PT-8 Series Temperature Controller
Operation Instruction

FineTek Co., Ltd

Tel: 886-2-22696789 Fax: 886-2-22686682
Email: info@fine-tek.com
http://www.fine-tek.com

Warning

- **Be sure to power off before wiring.**
- **Do not touch any wire terminal during power on to avoid from electrical shock.**
- **While connect wire to terminal, check if it is in correct wiring diagram.**
- **Repairing, remodifying, or taking apart of product will not include within guarantee.**
- **Avoid placing this product near any environment with explosion or flammable gas atmosphere concerns**
- **Must follow the guide to send rated power.**

Before Using This Product

1. **Check if the content is the order model you expect.。**
2. **Avoid from shock, vibrate or drop down the product.**
3. **Suggest warm up time is over 30 minutes before operation, if user concerns ultra-accurate in cold junction compensation.**
4. **Don’t use any solvent to clear the product except of alcohol.**

Product Mounting

1. **Should not mount at the place which is easy to freeze, dusty or enclosure with corrosion gas.**
2. **Avoid from place the product at high fluctuation of temperature environment, keep away from high temperature environment (<55℃) .**
3. **Check if any device will create high electric interference nearby, adopting appropriate isolation, grounding or filtering power line if necessary.**

A. Product Introduction

Thank your for purchasing of FineTek PT-83 series temperature controller. The PT-83 series catalog according to the dimension difference, they are the PT-8320 (H*W 48*48mm), PT-8330 (H*W 96*48mm), PT-8331 (H*W 48*96mm), PT-8340 (H*W 72*72mm) & PT-8350 (H*W 96*96mm); the versatile design can bring you the most satisfaction in application need.

The FineTek PT-83 series, innate with 24 bits ultra-accurate Analog-to-Digital Converter (ADC), continuous sampling and auto PID-Fuzzy control algorithm, let user get quick, stable measurement and support all the standard industrial output, communication (RS-485 with Modbus protocol), and alarm interface. Besides, with the retransmission of analog signal, user can construct higher level data acquisition likes PC, PLC if need.

B. Features

- Auto-tuning PID+Fuzzy controller with offset function.
- Easy to change control mode between ON/OFF, PID+Fuzzy and Ramp-Soak (only for profiler model).
- Feasible operate for heater, cooler or temperature control environment. Support versatile input likes the thermocouple (K, J, R, S, B, E, N, T), RTD (PT100, JPT100), DC Voltage and DC current. Output interface includes the relay output, 12VDC pulse output, voltage output and current output. Equipped with digital filter can isolate the electric interference.
- Health diagnostic in sensor broken alarm , heater broken alarm (HBA).
- Support the retransmission function to transfer the voltage and current.
- RS-485 with ModBus protocol communication.
- Remote set point (RSP) function.
- Memory stored by EEPROM (up to 1,000,000 read/write times).
- Manual control by front panel supported
- PV linear compensation
- CE certificate.

C. Specifications

Power Supply		100~240V AC 50/60 Hz
Power Consumption		7VA Maximum
Display		Upper row：Four red digital 7-segment-display Bottom row：Four green digit 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 (Driven by 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 time		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 signal according to the PV or SV value

D. Standard Measurement Range

Sensor	Input Type	Range	Accuracy
Thermocouple	K Type	-200°C~1370°C	0.3% ± 1 Digit
	J Type	-210°C~1200°C	0.3% ± 1 Digit
	R Type	-50°C~1760°C	0.3% ± 1 Digit
	S Type	-50°C~1760°C	0.3% ± 1 Digit
	B Type	250°C~1820°C	±8°C ± 1 Digit
	E Type	-200°C~1000°C	0.3% ± 1 Digit
	N Type	-200°C~1300°C	0.3% ± 1 Digit
	T Type	-200°C~400°C	±2°C ± 1 Digit
RTD	PT-100	-200°C~850°C	0.3% ± 1 Digit
	JPT-100	-200°C~850°C	0.3% ± 1 Digit
Voltage	mV	-10Mv~230mV	0.3% ± 1 Digit
	V	0~10V	0.3% ± 1 Digit
Current	mA	0~20mA	0.3% ± 1 Digit
Other	Linear Input	Customer Design by Request	

Type R and S ±9°C for 0 to 500°C

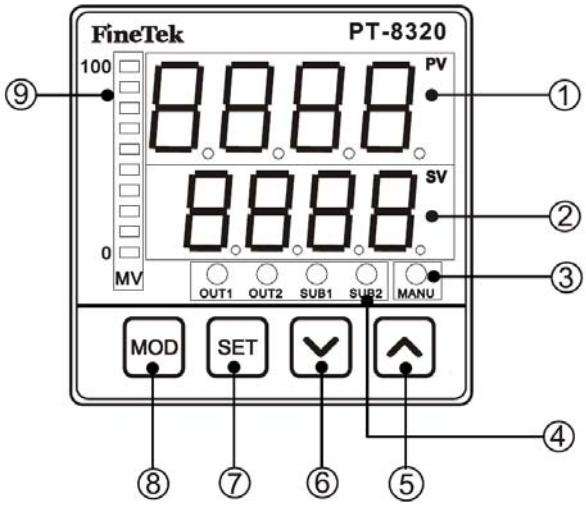
Tyep B accuracy is not guaranteed for 0 to 400°C

E. Error Messages

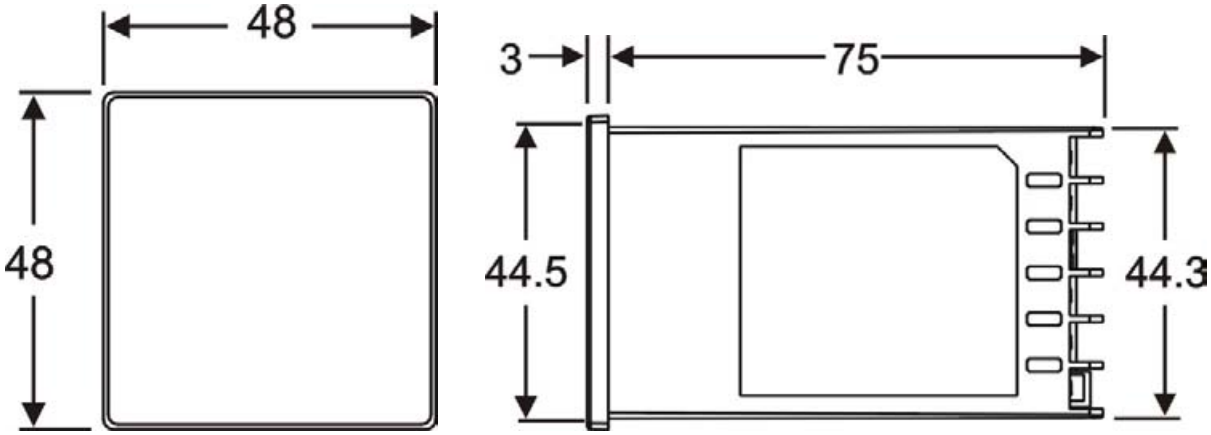
Trouble Shooting	
1	**Display over scale**
-1	**Display under scale**
▫ ▫ ▫ ▫	**Over measure range**
U U U U	**Under measure range**
- - - -	**Sensor break**

