting
rSP	rSP	Remote Set Point auxiliary input setting
Ct	Ct	Current transformer input setting

Under operating mode, please press MOD button in order to exchange above

Main menu selection

B. LV-0 Parameters block description

Parameters Display	Name of Parameters	Description of Parameters	Display Range	Default
PtN	Pattern	Display the present executing pattern	0~8	0
StEP	Step	Display the present executing step	0~16/SV	0
LinK	Link	Display the present link setting	0~8	0
PrOG	Program	Ramp & Soak control On/Off	rSt/rUn/HoLd	rSt
AdV	Advance	Skip to next step	on/oFF	OFF
tSTb	Standby time	Display waiting time for start (minute)	0~9999	0
tELP	Elapse time	Display schedule of executing time (minute)	0~9999	0
rPt	Repeat time	Display style executed time	0~9999	0
Ev-H	Heater MV	Display heater output	0.0~100.0	0
Ev-C	Cooler MV	Display cooler output	0.0~100.0	0

LV-0 section shows controller status, mainly for Ramp/Soak information.
To go to LV-0, please press MOD once under SV/PV, the details are listed as below:

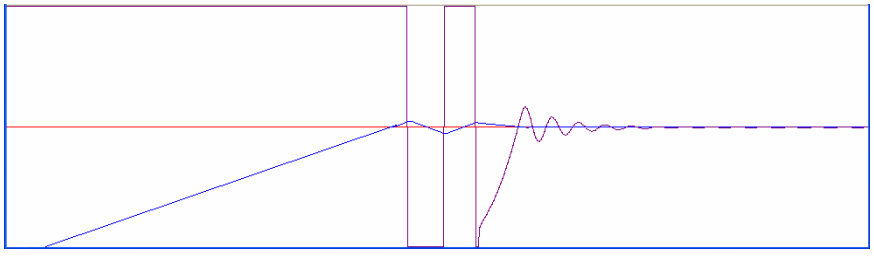
- PtN ： Indication of the on-going pattern
  0：Not in the Ramp/Soak control mode, which means oPEr = onoF or Pid
- StEP： Indication of the on-going step
  0：Ramp/Soak control not starts yet.
  SV：Maintain the last SV (EXPA->Pend=SV) after patterns are completed.
  1、3、5、7、 9、11、13、15：Ramp step
  2、4、6、8、10、12、14、16：Soak step
- LinK： Next pattern。(0: there is no next pattern)
- PrOG： Program control： Change is effective while LV2->oPEr not be onoF or Pid.
  rSt：Reset ramp/soak status, and control/alarm output stop action.
  rUn：Ramp/soak control begins or continues.
  Hold：Hold ramp/soak timing
- AdV ：Skip to next step.
  Ramp=>Soak：SV becomes the setting of the next soak step.
  Soak=>Ramp：
  EXPA=>PVSt=PV, PV reaches soak value after ramp time from the current PV.
  EXPA=>PVSt=SV, PV reaches soak value after ramp time from the current SV setting.
- tSTb ：Remaining time before controller actuates (min).
- tELP ：Time performed of the on-going step (min)
- rPt ：Remaining repeat times.
- Ev-H ：Percentage of manipulate value for the heater.
- Ev-C ：Percentage of manipulate value for the cooler.

C. LV-1 Parameters block description

Parameters display	Name of Parameters	Description of Parameters	Display range	Default
tUn	Tun	Auto Tuning	on/oFF	OFF
P	Proportional	Proportional parameter	0~999.9	2.0
I	Integral Time	Integral parameter (second)	0~9999	100
d	Derivative	Derivative parameter	0~9999	10
tAU	Tau	Fuzzy parameter	0.001~9.999	0.060
CoEF	Cooling Coefficient	Cooling parameter	0.01~99.99	1.00
E.AtE	MARE	Manual reset	0.0~100.0	0
oFS.t	Auto Tune Offset	SV Offset during Auto-tuning	-1999~9999	0
HYS.	Heater Hysteresis	Control output hysteresis for heater	0~9999	0
CHYS.	Cooler Hysteresis	Control output hysteresis for cooler	0~9999	0
H-Pd	Heater period	Cycle time of control heater output (second)	0.1~50.0	5.0
C-Pd	Cooler period	Cycle time of control cooler output (second)	0.1~50.0	5.0
dbon	Dead band	Dead band control	on/oFF	OFF
db-H	Heater dead band	Dead band of heater	-1999~9999	0
db-C	Cooler dead band	Dead band of cooler	-1999~9999	0
Ct	CT current monitor	Display CT		-1.
Hb	Heater burnout	Heater break setting	0~55.0	0

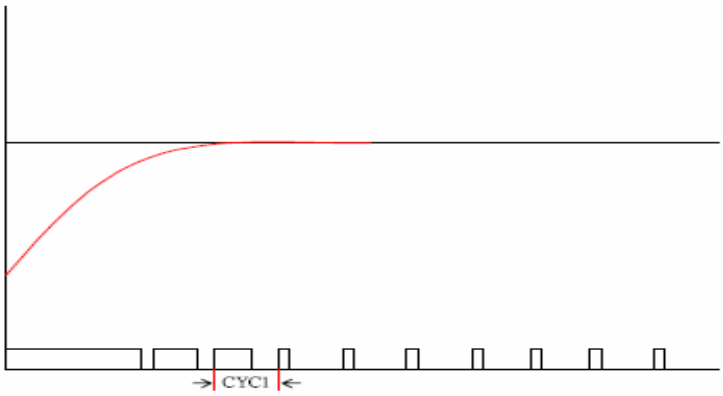
LV-1 section of parameters are used for basic control, P、I、D、tAU、CoEF parameters affect PID+Fuzzy control algorithm performance, theses parameter can be auto calculated by auto-tune function, without the need of complex PID tuning. Fuzzy compensation control makes system response faster and more reliable.
To go to LV-1, press MOD twice under SV/PV, and its sub options are listed below:

- tUn：Auto tuning tU on：Auto tuning on oFF：Auto tuning off.



When auto tuning is on, controller will start heating and cooling around the setting SV. After two cycles, PID parameters can be calculated. With these PID parameters, the controller can stabilize the system to a desire process value. You can also adopt the oFSt function (especially used during the auto tuning process), to prevent system over-heat during the auto tuning process.

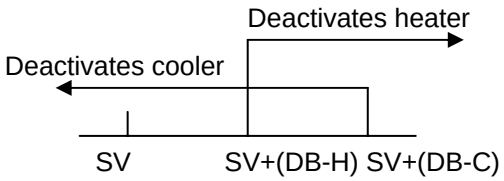
- P ：Proportional Gain parameter。Can be calculated by auto tuning or adjusted manually. This parameter is responsible to the system deviation. When offset occurs, proportional regulator responds to reduce the offset.
- I ：Integral parameter。Can be calculated by auto tuning or adjusted manually. When steady offset exist in a consistent temperature, Integral regulator will start compensating until offset is fixed.
- d ：Derivative parameter。Can be calculated by auto tuning or adjusted manually. Derivative regulator can predict the system trend by rate of change; derivative regulator will fix the offset in advance, before offset happens.
- tAU ：Fuzzy factor parameter. Can be calculated by auto tuning or adjusted manually.
  Fuzzy control compensates the insufficiency of PID controller and helps to reach the target based on the deviation and rate of change.
  Bigger Tau, more Fuzzy compensation!
- CoEF ：Cooling coefficient. Can be calculated by auto tuning or adjusted manually.
  Cooler proportional gain = P / Coef
  This function is used in cooling control, to tell the performance of cooler.
- E.rAtE ：Manual reset.
  When Integral i=0, and PV>SV, then MV=MArE.
- oFSt ：SV offset setting during Auto tuning
  When this function is set up, auto tuning will make the system to oscillate around SV+oFSt. For example, SV=200°C；OFST= -10°C. Auto tuning will calculate as SV+OFST=200+(-10)=190°C，to avoid over-heating.
- HYS. ：Hysteresis for heater on/off control.
- CHYS. ：Hysteresis for cooler on/off control.
  During ON/OFF control, control output should be turned off when PV>SV, and turned on when PV<SV. To avoid frequent ON and OFF control, hysteresis can be set. When HYS is set, PV>SV+HYS to turn off the control output, and turned on when PV<SV-HYS.
- H-Pd ：Heater control cycle time(sec)
- C-Pd ：Cooler control cycle time(sec)
  For any control output that is not in linear analog signal such as relay and 12V pulse output, signal output status will be ON/OFF only. For better PID result, Time Proportional is used. For example, period is set to be 5 seconds and PID is 30%. (ON)= 30%. 5*0.3=1.5 sec. (OFF)= 70% 5*0.7=3.5 sec.
  Control output reacts quicker as cycle time gets shorter. When mechanical contact output is used, please consider issue of mechanical life.



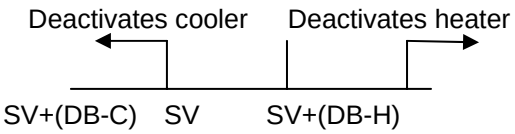
- dbon ：Enable/disable dead band control.
- db-H ：Dead band for heater.
- db-C ：Dead band for cooler.