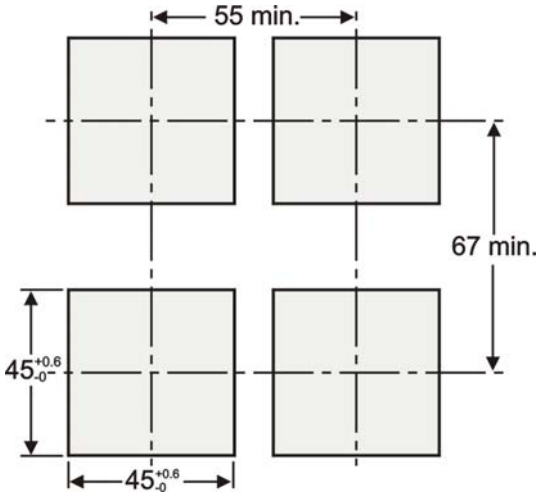
F. Panel Dimension

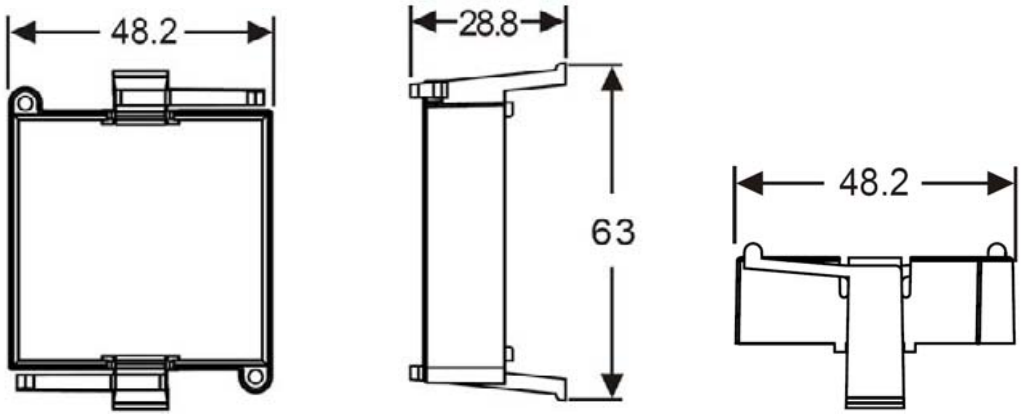
F.1 PT-8320 (48x48) (Unit：mm)



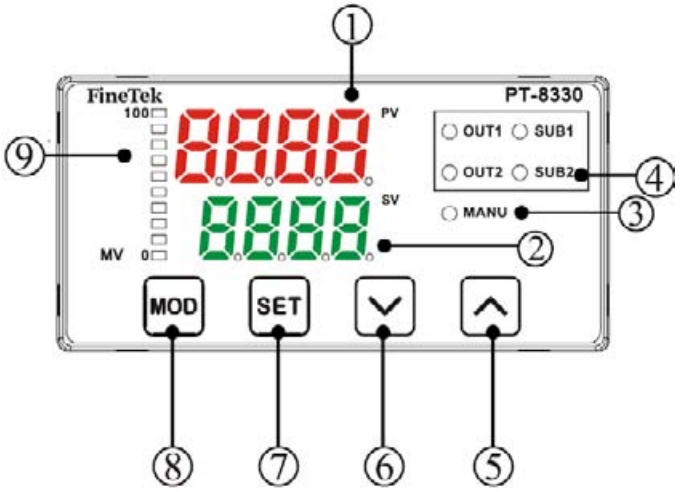
① Measured Value (PV) display
② Set Value (SV) display
③ Indicator for Manual Operation
④ Indicator for Output
⑤ "UP" key
⑥ "DOWN" key
⑦ Set key
⑧ MOD key
⑨ Bargraph indicator



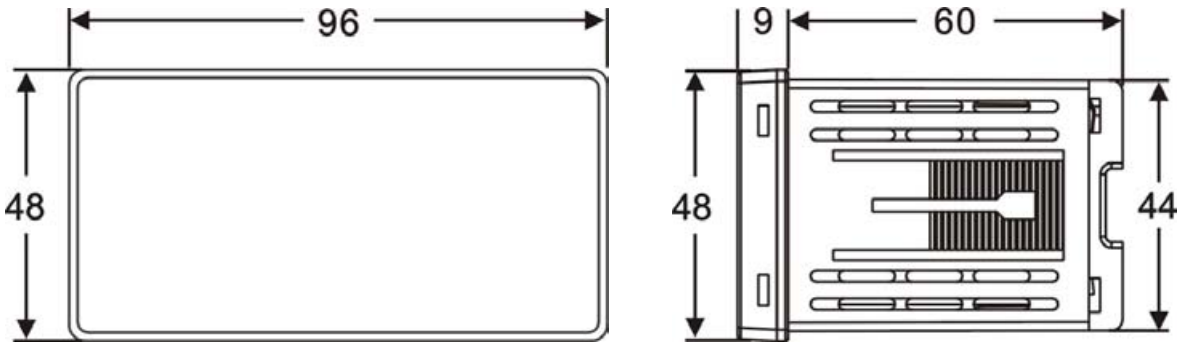


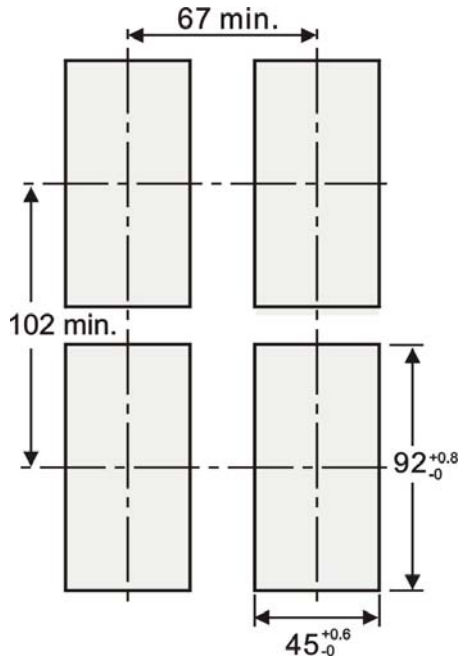


F.2 PT-8330 (96x48) (Unit：mm)

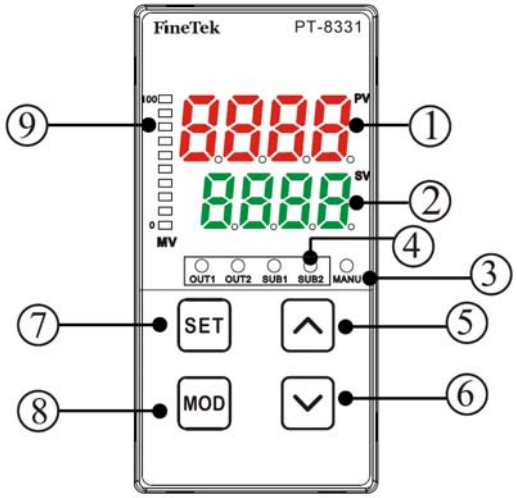


① Measured Value (PV) display
② Set Value (SV) display
③ Indicator for Manual Operation
④ Indicator for Output
⑤ "UP" key
⑥ "DOWN" key
⑦ Set key
⑧ MOD key
⑨ Bargraph indicator

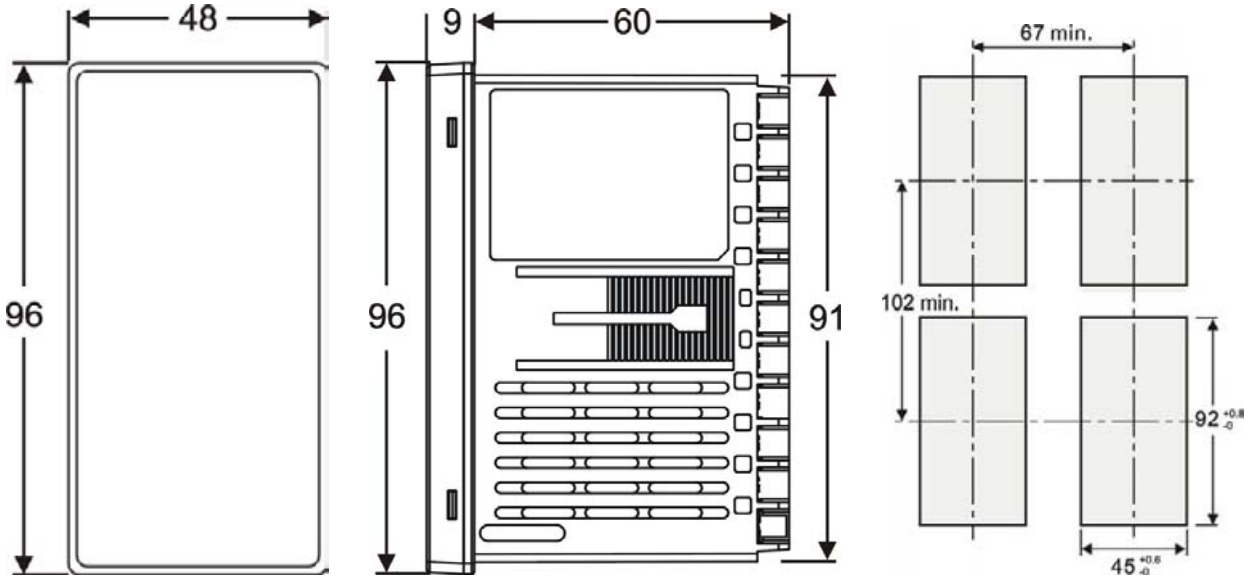




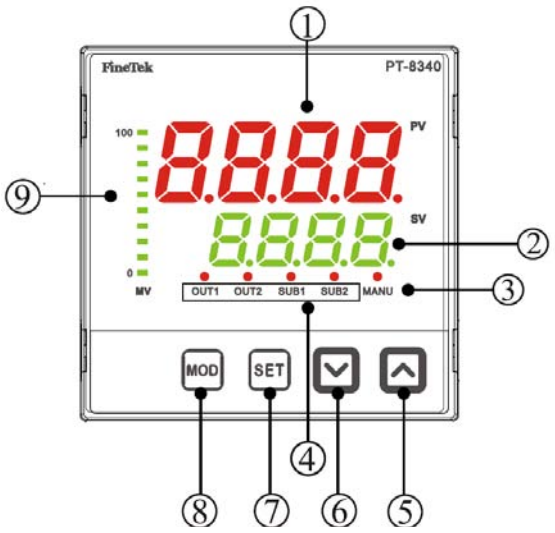
F.3 PT-8331 (48x96) (Unit: mm)



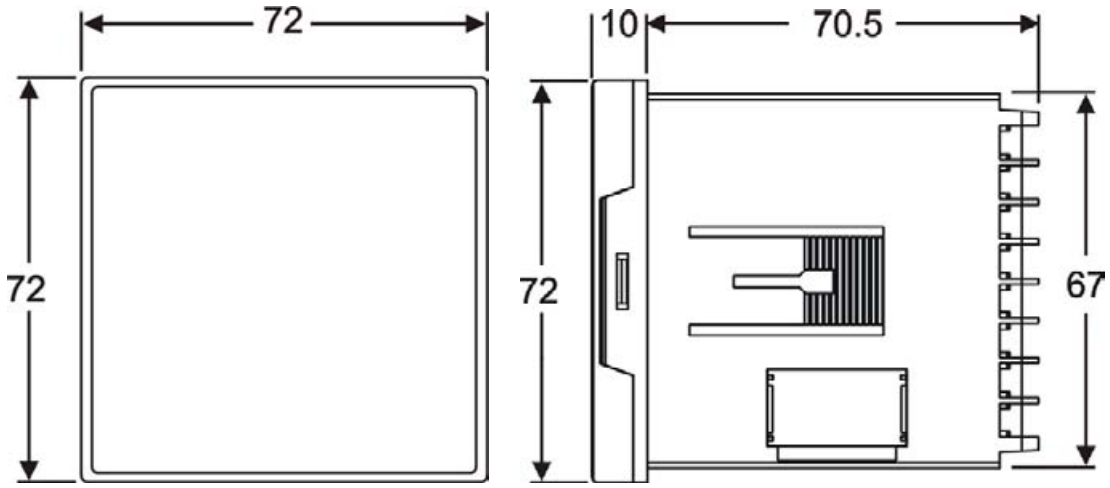
① Measured Value (PV) display
② Set Value (SV) display
③ Indicator for Manual Operation
④ Indicator for Output
⑤ "UP" key
⑥ "DOWN" key
⑦ Set key
⑧ MOD key
⑨ Bargraph indicator

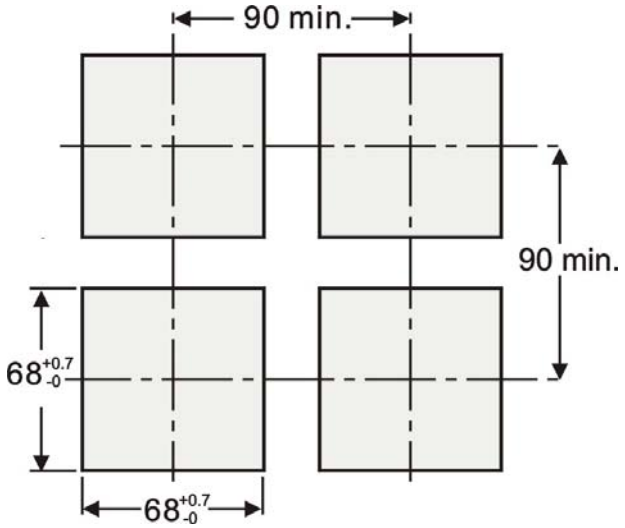


F.4 PT-8340 (72x72) (Unit: mm)

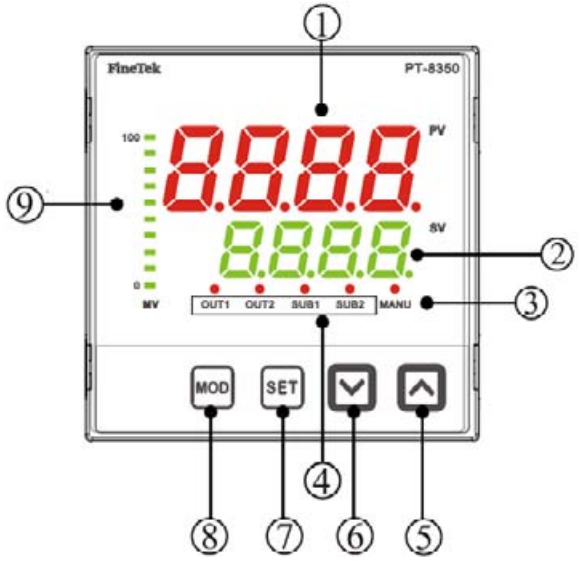


① Measured Value (PV) display
② Set Value (SV) display
③ Indicator for Manual Operation
④ Indicator for Output
⑤ "UP" key
⑥ "DOWN" key
⑦ Set key
⑧ MOD key
⑨ Bargraph indicator