Heating and cooling range can be controlled via dead band setting
Heater dead band control：If PV>SV+DB-H, heater is not active.
Cooler dead band control：If PV<SV+DB-C, cooler is not active.

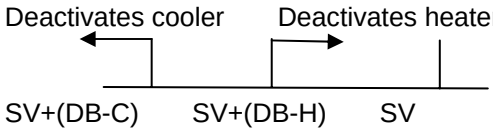
DB-H>0；DB-C>0
Over SV+DB-H deactivates heater
Under SV+DB-C deactivates cooler



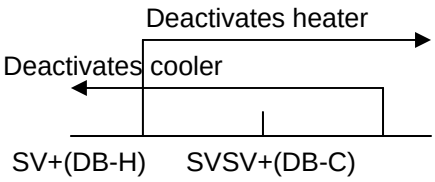
DB-H>0；DB-C<0
Over SV+DB-H deactivates heater
Under SV+DB-C 以 deactivates cooler



DB-H<0；DB-C<0
Over SV+DB-H deactivates heater
Under SV+DB-C deactivates cooler



DB-H<0；DB-C>0
Over SV+DB-H deactivates heater
Under SV+DB-C deactivates cooler



- CT ：Display CT (current transformer)input current

  Install CT input expansion module, it will display relative current value
- Hb ：Heater break alarm setup: when CT transformer current is lower than SV during heating, it will be considered heater break. Thus, alarm will send out.

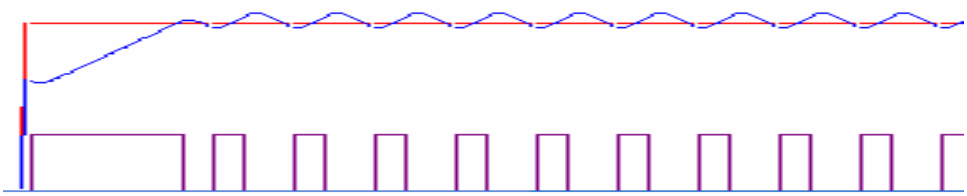
D. LU2 Parameters block description

Parameter display	Name of Parameters	Description of Parameters	Display Range	Default
,nP	Input	Input signal selection	K/J/t/E/r/S/b/n/Pt/JPt/dC	K type
oPEr	Operation	Control mode selection	onoF/P,d/Pr oG/P-nF	OnoF
r-L	Remote/Local	SV Remote/unit intput	on/oFF	off
S.U	Set Value	Temperature setting	-1999~9999	0.0
dot	Dot	Decimal point setting	dot1~dot3	dot1
Unit	Unit	Temperature unit display	oC/oF	℃
E.UL	Multiplier	PV Multiplier	-1.999~9.999	1.000
b,AS	Bias	PV compensation input	-1999~9999	0.0
E.odE	Mode	Control mode setting	H-C/CooL	H-C
F,Lt	Filter	Digital filter	1~100	5
Stb	Standby timer	Waiting time for control starting (second)	0~9999	0
LbAt	LbA detection Time	Detection time of heater break (second)	0~9999	0
LbA3	LbA detection Width	Detection of temperature differentiation of heater break	0~9999	1.0
bAr	LED Status Bar	Bar-graph display	HEAT/CooL/Prog	HEAT
tr-H	Transfer SV Hi	Re-transmit SV high value	-1999~9999	100.0
tr-L	Transfer SV Lo	Re-transmit SV low value	-1999~9999	0

LU-2 section is for advanced control parameters, ON/OFF or PID control mode can be configured to achieve the requirement.
Under SV/PV mode press 3 times of MOD button, it is for main menu of LV-2, the sub-selection as following：

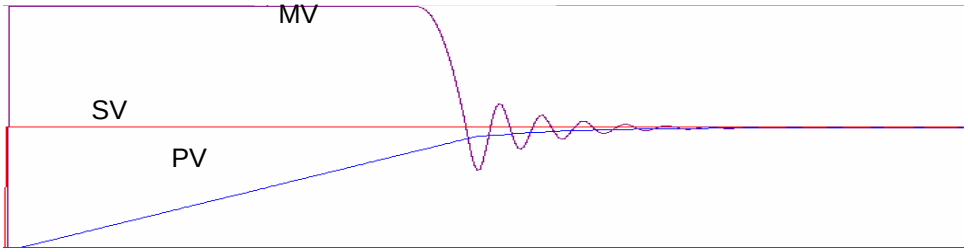
- ,nP： Input signal
  - K tP：K Type thermocouple input
    Input range：-200～1370°C 0.3%±1Digit。
  - J tP：J Type thermocouple input
    Input range：-210～1200°C 0.3%±1Digit。
  - t tP：T Type thermocouple input
    Input range：-200～400°C ±2°C±1Digit。
  - E tP：E Type thermocouple input
    Input range：-200～1000°C 0.3%±1Digit。
  - r tP：R Type thermocouple input
    Input range：-50～1760°C 0.3%±1Digit。
  - S tP：S Type thermocouple input
    Input range：-50～1760°C 0.3%±1Digit。
  - b tP：B Type thermocouple input
    Input range：250～1820°C ±8°C±1Digit。
  - n tP：N Type thermocouple input
    Input range：-200～1300°C 0.3%±1Digit。
  - Pt tP：PT Type thermocouple input
    Input range：-200～850°C 0.3%±1Digit。
  - JPt P：JPT Type thermocouple input
    Input range：-200～850°C 0.3%±1Digit。
  - dC tP：DC Type voltage input
    Input range：0～230mV 0.3%±1Digit。
- oPEr： onoF：ON-OFF； P,d：PID
  Pro G：Program； P-nF：Program-ONOFF

On/Off mode



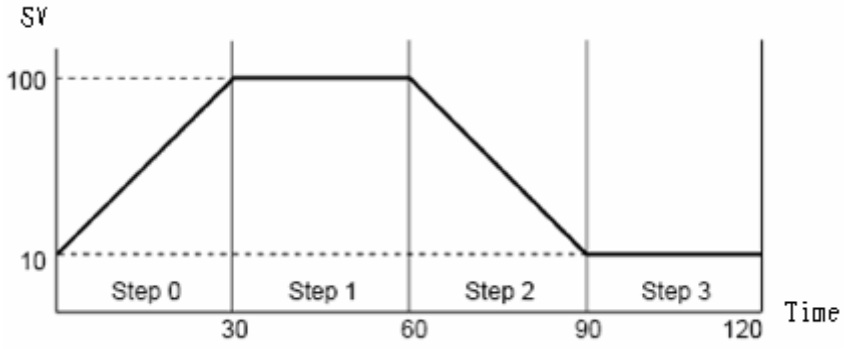
On/Off mode control is a very common and simple control mode. When the control output is programmed as the heating output and the temperature lower than setting value, control output start to activate; if the temperature is higher than setting value, control output deactivate in order to control the temperature. It also can adjust hysteresis band to reduce the overshooting on the system to achieve the best control and stability.

PID mode



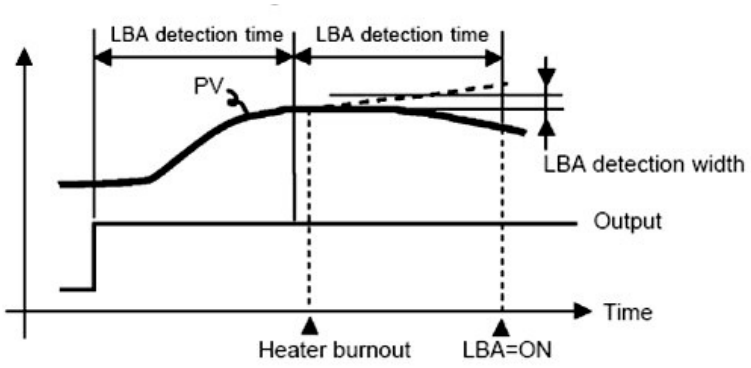
PID control is corresponding to three constants which are proportional, integral, derivative. P is to handle the immediate error, I is to learn from the past and D is to handle the future. When control output is the heating output, the PT-series will apply PID+ Fuzzy algorithm to calculate a MV value (manipulate value) to be used in determining whether the control output should be strong or weak in order to constantly calculating the deviation of stability and prediction. The built-in Fuzzy control is to enhance the system in stability for achieving the best control and efficient.

Program /Program ONOFF Mode



Program mode offers 8 patterns temperature control. Every pattern includes temperature setup, time of ramp, time of soak. Measurement unit is minute. The 8 patterns temperature control allows the system to reach the set temperature within the set time of ramp(increase/decrease), and to maintain the set temperature within the set time of soak. It can also utilize Wait Width(EXPA->WAit) to let the system stay close to the setup even if the system is unable to follow the setup perfectly. There are 8 sub-patterns for set up in one pattern. Via Link function, 64 sub-patterns temperature control can be given with ON/OFF and PID control as optional.

- r-L ：Remote(RSP) or local SV
  on：Remote mode (RSP)； oFF：Local mode。
- SV ：Temperature set value； Set value between。
- dot ：Decimal point set value。
  dot0：decimal point 0
  dot 1：decimal point 1
  dot2：decimal point 2
  dot3：decimal point 3
- Unit ：Measurement Unit setup。℃/℉
- E.UL ：PV magnification adjustment。
- bIAS：PV Offset input。When PV's current value and expected value does not match, PV offset input function can be utilized for adjustment.PV = PV*MUL + biAS
- E.odE：Control setup。
  H-C：for system heating and cooling。
  Cool：for system cooling。
- FILt：Digital filter；Decrease static signal。1～100 filter time can be set。 Digital filter can only affect PV value time update, not speed update。
- SEb ：Wait Width：System can be set to control when the system can be actuated.When Wait Width is set to be 0, there will be no Wait function.
- LbAt：LBA heater burnout time：Set LBA burnout cycle time(second)
  ，when LbAt is set to be 0，there is no LBA function。
- LbA3：LBA heater burnout temperature difference：Set LBA burnout temperature difference. When system is being heated and temperature increase is less than the temperature difference within LBA time, controller will assume heater is broken then LBA alarm signal will be sent out.



- bAr ：Bargraphic Indicator
  HEAt：Heating control value，one light represents 10% value.
  Cool：Cooling control value，one light represents 10% value.
  Prog：8 modes are active.
  First light blinks：First mode of temperature increasing/decreasing is active.
  First light on constantly：First mode of temperature holding is active.
  Second light blinks：Second mode of temperature increasing/decreasing is active.
  Second light on constantly：Second mode of temperature holding is active.
- tr-H：Set to re-transfer greatest SV value：
- tr-L：Set to re-transfer smallest SV value：

When output is the SV re-transfer analog output, SV can be transferred into the corresponding voltage and current output.

Example：TR-H =100.0 TR-L=0.0 Liner output 0~10VDC

SV 0.0 ~ 100.0 corresponds to 0~10V analog output

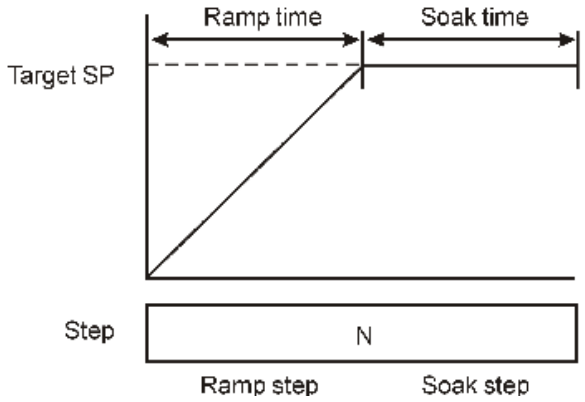
E. PtnS Parameter Table

Parameters display	Name of Parameters	Description of Parameters	Display range	Value
Ptn	Pattern NO.	Pattern selection	1~8	1
StEP	Number of steps	Steps needed to be performed	1~8	8
SU 1~SU8	Set Value	Temperature setup	-1999~9999	0
tr 1~tr8	Ramp time	Time increase/decrease(min)	0~9999	0
ts1~ts8	Soak time	Time of temperature holding(min)	0~9999	0
rPt	Repeat time	Repeat time	0~9999	0
Ln K	Link pattern	Link pattern	0~8	0
ts1S	Time signal step	Output signal step 1	r 1~S8	r1
on 1	Signal 1 ON time	Signal 1 ON time (min)	0~9999	0
oFF 1	Signal 1 OFF time	Signal 1 OFF time (min)	0~9999	0
ts2S	Time signal2 step	Output signal step 2	r 1~S8	r1
on 2	Signal2 ON time	Signal 2 ON time (min)	0~9999	0
oFF 2	Signal2 OFF time	Signal 2 OFF time (min)	0~9999	0

PtnS Parameter is a multi-pattern control function. Every pattern can perform 8 steps of temperature control. Via link pattern, 64 steps of temperature control can be performed.

Press MOD 4 times under SV/PV mode，sub-menu can be selected under the main menu as below:

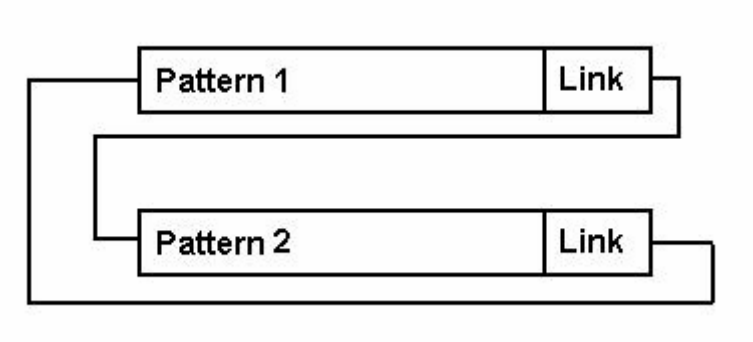
- Ptn ：8 pattern selection：Total of 8 patterns for selection. It is also the first action pattern among the 8 patterns.
- StEP ：Step selection：Step 1~8. Temperature increase/decrease, temperature hold can be set in each step.
- SU 1~SU8 ：Temperature setup：Set target temperature in each step.
  Ex.： SV=50 PV=30 SV1=50 tr1=1 ts1=2
  PV starts to increase to reach SV(increase speed is in inverse ratio to ramp time). After 1 minute, SV reaches 50 and temperature begins holding for 2 minutes.
- tr 1~tr8 ：Time of increase/decrease(Ramp)：Set time needed(minute) in order to reach the set temperature.
- ts1~ts8 ：Time of holding(Soak)：Time of hold(minute) after ramp time.



- rPt ：Repeat time：Repeat time for each step
  Default setting=0，Repeat time= 0，Total action= 1
  Default setting=1，Repeat time= 1，Total action= 2, and so on.

- Link ：Pattern Link：Pattern selection followed by completion of each pattern.

  Ex.：Set Link=2 followed by Pattern 1.
  Link=1 followed by Pattern 2.



- tS.1S/tS.2S：Signal output procedure：signal output setup
  r1：Temperature increase 1
  s1：Temperature holding 1
  r2：Temperature increase 2
  s2：Temperature holding 2
- on1/on2 ：Signal on wait time：Signal output turns on at set wait time
- oFF1/oFF2：Signal off wait time: Signal output turns off at set wait time.

Signal will be turned off followed by time signal 1~2. Signal will be turned on in specified step.

F. ALE. Parameter Table

Parameters display	Name of Parameters	Description of Parameters	Display range	Reset Value
SoFt	Soft Start	Alarm soft start	on/oFF	OFF
Pos1	Position 1	Alarm position 1	-1999~9999	0.0
HYS1	Hysteresis 1	Hysteresis 1	0000~9999	0.0
dYt1	Delay Time 1	Delay time 1(sec)	0~99	0
StY1	Style 1	Style 1	StY1~StY8,SEtt	Sty1
Pos2	Position 2	Alarm position 2	-1999~9999	0.0
HYS2	Hysteresis 2	Hysteresis 2(sec)	0000~9999	0.0
dYt2	Delay Time 2	Delay Time 2	0~99	0
StY2	Style 2	Style 2	StY1~StY8,SEtt	Sty1
Pos3	Position 3	Alarm position 3	-1999~9999	0.0
HYS3	Hysteresis 3	Hysteresis 3(sec)	0000~9999	0.0
dYt3	Delay Time 3	Delay Time 3	0~99	0
StY3	Style 3	Style 3	StY1~StY8,SEtt	Sty1
Pos4	Position 4	Alarm position 4	-1999~9999	0.0
HYS4	Hysteresis 4	Hysteresis 4(sec)	0000~9999	0.0
dYt4	Delay Time 4	Delay Time 4	0~99	0
StY4	Style 4	Style 4	StY1~StY8,SEtt	Sty1

ALE. There are 4 sets of alarm parameter setting designed to fit different application condition. In addition, there is Error Alarm function(ALM->StyLE->SErr) for additional protection for your system. Press MOD 5 times under SV/PV mode to go to ALM main menu. Sub-menu:

- SoFt：Alarm soft start on/off
  Alarm will go off when system is within the alarm range twice.
- Pos1：Position 1 setup.
- HYS1：Hysteresis 1 setup.
- dYt1：Delay time 1 setup(sec).
- StY1：Style 1 selection(Please refer to StyL alarm style description).
- Pos2：Position 2 setup.
- HYS2：Hysteresis 2 setup.
- dYt2：Delay time 2 setup(sec).
- StY2：Style 2 selection(Please refer to StyL alarm style description).

- P o S.3 : Position 3 setup.
- H Y S.3 : Hysteresis 3 setup.
- d Y t 3 : Delay time 3 setup(sec).
- S.t Y 3 : Style 3 selection(Please refer to StyL alarm style description).
- P o S.4 : Position 4 setup.
- H Y S.4 : Hysteresis 4 setup.
- d Y t 4 : Delay time 4 setup(sec).
- S.t Y 4 : Style 4 selection(Please refer to StyL alarm style description).