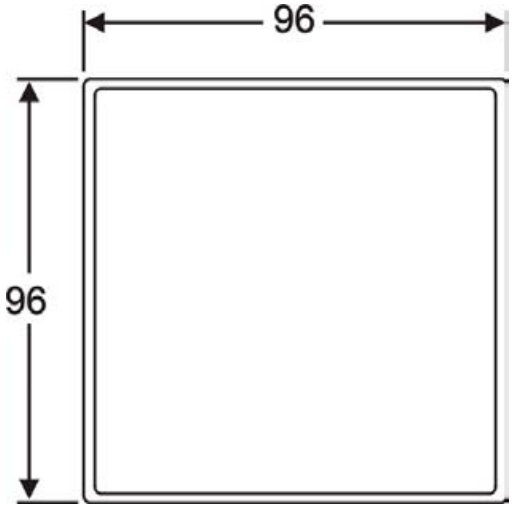


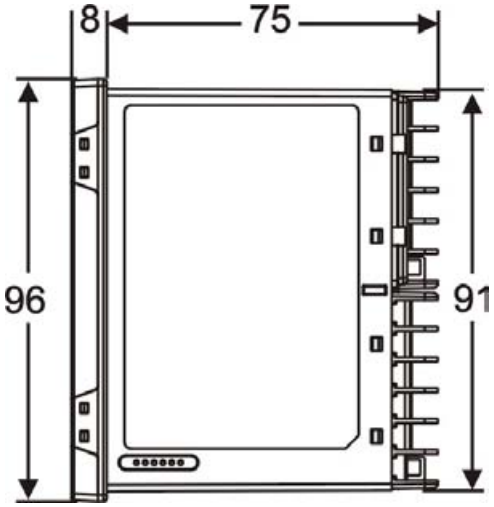


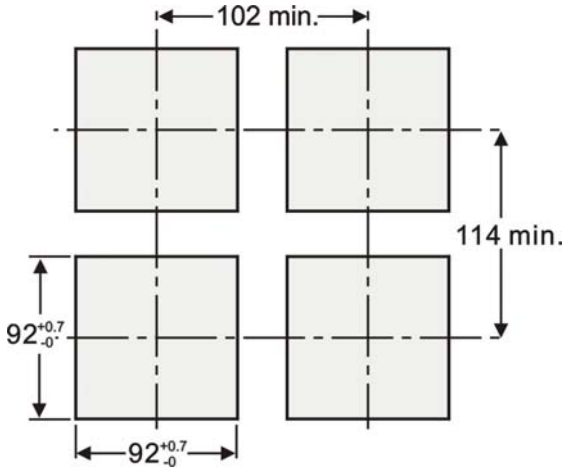
F.5 PT-8350 (96x96) (Unit:mm)



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





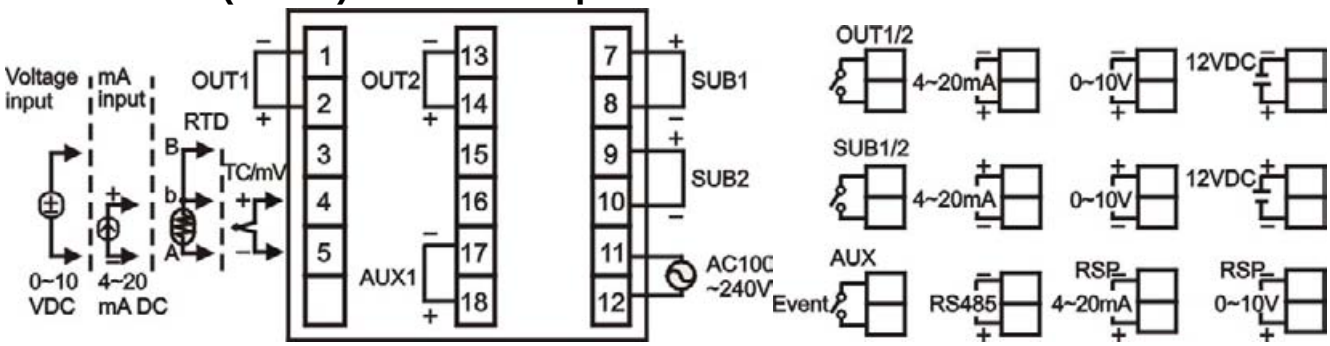


G. Terminal Wiring

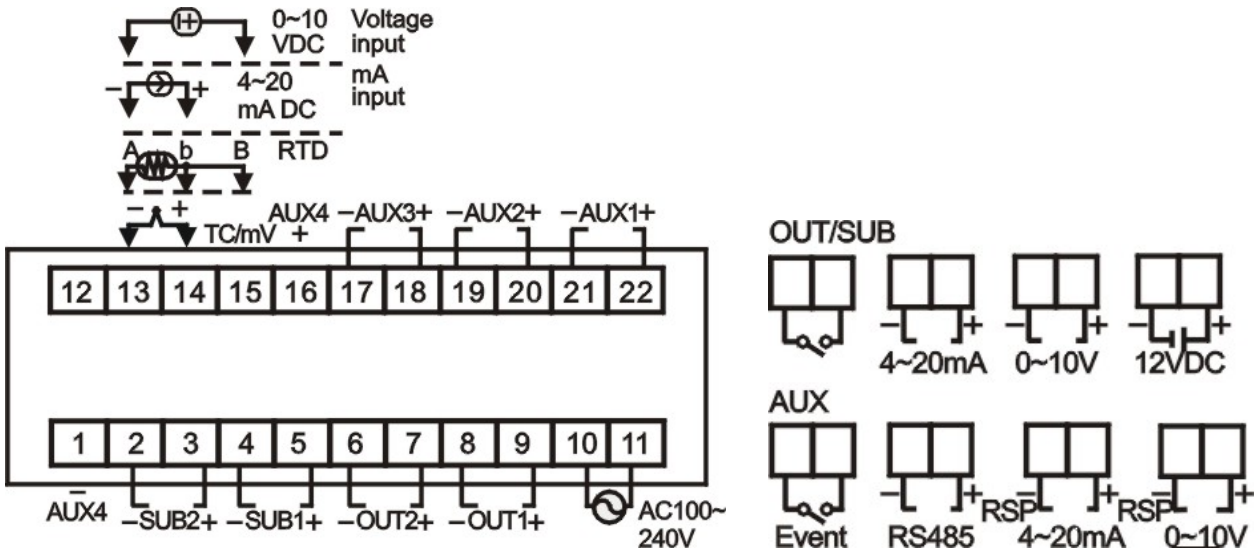
- ✶ Use standard wire and terminal to connect.
- ✶ The input wire and power line should be carefully separated to avoid from electric interference.
- ✶ Power filter is recommended for further reduce electric noise.
- ✶ Keep away from high-frequency electric noise environment or should be carefully isolated.
- ✶ It can install a fuse to protect this controller to avoid from over-current
- ✶ Use correct compensation wire for extension of thermocouple sensor

OUT1, OUT2, SUB1, SUB2: Output terminals (Note for positive / negative connection)
AUX1, AUX2, AUX3, AUX4: Auxiliary Inputs (Note for positive / negative connection)