6.1 SEt 1 Offset High Alarm

SEtL Alarm Style

Alarm output on

When PV>=SV+POS1, DY1 starts timing.

When DY1 finishes timing, alarm sends out signal output.

Alarm output off

When PV<SV+POS1-HYS1, alarm output stops.

Ex.：

PV= present value

SV= set value

POS1= Alarm set point

DY1= Alarm delay time

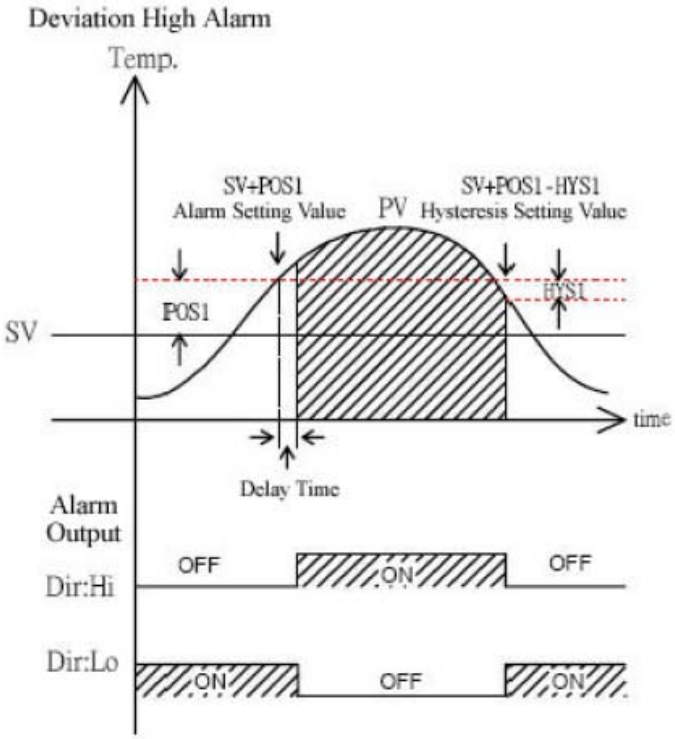
SV=60； POS1=10；

HYS1=5； DY1=5;

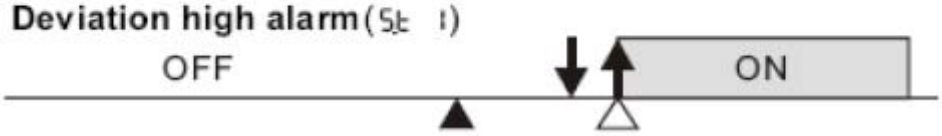
When PV>=70, DY1 starts timing.

When DY1 finishes timing, alarm sends out signal output.

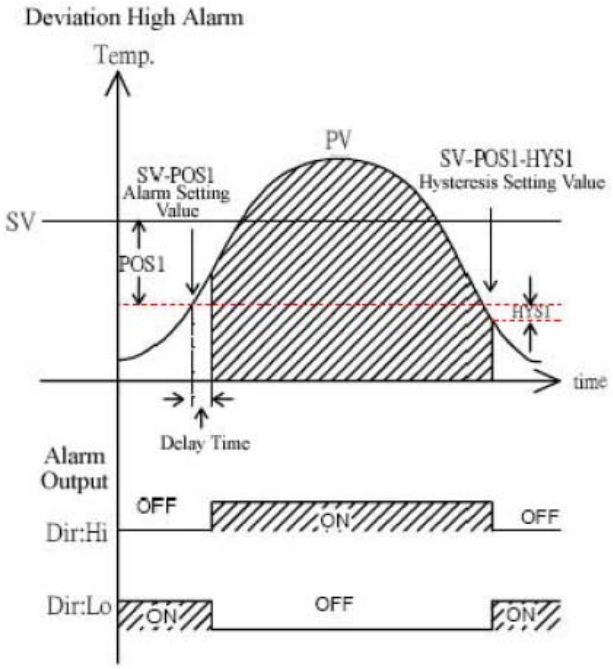
When PV<65, alarm output stops.



▲: SV △: Alarm Setting Value (PoS.) ▼: Hysteresis Setting Value (HYS.)



6.2 SEt2 Offset High Alarm



Alarm output on

When PV>=SV-POS1, DY1 starts timing.

When DY1 finishes timing, alarm sends out signal output.

Alarm output off

When PV<=SV-POS1-HYS1, alarm output stops.

Ex.：

PV= present value

SV= set value

POS1= Alarm set point

DY1= Alarm delay time

SV=60； POS1=10；

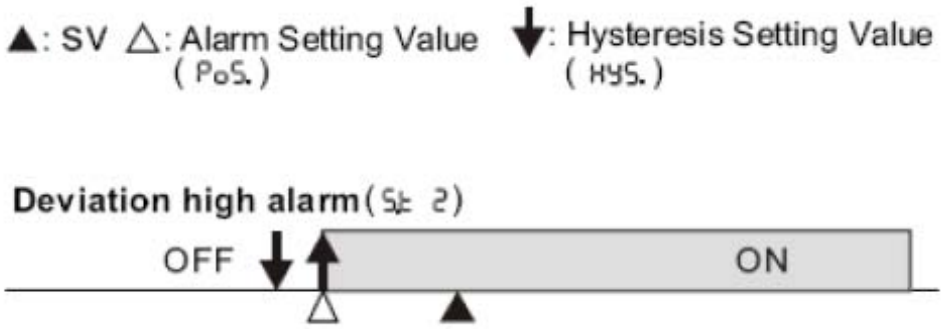
HYS1=5； DY1=5;

When PV>=50, DY1 starts timing.

When DY1 finishes timing, alarm

sends out signal output.

When PV<45, alarm output stops.



6.3 Sᴇᴛ3 Offset Low Alarm

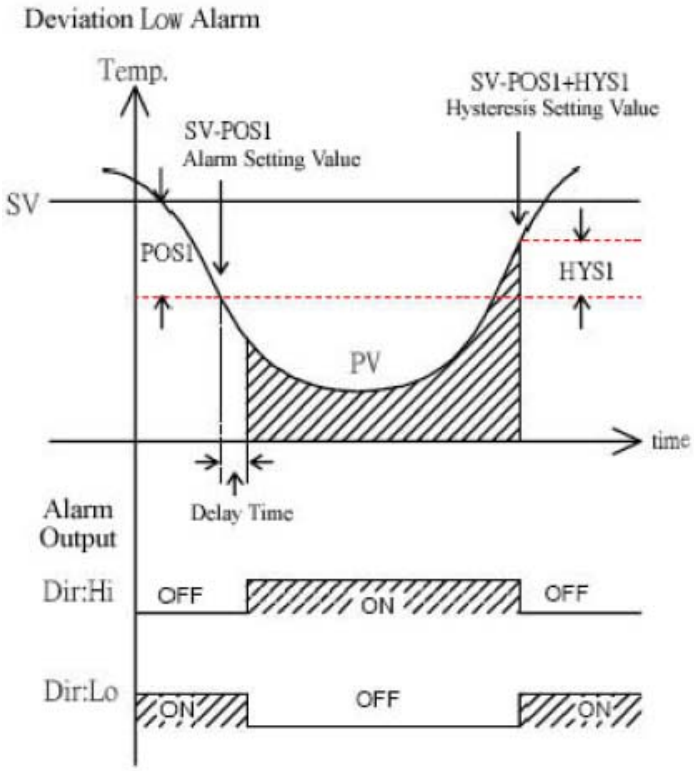
Alarm output on

When PV<=SV-POS1, DY1 starts timing.

When DY1 finishes timing, alarm sends out signal output.

Alarm output off

When PV>=SV-POS1+HYS1, alarm output stops.



Ex.：

PV= present value

SV= set value

POS1= Alarm set point

DY1= Alarm delay time

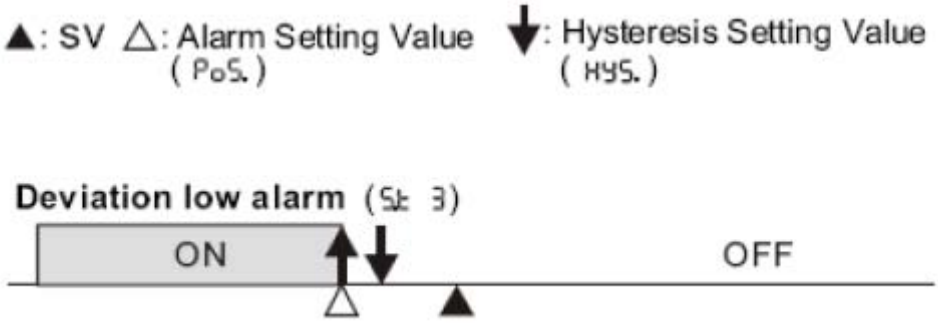
SV=60； POS1=10；

HYS1=5； DY1=5;

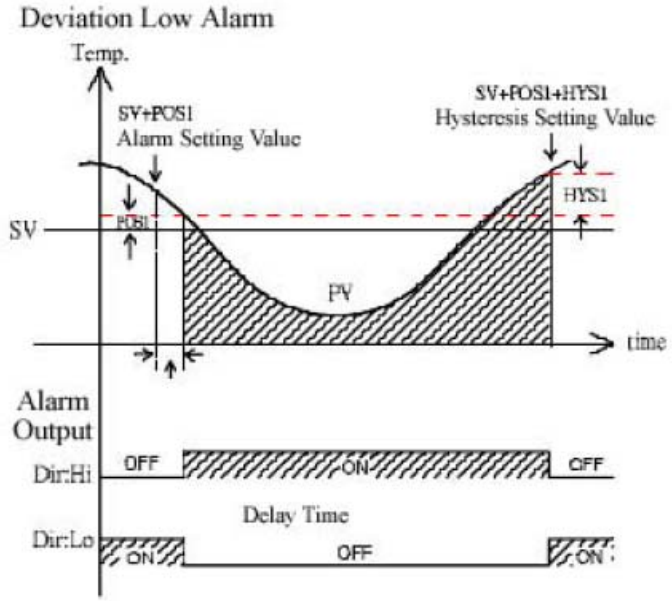
When PV<=50, DY1 starts timing.

When DY1 finishes timing, alarm sends out signal output.

When PV>=55, alarm output stops.



6.4 Sb Y4 Offset Low Alarm



Alarm output on

When PV<=SV+POS1, DY1 starts timing.

When DY1 finishes timing, alarm sends out signal output.

Alarm output off

When PV>=SV+POS1+HYS1, alarm output stops.

Ex.：

PV= present value

SV= set value

POS1= Alarm set point

DY1= Alarm delay time

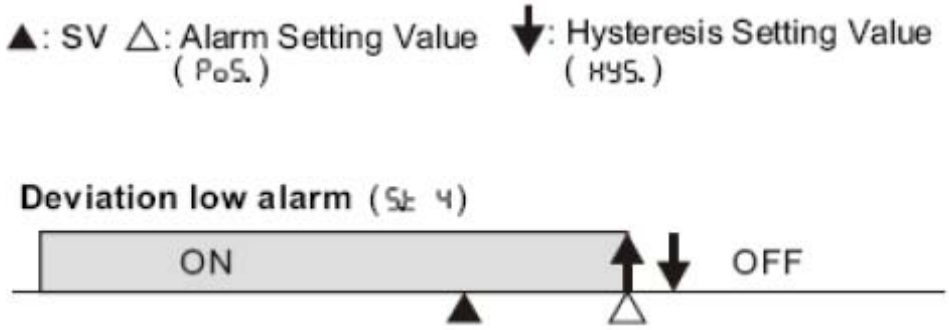
SV=60； POS1=10；

HYS1=5； DY1=5;

When PV<=70, DY1 starts timing.

When DY1 finishes timing, alarm sends out signal output.

When PV>=75, alarm output stops.



6.5 SEt 5 Out-Range Alarm

Alarm output on

When PV<=SV+POS1 or PV<=SV-POS1, DY1 starts timing.

When DY1 finishes timing, alarm sends out signal output.

Alarm output off

When PV>=SV+POS1+HYS1 or PV<=SV+POS1-HYS1, alarm output stops.

Ex.：

PV= present value

SV= set value

POS1= Alarm set point

DY1= Alarm delay time

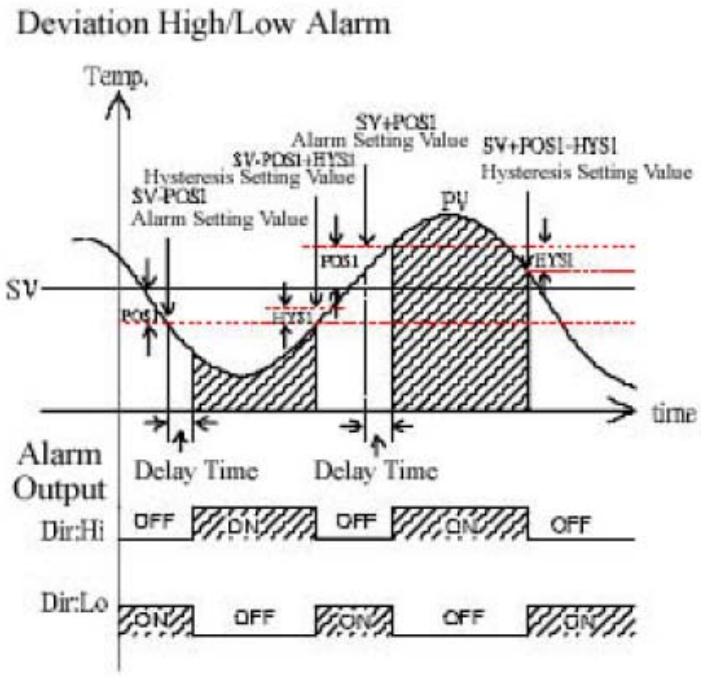
SV=60； POS1=10；

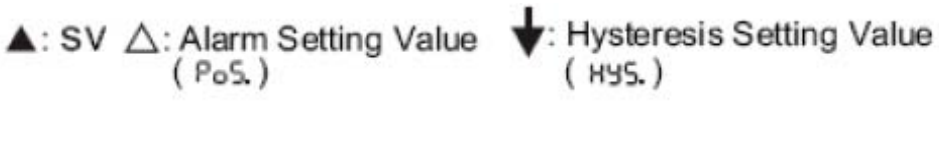
HYS1=5； DY1=5;

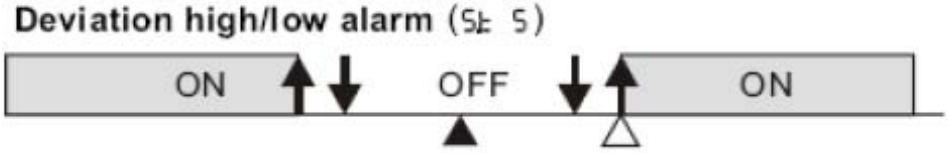
When PV<=50 or PV>=70, DY1 starts timing.

When DY1 finishes timing, alarm sends out signal output.

When PV>=55 or PV<=65, alarm output stops.







6.6 SLY6 In-Range Alarm

Alarm output on

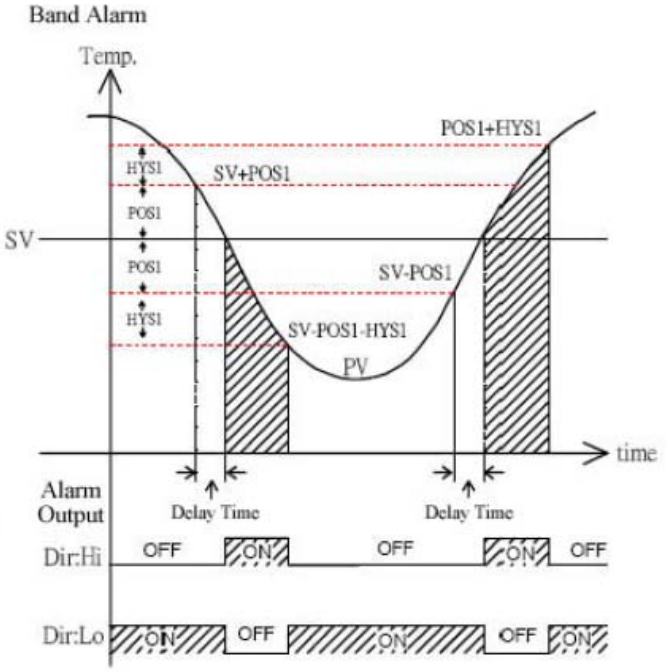
When PV>=SV-POS1 and PV<=SV+POS1, DY1 starts timing.

When DY1 finishes timing, alarm sends out signal output.

Alarm output off

When PV<=SV-POS1-HYS1or

PV>=SV+POS1+HYS1, alarm output stops.



Ex.：

PV= present value

SV= set value

POS1= Alarm set point

DY1= Alarm delay time

SV=60； POS1=10；

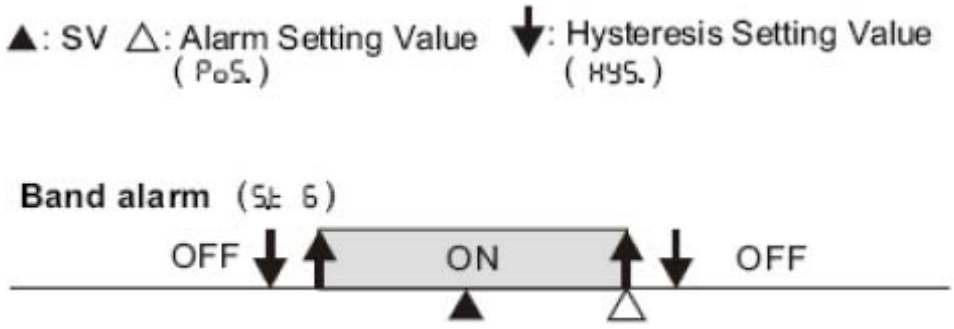
HYS1=5； DY1=5;

When PV>=50 and PV<=70, DY1 starts timing.