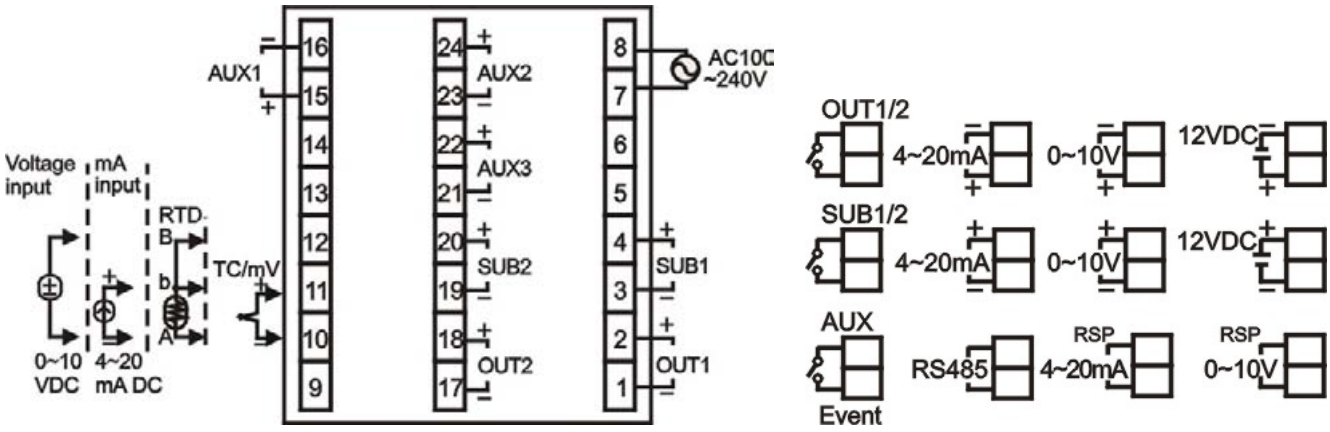
G.1 PT-8320 (48x48) Terminal Map



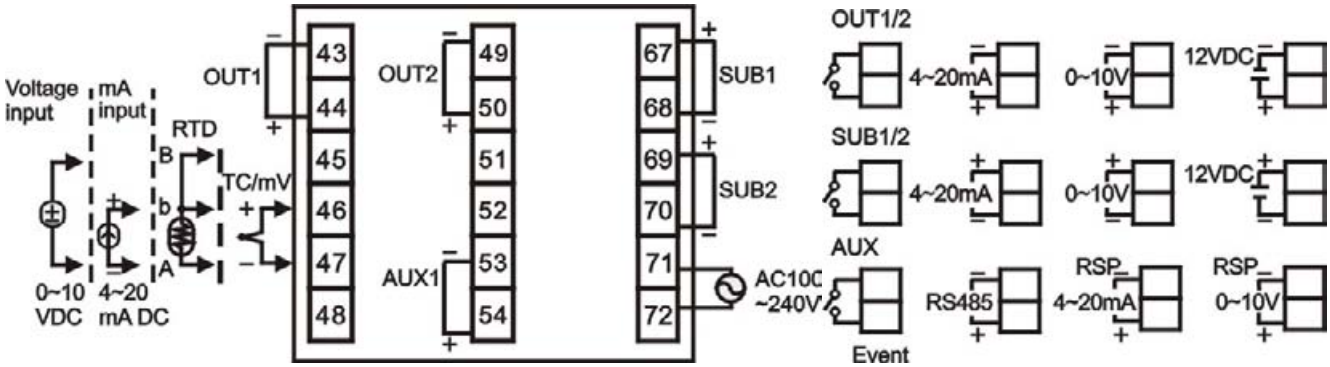
G.2 PT-8330/8331 (96x48,48x96) Terminal Map



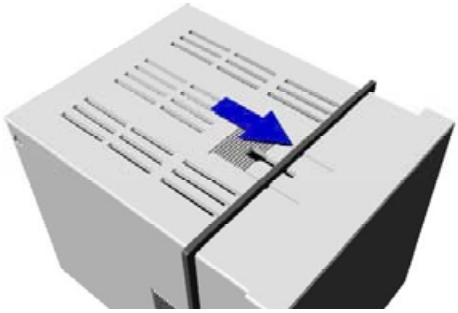
G.3 PT-8340 (72x72) Terminal Map



G.4 PT-8350 (96x96) Terminal Map



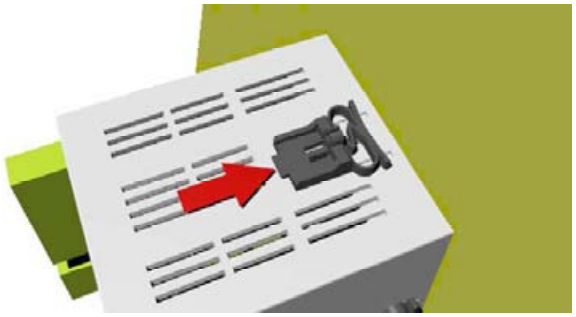
H. Installation Notice



Put washer on

Install body into the cutout from

Put bracket into slot



Push the bracket forward to fix the

I. Operation Interface

I.1 Parameter Code

Alphabetical Code									
A	B	C	D	E	F	G	H	I	J
									
K	L	M	N	O	P	Q	R	S	T
									
U	V	W	X	Y	Z				
0	1	2	3	4	5	6	7	8	9
									

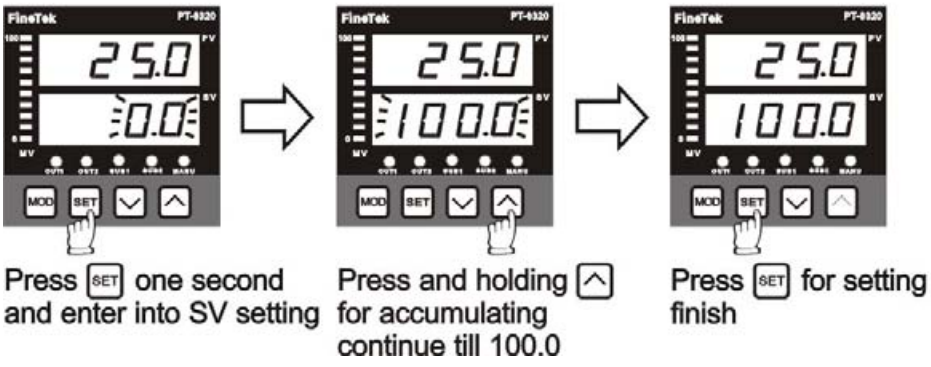
I.2 Button Function

All PT-83 series equip by four buttons (MOD, SET, DOWN & UP) on front panel to operate each function. In operation, the PT-83 will show the present value (PV) at upper digital and setting value at lower digital on panel display. While user presses the MOD then accesses into the operation menu. The menu is distinguished into two modes for user, the operation mode & setting mode. In different mode, these four buttons act as different functionality as below.

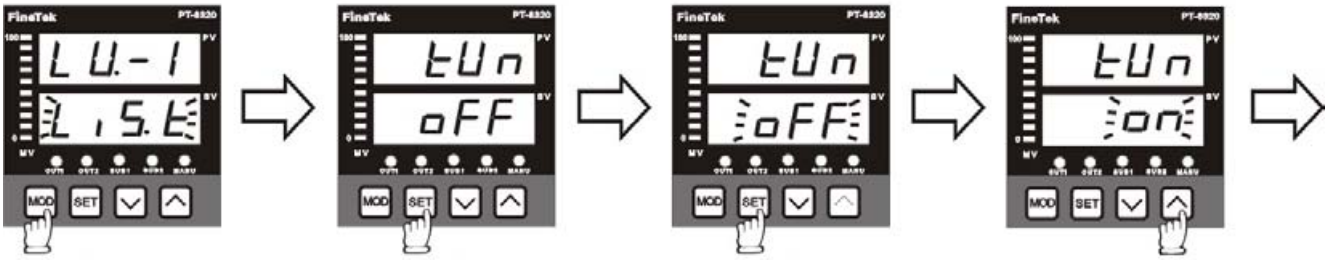
Press Action	Operation Mode	Setting Mode
MOD MOD	Change selection	
SET SET	Access into selected item	Confirm
Down	N/A	Decresse
Up	Return to upper menu	Increase

I.3 Operation Steps

1.Quick setting, For examples; Set SV=100 Parameters programming as following:



2.Auto Tuning

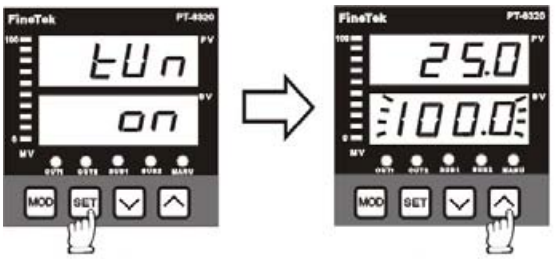


Press MOD
1 time to display LV-1
2 time for ramp/soak model

Press SET enter into
LV-1 Sub item

Press SET enter into
edit mode

Press ^ in order to
choose on

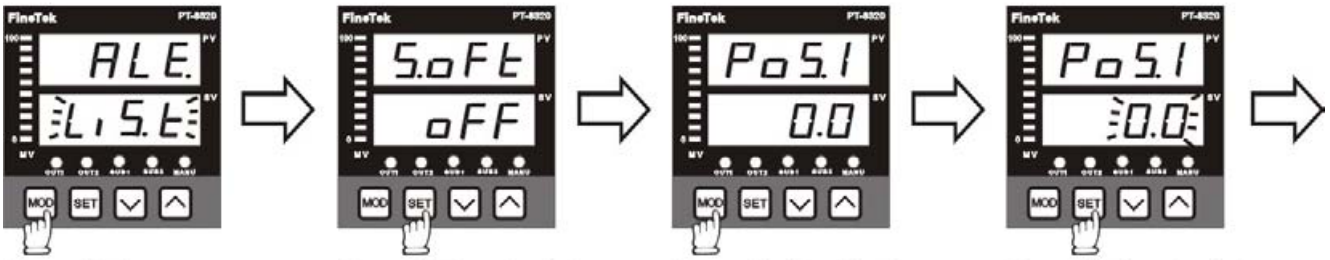


*SV flash for operating
Auto Tune

Press SET for setting
finish

Press ^ twice to
come back Main menu

3.Set alarm for pre-set deviation High-Alarm mode for SEY1 Alarm starting when PV more than SV+5

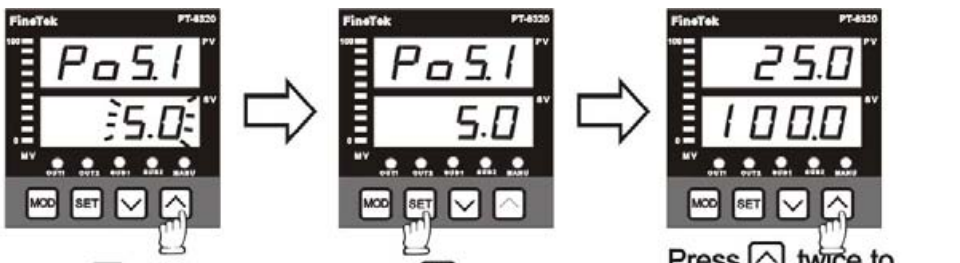


Press MOD
3 time to display ALM
5 time for ramp/soak model

Press SET enter into
ALM Sub item

Press MOD to display
alarm position setting

Press SET enter into
edit mode



Press ^ and holding
for accumulating continue
up to 5.0

Press SET for setting
finish

Press ^ twice to
come back Main menu

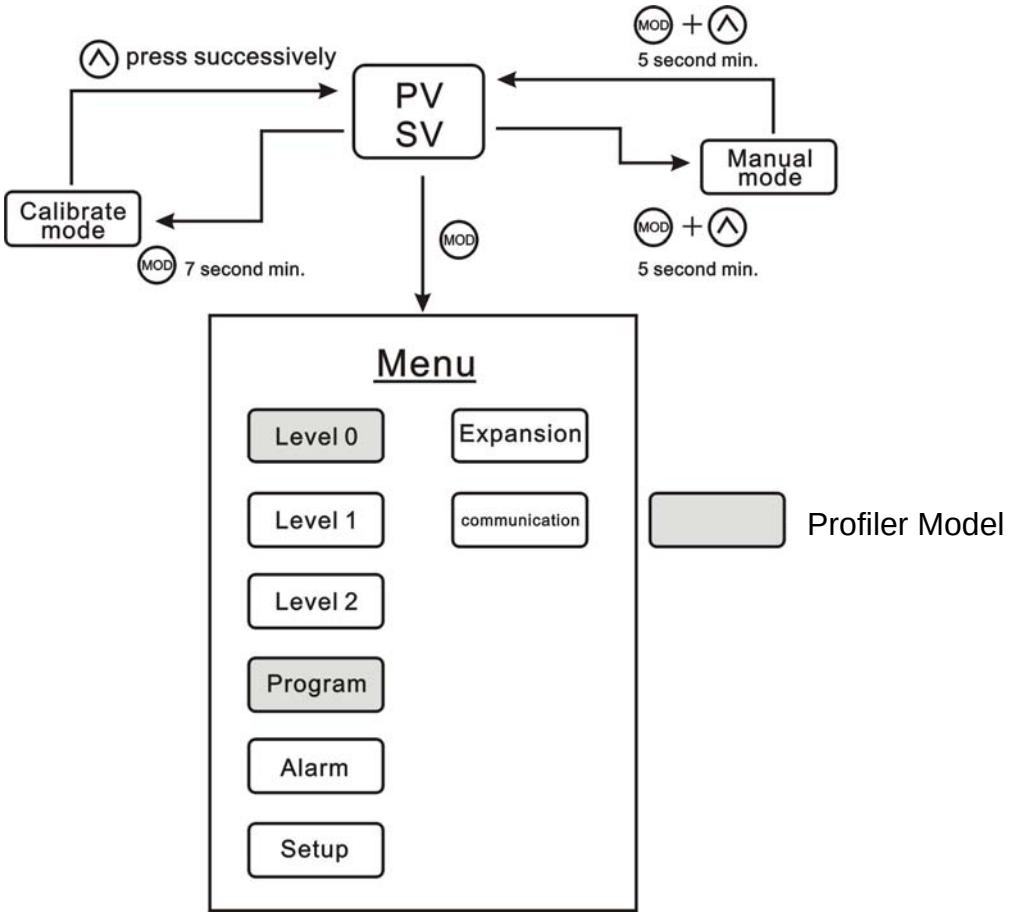
*Totally nine alarm mode, please refer to introduction of Alarm mode

J. Menu Description

J.1 Main Function

Code	Name of Parameter	Description of Parameter
	PV value SV value	Present value Setting value
LU-0	LV-0	Status information (Optional function for Profiler model)
LU-1	LV-1	PID setting
LU-2	LV-2	Advanced setting for control
Prog	Prog	Ramp & Soak setting (Optional function for Profiler model)
ALE.	ALM	Alarm setting
StUP	StUP	Hardware configuration setting
EXPA	EXPA	Expansion function setting
CoME.	CoMM	Communication setting
LoCK	LoCK	Lock function

Note: User can press MOD button to change each main function cycling above.



K. LV-0 Parameters Table (Only for Profiler model)

Code	Parameter	Description	Range	Default
Ptn	Pattern	Present executing pattern	0~8	0
StEP	Step	Present executing step	0~16、SV	0
Ln k	Link	Display the present link setting	0~8	0
Prog	Program	Ramp & Soak control	rSt/run/ HoLd	rSt
Adv	Advance	Skip to next step	on/oFF	oFF
tSbt	Standby time	Remaining time to start control(minute)	0~9999	0
tELP	Elapse time	Time of current step have been executing (minute)	0~9999	0
rPt	Repeat time	Current pattern remaining repeat time	0~9999	0
EV-H	Heater MV	Manipulate value of Heater output	0.0~100.0	0
EV-C	Cooler MV	Manipulate value of 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 P, d
- StEP : Indication of the on-going step
  0 ：Ramp/Soak control not starts yet.
  SV：Maintain the last SV (EHPA->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
- Ln k : Next pattern。(0: there is no next pattern)
- Prog : Program control：Change is effective while LV2->oPEr not be onoF or P, d.
  rSt ：Reset ramp/soak status, and stop the control/alarm output.
  run ：Ramp/soak control resumes.
  HoLd ：Hold ramp/soak timing
- Adv : Skip to next step.
  Skip from “Ramp” step, into “Soak” step：SV switch to the setting of the next soak step.
  Skip from “Soak” step, into “Ramp” step：
  EHPA=>PVSt=PV, PV reaches soak value after ramp time parameter from the current PV.
  EHPA=>PVSt=SV, PV reaches soak value after ramp time parameter from the current SV setting.
- tSbt : Display the remaining time to active (min).
- tELP : Display the time current step have been operating (min).
- rPt : Display the remaining repeat times.
- EV-H : Percentage of manipulate value for the heater.
- EV-C : Percentage of manipulate value for the cooler.