When DY1 finishes timing, alarm

sends out signal output.

When PV<=45 or PV>=75, alarm output stops.



6.7 SPY1 Absolute Value High Alarm

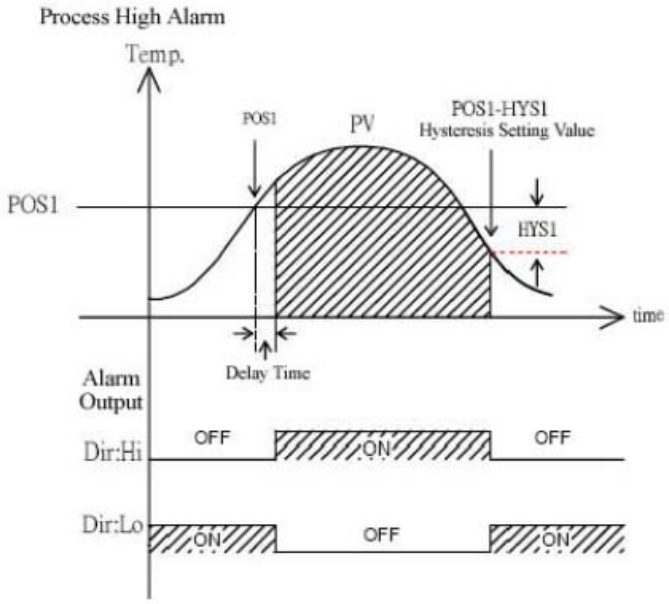
Alarm output on

When PV>=POS1, DY1

starts timing.

When DY1 finishes timing, alarm sends out

signal output.



Alarm output off

When PV<=POS1-HYS1, alarm output stops.

Ex.：

PV= present value

SV= set value

POS1= Alarm set point

DY1= Alarm delay time

SV=10； POS1=60；

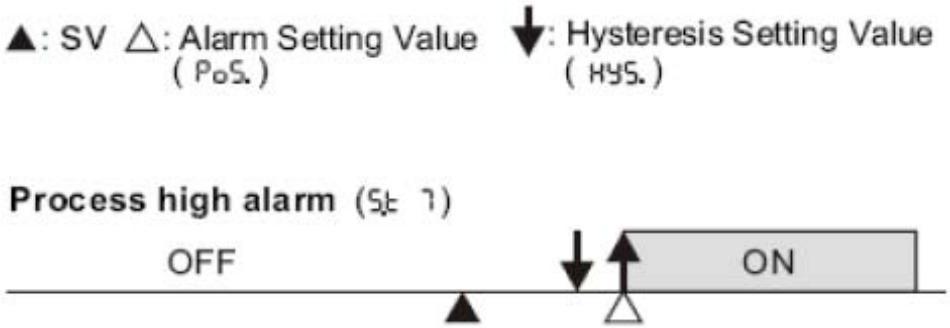
HYS1=5； DY1=5;

When PV>=60, DY1 starts timing.

When DY1 finishes timing, alarm

sends out signal output.

When PV<=55, alarm output stops.



6.8 SL 8 Absolute Value Low Alarm

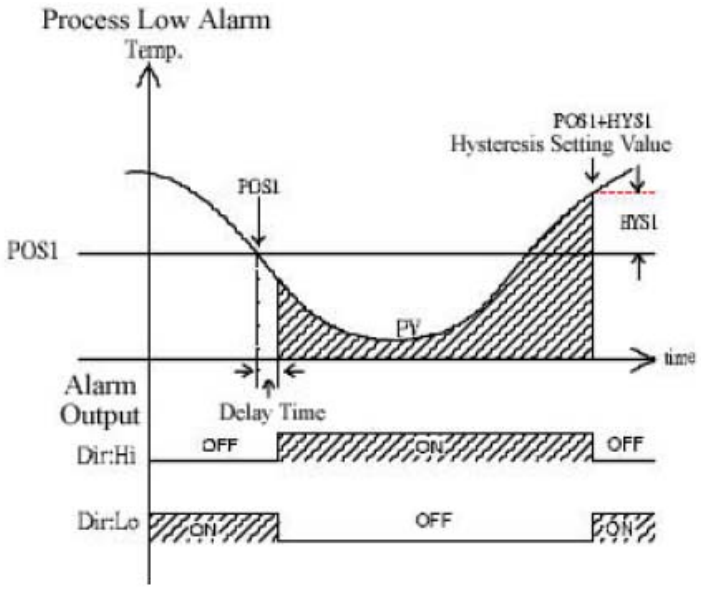
Alarm output on

When PV<= POS1, DY1

starts timing.

When DY1 finishes timing, alarm sends out

signal output.



Alarm output off

When PV>=POS1+HYS1, alarm output stops.

Ex.：

PV= present value

SV= set value

POS1= Alarm set point

DY1= Alarm delay time

SV=60； POS1=10；

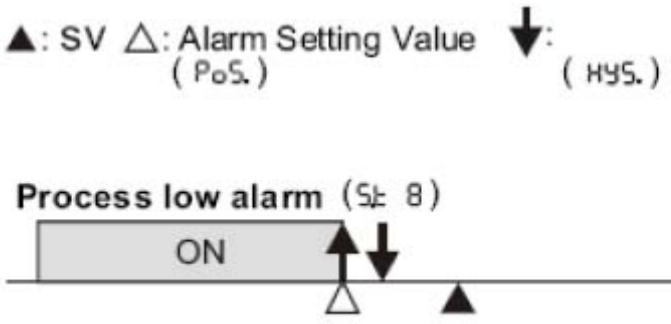
HYS1=5； DY1=5;

When PV<=10, DY1 starts timing.

When DY1 finishes timing, alarm

sends out signal output.

When PV>=15, alarm output stops.



6.9 SErr Signal Error Alarm

Under this alarm mode, alarm will go off when PV encounters irregular condition.

When PV indicates [——] – Sensor break

[U U U U] – Exceed low limit measuring range

[o o o o] – Alarm goes off if exceeding high limit measuring range

G. SEUP Parameter Table

Parameters display	Name of Parameters	Description of Parameters	Display range	Reset Value
oUt 1	Out1	control/alarm/output transmission	nonE,HEAt,CooL, AL E. 1~AL E.4,HbA, LbA,t - PU,t - SU, tS- 1,tS- 2,PEnd, SEg	Heat
oUt 2	Out2			Cool
SUb 1	Sub1			ALM1
SUb 2	Sub2			ALM2
AUX 1	AUX1	AUX input	nonE, PSP, C t, EUt 1~EUt 4	None
AUX2	AUX2			
AUX3	AUX3			
AUX4	AUX4			
EUt 1	Event 1	Event input	nonE, P-L, E.AnU, PSt, HoLd, AdU	None
EUt 2	Event 2			
EUt 3	Event 3			
EUt 4	Event 4			
d, r 1	Direction 1	Input direction (forward or reverse)	H, /Lo	Hi
d, r 2	Direction 2			
d, r 3	Direction 3			
d, r 4	Direction 4			

SEUP Users can set parameters according to application environment and habit.

- oUt 1 : Out 1 control/alarm/output transmission：Selectable output types
- oUt 2 : Out 2 control/alarm/output transmission：Selectable output types
- SUb 1 : Sub 1 control/alarm/output transmission：Selectable output types
- SUb 2 : Sub 2 control/alarm/output transmission：Selectable output types

  HEAt ：Heater control output

  CooL ：Cooler control output

  AL E. 1~AL E.4：Alarm output to be performed with ALM for detail setup.

  HbA ：Heater break alarm to be performed with CT transformer.

  LbA ：Loop break alarm to detect heater break by software. This function has to be performed with LV-2→LbAt and LbAW.

  t - PU：Controller has to work with analog output to transfer PV value to voltage/current value. For module 0-10vDC、4-20mA, please refer to SCALE.

  t - SU：Controller has to work with analog output to transfer SV value to voltage/current value. For module 0-10vDC、4-20mA, please refer to LV-2→tr-H and tr-L.

  tS- 1~tS- 2：In specified steps, ts1~2 will send out signal after On Wait Time and ts1~2 will be turned off after Off Wait Time.

Ex.: ts1=S2， on=2， off=3

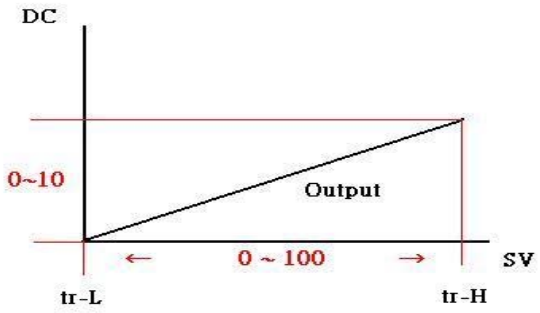
After 2 minutes in Temperature Holding Step 2, ts1 will be on. After another 1 minute, it will be off again.

After ts-1~2 goes to the next step, all signal will be off until it reaches specified steps.

PEnd ：When 8 steps are completed, Pend will receive a pulse signal.

Stg ：When performing 8 steps, Stg will receive pulse signal when it is in ramp or soak

Ex.：To correspond SV 0.0~100.0 to 0-10VDC output, please set LV-2→tr-H = 100，LV-2→tr-L = 0



- AUX 1：Aux 1 input
- AUX2：Aux 2 input
- AUX3：Aux 3 input
- AUX4：Aux 4 input

Offer different signal input including remote SV value(RSP)、remote Event, current transformer, and CT input.

rSP：Remote SV value setup with 0-10V，0-20mA module input.

Please go to rSP in main menu for detail setup.

Ct ：Current transformer input for current measurement with Ct module.

Please go to Ct in main menu for detail setup.

EUt 1~EUt 4：Specified Event can be set with Event module.

- EUt 1 : Event 1 input
- EUt 2 : Event 2 input
- EUt 3 : Event 3 input
- EUt 4 : Event 4 input

EUt 1~EUt 4：Specified Event can be set with Event module.

Under Stup→EVt1~4 in main menu，corresponding Event(Reset,Remote

-Local ,Manual, Hold, Advance) can be set。Simply switch on to perform.

r-L ：Switch on => LV-2->r-L=on

Switch off => LV-2->r-L=oFF

E.AnU：Switch on => Switch between manual and standard mode

Prog：Switch on => LV-0->Prog=rSt

Switch off => LV-0->Prog=rUn

HoLd：Switch on => LV-0->Prog=HoLd

Switch off=>LV-0->Prog=Retrieve Hold original setting

FLdU：Switch on => LV-0->AdV=on

- d,Pr1：Output direction 1(Forward/reverse)
- d,Pr2：Output direction 2(Forward/reverse)
- d,Pr3：Output direction 3(Forward/reverse)
- d,Pr4：Output direction 4(Forward/reverse)

Select Forward output or Reverse Output with Out1, Out2, Sub1, Sub2.

H. EXPR Parameter Table

Parameters display	Name of Parameters	Description of Parameters	Display range	Reset Value
SU-H	Set value upper limit	SV upper limit setup，SV-H>SV-L	-1999~9999	9999
SU-L	Set value lower limit	SV lower limit setup，SV-L<SV-H	-1999~9999	-1999
At-H	AT hysteresis	Auto Tune hysteresis	0.0~100.0	0.5
P-on	Power ON	Power on	Con/rSt/rUn/E.Man	rSt
PEnd	Pend condition	Pend condition	rSt/SU	rSt
3A,t	Wait width	Wait width	-1999~9999	0
PUSt	PV Start	PV/SV start	PU/SU	PV
rEtn	Return display	SV/PV main menu Auto return(sec)	oFF/10/20/30/40/50/60	0
HbL	HBA latch	HBA latch alarm	on/oFF	OFF
FACt	Reset default	Default vale retrieval	on/oFF	OFF

Users can set parameters according to application environment and habit.

- SU-H：SV value upper limit setup：To limit maximum SV value, preset value is 9999.
- SU-L：SV value lower limit setup：To limit minimum SV value, preset value is -1999.
- At-H：Auto Tune hysteresis setup：To avoid signal interruption during Auto Tune which causes faulty calculation, At-H value is preset to be 0.5. System will be heated to PV+0.5, and cooled to PV-0.5 during Auto Tune.
- P-on：Power on setup：This mode is designed for 8 patterns(Program mode). It can set Continue, Reset, Run and Manual when system is on.
  rSt：Controller turns on. Program mode is in reset condition. Alarm will not go off.
  E.Man：Controller is in manual mode when it is turned on.
  rUn：Controller turns on. Program mode resets automatically.
  Con：Restore the program status before power failure, and continue operating
  (rSt、rUn、Con options are effective while LV2->oPEr=Prog or P-nF)
- PEnd：Pend status：Set controller's mode after 8 patterns finish running.
  It can be set as Reset. Controller will return to rSt after 8 patterns complete and alarm does not go off.(LV0->Prog=rSt)
  It can be set as SV. Controller will remain in the last SV after 8 patterns complete and continues functioning.
- 3A,t：Wait Width：When performing 8 patterns, ｜PV-SV｜has to be smaller than Wait width in order to enter the next step and follow the setting.
  Default value 0: Disable.

- PUSt : Ramp/Soak initial SV setting, the SV initial value of the first step or when skip into ramp step, the SV initial value accumulate from the current PV or according to the SV setting.

  PV：Perform based on PV setup
  SV：Perform based on SV setup

- rEtn：PV/SV main menu auto return：Display will automatically returned to PV/SV main menu when there is no new setup for time input. Setup range is oFF、10、20、30、40、50、60.(Default oFF Not return to PV/SV automatically，Unit：second)
- HbL ：Alarm latch：HBA latch alarm can be set.
  When latch mode is on, HBA alarm not de-energize while system outside the alarm range.
  (default：OFF)
- FACt：Preset default value retrieval(reset)：This mode can retrieve preset default value.

I、 CodE. List of parameters

Parameters display	Name of Parameters	Description of Parameters	Display range	Default
Id	ID	Identification	1~255	1
bPS.	BPS.	Baud rate	Describe below	9600
StYL	Style	Transmitting Style	Describe below	8n1
ForE.	Format	Transmitting Format	Hex/Ascii	Hex
toUt	Time Out	Setting for Time limit	100~9999	100
Wrt	Allow Write	Allow writing for parameters	on/oFF	ON

- Id ：Identify the address of control unit

- bPS. ：Selection for Baud Rate communication
  - 600 ：Baud rate 600
  - 1200 ：Baud rate 1200
  - 2400 ：Baud rate 2400
  - 4800 ：Baud rate 4800
  - 9600 ：Baud rate 9600
  - 19200：Baud rate 19200
  - 38400：Baud rate 38400

- StYL ：Selection for communication style
  - 8n1：None parity check, Stops one bit
  - 8n2：None parity check, Stops two bits
  - 8o1：Odd check, Stops one bit
  - 8E1：Even check, Stops one bit

- ForE. ：Selection for communication format
  - HEH.：Hex mode
  - AS.Ci：ASCII mode

- toUt ：Setting for time limit
- Wrt : Allow writing, setting the communication with parameters writing(ON/OFF)

J、 LoCK Parameters block description

Parameter Display	Name of Parameters	Description of Parameters	Setting Range	Default
LAbE	LABEL	Lock selection	Lb00~Lb04	LB00

Through LAbe parameter setting, it is adjust the main menu selectable and good for use friendly, avoid the possibility mistake in setting function.

	LB00	LB01	LB02	LB03	LB04
PV/SV	●	●	●	●	●
LV-0	●	●		●	
LV-1	●	●	●		
LV-2	●	●	●		
Prog	●	●		●	
ALM	●	●	●		
StUP	●				
EXPA	●				
CoMM	●				
LoCK	●	●	●	●	●
SCAL	●				
rSP	●				
Ct	●				
CALI	●				
MANU	●	●	●	●	●

CALI：Calibration selection

MANU：Manual selection

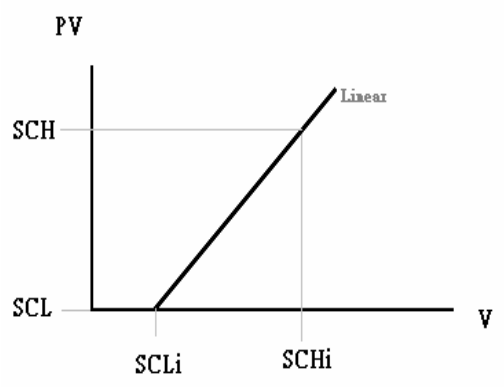
K. SCAL Parameter Table

Parameter Display	Name of Parameters	Description of Parameters	Setting Range	Pre-set value
SCH	Scale Hi	Greatest PV value	-1999~9999	100.0
SCL	Scale Lo	Lowest PV value	-1999~9999	0.0
SEnS	Sensor input voltage	Sensor AD voltage		
SCH ,	Sensor Hi	Greatest voltage input	-1.999~9.999	0.25
SCL ,	Sensor Lo	Lowest voltage input	-1.999~9.999	0.1
SCEn	Scale Enable	Scale enable switch	oFF/on	OFF

- SCH ：Greatest PV value：Set PV value in Span voltage.
- SCL ：Lowest PV value：Set PV value in Zero voltage.
  PV can be re-transmitted for t-PV(Transfer PV).
- SEnS ：Sensor AD voltage：Set SCHi、SCLi.
- SCH , ：Greatest voltage input：Set greatest measuring voltage in Sensor input.
- SCL , ：Lowest voltage input：Set lowest measuring voltage in Sensor input.
- SCEn ：Input switch：ON/OFF voltage input in PV display

Ex. 1：PV value 0.0~ 100.0 corresponds to 0~10V DC output in SUB2 terminal

Steps：
1、 StUP→SUB2 = t-PV in main menu
2、 SCAL→SCH = 100.0 in main menu
3、 SCAL→SCL = 0.0 in main menu
4、 Complete setup