L. LV-1 Parameter Table

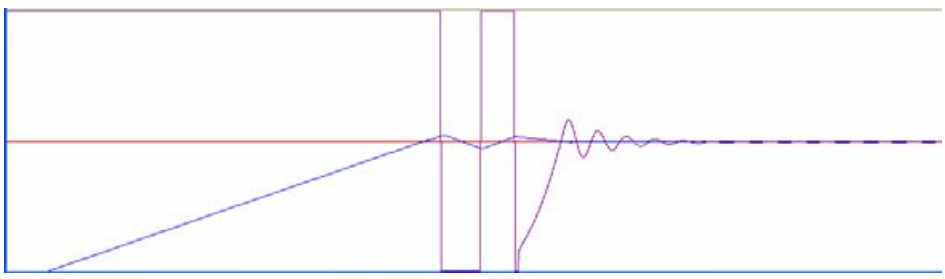
Code	Parameter	Description	Range	Default
tUn	Auto Tune	Auto Tuning	on/oFF	oFF
P	Proportional Gain	Proportional gain parameter of PID	0~999.9	2.0
I	Integral Time	Integral parameter of PID (unit : second)	0~9999	100
d	Differential Time	Derivative parameter of PID (unit : second)	0~9999	10
tAU	Tau	Fuzzy parameter	0.001~9.999	0.060
CoEF	Cooling Coefficient	Cooling parameter	0.01~99.99	1.00
E.rSt	Manual reset	Manual reset	0.0~100.0	0
oFS.t	Auto Tune Offset	SV Offset during Auto-tuning	-1999~9999	0
HYS.	Heater Hysteresis	On/Off output hysteresis for heater	0~9999	0
CHYS.	Cooler Hysteresis	On/Off output hysteresis for cooler	0~9999	0
H-Pd	Heater period	Cycle time of heater control output (second)	0.1~50.0	15.0
C-Pd	Cooler period	Cycle time of cooler control output (second)	0.1~50.0	15.0
dbon	Dead band	Dead band function On/Off switch	on/oFF	oFF
db-H	Heater dead band	Dead band of heater control	-1999~9999	0
db-C	Cooler dead band	Dead band of cooler control	-1999~9999	0
E.U.-H	Heater MV	Display the heater output power	0.0~100.0	0
E.U.-C	Cooler MV	Display the cooler output power	0.0~100.0	0
Ct	CT current monitor	Display CT value		-1.
Hb	Heater burnout	Heater break setting	0~55.0	0

Note: ▭ Parameters in gray background will present at the LV-0 main menu on profiler model.

LV-1 section of parameters are used for basic control，P、I、d、tAU、CoEF parameters, which dominates the PID + Fuzzy control algorithm performance. Theses parameter can be auto-tuning to find optimal solution, free from complex PID tuning procedure. Besides, this system is auxiliary by Fuzzy compensation algorithm to make system response faster and more reliable.

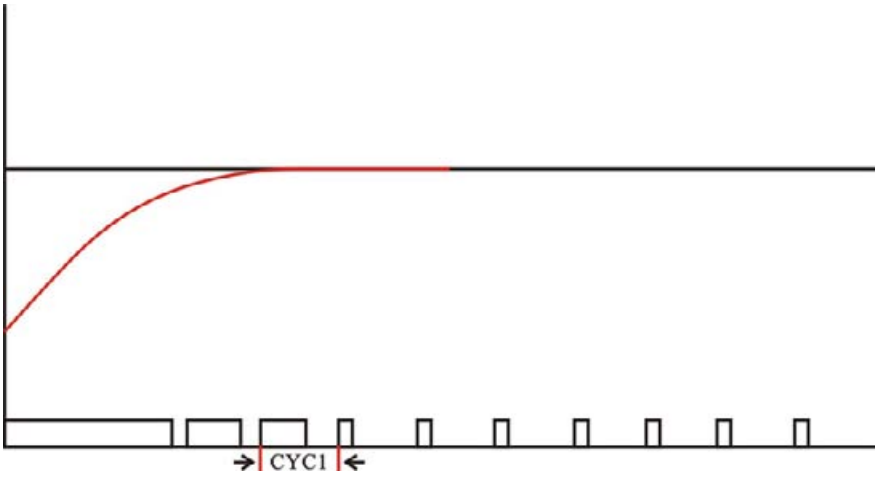
To go to LV-1, press MOD once (twice for profiler model) under SV/PV, and its sub options are listed below:

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



When auto tuning is on, controller will start heating and cooling around the setting SV. In general, the PID parameters can be completed and keep the controlled plant stable according SV after two oscillation cycles. In addition, the oFSt function (especially used during the auto tuning process) can further prevent system overshooting during the auto tuning process.

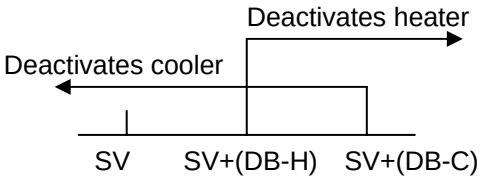
- P Proportional Gain parameter. Can be calculated by auto tuning or manually adjustment. This parameter is responsible to the system deviation. When offset occurs, proportional regulator responds to reduce the offset.
- I Integral parameter. Can be calculated by auto tuning or adjusted manually. When 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 value will get more fast 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 indicate the performance of cooler.
- E.rSt 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 according by the 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 switch, 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 manipulate value 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, user is recommended to adopt longer cycle time to protect mechanical life.



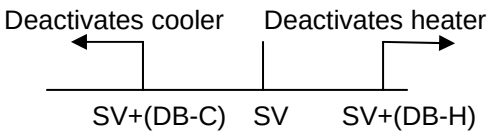
- dbon Enable/disable dead band control.
- db-H Dead band for heater.
- db-C Dead band for cooler.

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.

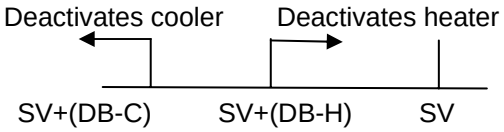
DB-H>0；DB-C>0
Over SV+DB-H deactivates heater
Under SV+DB-C deactivates cooler



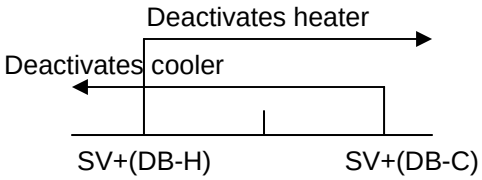
DB-H>0；DB-C<0
Over SV+DB-H deactivates heater
Under SV+DB-C deactivates cooler



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

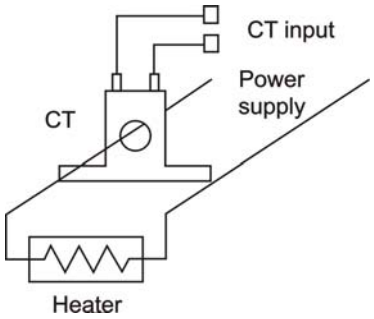


DB-H<0；DB-C>0
Over SV+DB-H deactivates heater
Under SV+DB-C deactivates cooler



- E.U-H Indicate the output energy percentage by heater; where the upper row shows the PV value after one second showing “MV-H”.
- E.U-C Indicate the output energy percentage by cooler; where the upper row shows the PV value after one second showing “MV-C”.

- 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's current is lower than HB setting during heating, it will be considered as heater break. Thus, HBA alarm will be sent out.



M. LU-2 Parameter Table

Code	Parameter	Description	Range	Default
,nP	Input	Input type selection	K, J, t, E, r, S, b, n, Pt, JPt, dC	K tP
oPEr	Operation	Control mode selection	onoF/P, d/PrG9/P-nF	P, d
r-L	Remote/Local	SV remote/local input	on/oFF	oFF
S.U.	Set Value	Set value	-1999~9999	0.0
S.U.2	Set Value 2	Second set value	-1999~9999	0.0
dot	Dot	Decimal point setting	dot 1~dot 3	dot 1
Unit	Unit	Temperature unit selection	°C / °F	°C
E.UL	Multiplier	PV slope compensation	-1.999~9.999	1.000
b, AS.	Bias	PV offset compensation	-1999~9999	0.0
F, Lt	Filter	Digital filter	1~100	5
S.tb	Standby timer	Waiting time for control starting (second)	0~9999	0
LbAt	LbA detection Time	Detection time of heater break alarm (second)	0~9999	0
LbA3.	LbA detection Width	Detection of temperature differentiation of heater break alarm	0~9999	1.0
bAr	LED Status Bar	Bar-graph display	nonE/HEAt/CooL/PrG9	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
SCEn	SCAL Enable	SCAL Transfer on / Off	on/oFF	oFF

Note: ▭ Parameters in gray background will be available on profiler model.