Ex. 2：0-10mV value corresponds to PV 0.0~200.0 in Sensor output

Steps：
1、 Connect 0-10mV DC to PT8 in Sensor output terminal.
2、 SCAL→SCH = 200.0
3、 SCAL→SCL = 0.0
4、 Input 0V to observe SCAL→SEnS and input value into SCAL→SCLi
5、 Input 10mV to observe SCAL→SEnS and input value into SCAL→SCHi
6、 SCAL→SCEN = ON
7、 Back to main menu
Input 0mV, PV = 0.0?
Input 10mV, PV = 200.0?
8、 Complete setup

L. rSP Parameter Table

Parameter Display	Name of Parameters	Description of Parameters	Setting Range	Pre-set value
SCH	Scale Hi	Greatest SV Value(RSP)	-1999~9999	10.0
SCL	Scale Lo	Lowest SV Value(RSP)	-1999~9999	0.0
Ad	AD Voltage	AD Voltage		
SCH,	Input Hi	Set Span Voltage	-1.999~9.999	2.264
SCL,	input Lo	Set Zero Voltage	-1.999~9.999	0.072

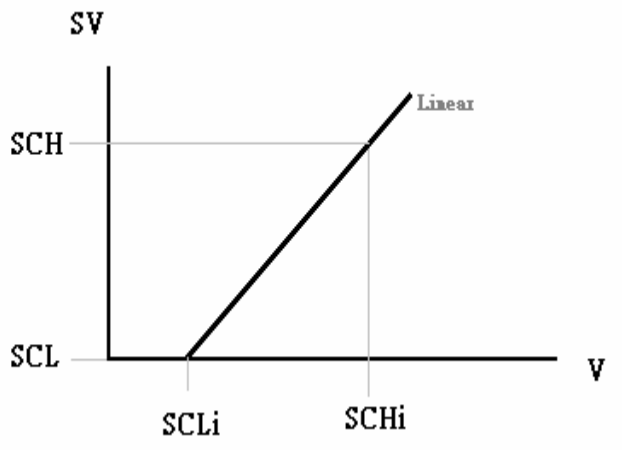
Note：LV-2 → r-L has to be turned on in order to perform each mode.

- SCL ：Greatest SV Value：Set greatest SV value in Span voltage.
- SCL ：Lowest SV Value：Set lowest SV value in Zero voltage.
- Ad ：Sensor AD Voltage：To calibrate zero, span voltage
- SCH, : Set Span Voltage：Set greatest voltage output for AD.
- SCL, ：Set Zero Voltage：Set lowest voltage value for AD.

Ex.：Set input of 0~10vdc in AUX1
SV value: 0.0~100.0

Steps：

1、 Connect 0-10VDC output to PT8(AUX1)(RSP 0-10Vdc)
2、 Select rSP under StUP→AUX1 in main menu.
3、 Select rSP→SCH = 100.0 in main menu
4、 Select rSP→SCL = 0.0 in main menu
5、 Input 0V to observe rSP→AD.Input value into rSP→SCLi
6、 Input 10v to observe rSP→AD. Input value into rSP→SCHi
7、 Select LV-2→r-L = ON in main menu
8、 Back to PV/SV main menu
Input 0v, SV = 0.0
Input 10v,SV = 100.0
9、 Complete setup



M. Ct Parameter Table

Display	Name	Description	Range	Preset Value
SCH	Scale Hi	Scale Hi(CT current)	-1999~9999	35.0
SCL	Scale Lo	Scale Lo(CT current)	-1999~9999	0.0
Ad	AD Voltage	AD Voltage Indication		
SCH,	Input Hi	Set Span voltage	-1.999~9.999	2.5
SCL,	input Lo	Set Zero voltage	-1.999~9.999	0.1

Note：Tolerance of greatest CT current input is 30mA

- SCH ：Scale Hi：Set greatest CT value in Span voltage
- SCL ：Scale Lo：Set lowest CT value in Zero voltage
- Ad ：Sensor AD Voltage：To calibrate zero, span voltage
- SCH, ：Set Span voltage：。
- SCL, ：Set Zero voltage：。

Ex.：When hardware detects heater breakage, CT input utilizes AUX1 and SUB1 to send alarm signal.

Steps：(Please refer to CT input module in the right)

1、 Connect CT transformer to PT8(AUX1)。
2、 Select Ct under StUP→AUX1 in main menu.
3、 Select HbA under StUP→SUB1 in main menu.
4、 Observe AD voltage exceeds 0.100v when heater is on under Ct→AD in main menu. If AD voltage exceeds 0.100v, it means transformer is connected correctly.
5、 Observe Ct value(HNC) when heater is off and (HNO) when heater is on under LV-1→Ct in main menu.
6、 Input proper set value (HNC < Hb < HNO) under LV-1→Hb in main menu. Normal setup is 70% of HNO.
7、 Complete setup.

Ex.：Calibrate CT transformer：

Transformer input is 5A；Ratio is 1000:1

1、 Main menu Ct→SCH = 5.0
2、 Main menu Ct→SCL = 0.0
3、 Input 0A to observe Ct→AD display，input value into SCLi
4、 Input 5A to observe AD，input value into SCHi
5、 Complete setup.

N、CAL, Parameter Table

Display	Name	Description	Range	Preset Value
A, C	Analog input calibrate	Sensor input calibration		
AoC 1	Analog output1 calibrate	Analog output1 calibration		
AoC 2	Analog output2 calibrate	Analog output2 calibration		
AoC 3	Analog output3 calibrate	Analog output3 calibration		
AoC 4	Analog output4 calibrate	Analog output4 calibrate		
FUZY	Fuzzy Switch	FuzzySwitch	on/oFF	ON
, nFo	TEMP121 information	Temperature Information		

CAL, Calibration mode can be performed based on each input/output.

To go to Cali main menu, please press MOD and hold for 5 seconds under SV/PV mode.

To go back to SV/PV mode, please press and hold MOD for 5 seconds under Fine-Tek mode.

- A, C：Sensor Input Calibration：After calibration, voltage and resistance can be measured accurately.

  Sub-menu：

  1、PAS ：Input correct password to enter.(password：12)

  2、0mV ：Calibrate 0mv input.

  3、50mV：Calibrate 50mV input.

  4、r100：Calibrate 100Ω input.

  5、r300：Calibrate 300Ω input.

  6、Adjt： Temperature compensation calibration.

  PV = PV + Adjt

  (Please see Example 1 for detail)

- AoC 1~AoC 4：Analog Output Calibration： Calibration will be performed based on each analog output to get accurate Span & Zero voltage

  Sub-menu：

  1.AdjF：Calibrate Span voltage output(0~10v), current(4~20mA)

  2.Adj0：Calibrate Zero voltage input(0~10v), current(4~20mA)

  (Please see Example 2 for detail)

- FUZY：Fuzzy Switch：Whether Fuzzy is to be activated when setting up PID.(Preset Value：ON)
- , nFo：IC Temperature Indication：To indicate temperature information.

  IC temperature for thermocouple input.

  PV = TC temperature difference + internal IC temperature

Example 1：Calibrate Sensor input

Setup：

10、 Connect calibrator with sensor input

11、 Press and hold MOD for 5 seconds to enter Cali mode

12、 Select AiC

13、 Press SET under Aic→PAS = 12

14、 Set calibrator output= 0mV

15、 Press SET to enter Aic→0mv to edit. Press ⋀ until value is stable, then press SET to confirm.

16、 Set calibrator output= 50mV

17、 Press SET to enter Aic→50mv to edit. Press ⋀ until value is stable, then press SET to confirm.

18、 Set calibrator output= 100Ω

19、 Press SET to enter Aic→r100 to edit. Press ⋀ until value is stable, then press SET to confirm.
Note：(Please follow RTD wiring steps when calibrating)

20、 Set calibrator= 300Ω

21、 Press SET to enter Aic→r300 to edit. Press ⋀ until value is stable, then press SET to confirm.
Note：(Please follow RTD wiring steps when calibrating)

22、 Press SET to enter Aic→r300 to edit. Press SET to enter Aic→Adjt to edit error of room temperature and present temperature IC.
Note：(Please refer present temperature IC in inFo→tEMP)

23、 Setup complete.

Example 2：Calibrate OUT1 analog output 0~10v DC

Setup：

1、 Connect calibrator with analog output

2、 Press and hold MOD for 5 seconds to enter Cali mode

3、 Select AoC1

4、 Press SET to enter AoC1→AdjF to edit. Observe calibrator voltage value, then press ⋁、⋀ to get 10.00v.

5、 Press SET to enter AoC1→Adj0 to edit. Observe calibrator voltage value, then press ⋁、⋀ to get 0.00v. Press SET to confirm.

6、 Setup complete.

O、E.AnU Parameters block description

Parameter	Name of Parameters	Description of Parameters	Setting Range	Default
E.AnU	Manual operation	Display PV value	-1999~9999	
HEAt	Heater MV	Control heater output manipulate value	0.0~100.0	0
CooL	Cooler MV	Control cooler output manipulate value	0.0~100.0	0

- E.AnU：Display PV value
- HEAt：Control heater output manipulate value
- CooL：Control cooler output manipulate value