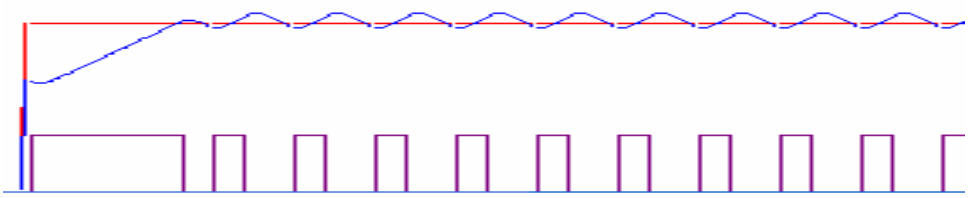
LU-2 section is for advanced control parameters, ON/OFF or PID control mode can be configured on demand. Under SV/PV mode press 2 times (3 times for profiler model) of MOD button, then access into LV-2, the sub-selection as following：

- ,nP ： Input signal selection
  - 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。
- ■ PtP PT100 Platinum resistance type input
  Input range：-200~850°C 0.3%±1Digit。
- ■ JPtP JPT100 Platinum resistance type input
  Input range：-200~850°C 0.3%±1Digit。
- ■ dCtP DC Type voltage input
  Input range：0~230mV 0.3%±1Digit。

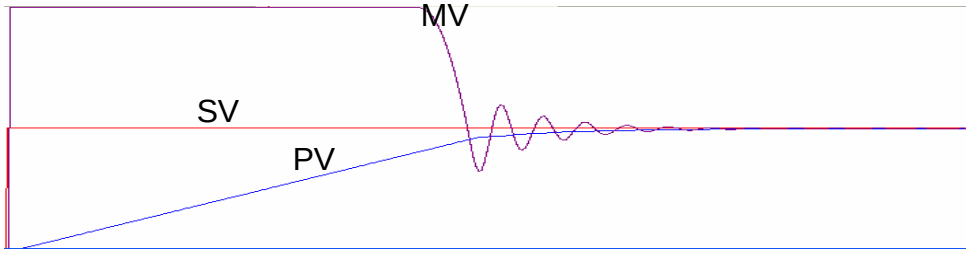
➢ oPEr： Control Mode onoF：ON-OFF P, d ：PID
PrG9：Program P-nF：Program-ONOFF

On/Off Mode



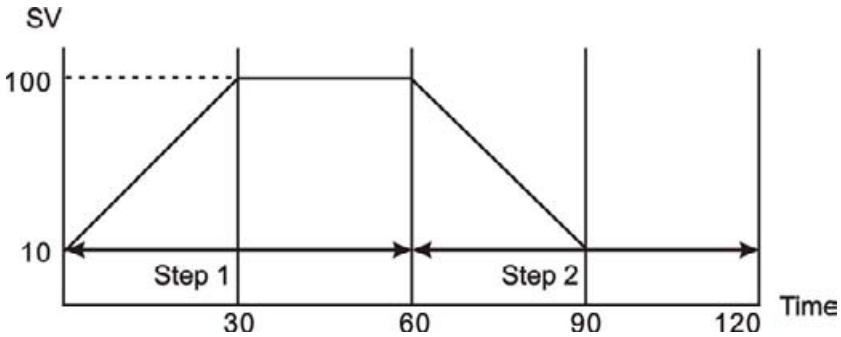
On/Off control mode is a simplest and directly response control mode. When the controller is used for heating process, it will be active (Output high, ON) while the present value less than SV. In the same way but different approach, while the present value is large than SV, then the output deactivate and output low (Off). Use hysteresis to reduce the switching frequency, extending the robustness of the control plant.

PID Mode



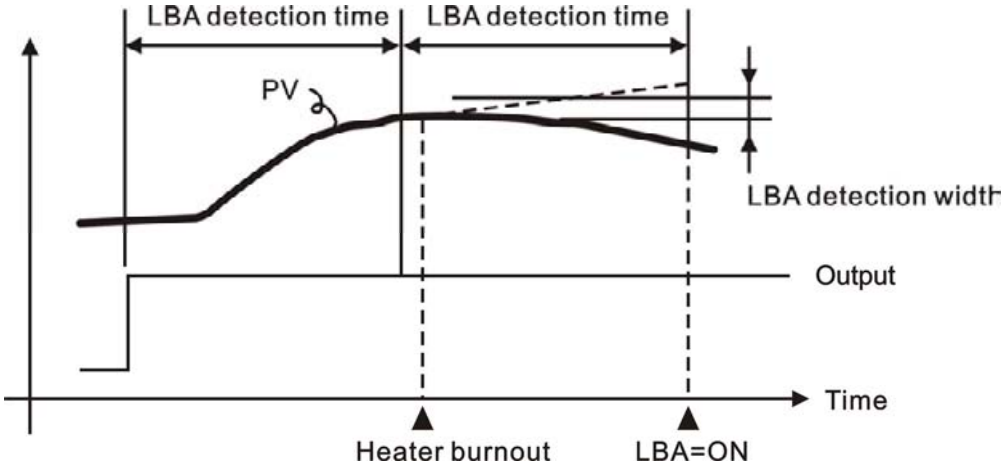
Sometimes, the user hope to have quick response in control process and the On/Off control is not satisfied in this need. PID control performance dominates by the proportional (P), integral (I), derivative (D) constants. Where the P is to handle the response speed, I is to eliminate the steady offset and D is to overcome the disturbance according to the process trend. The PT-series adopt PID+ Fuzzy algorithm to calculate a MV value (manipulate value) to be used in determining whether the control output energy should be stronger or weaker dynamically. The built-in Fuzzy control is to enhance the system in stability for achieving the best control and efficient.

Program/Program ON/OFF Mode (Only for Profiler Model)



Profiler mode offers eight patterns temperature control as template. Every pattern includes temperature setup, time of ramp, time of soak, time 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(EHPA->3.A, E) 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 for each pattern. Via Link function, all the patterns can cascade together and provide up to 64 sub-patterns temperature control description. All the patterns receive the On/Off Control or PID Control.

- r-L Remote(RSP) or local setting of SV
  on：Remote mode (RSP)； oFF：Local mode。
- S.U Temperature Setting； Set value should within SV-L & SV-H。
- S.U.2 Second Temperature Setting； Set value should within SV-L & SV-H。
  PT-83 series provide two temperature setting channel, is convenient to user.
  Quick SV setting: On PV/SV mode, hold “SET” over 1 sec till the SV begins to blink, then press “Up” and “Down” to adjust the setting value, completed and save by press “SET” again.
  Quick SV⇔SV2 switch：On PV/SV mode, hold “SET” over 5 sec to change SV or SV2 in active
- 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。°C / °F
- E.UL PV magnification adjustment。
- b.AS PV Offset input。When PV’s current value and factory calibration value exists constant bias, which mostly creates from the input sensor difference. The user can compensate the bias follow the relation below. PV = PV*E.UL +b.AS
- F.Lt Digital filter；Reduce noise comes from with input signal. 1~100 filter time factor can be set. This function will not accumulate any signal data but higher filter time factor will make lower response in indicating PV value.
- S.tb Standby timer (minute) ; Time to actuate system since power on. For profiler model, the standby sequence will be the same even P-ON=RUN, if user set STB = 0, the controller will act immediately
- LbAt LBA heater burnout detection time; Set LBA burnout cycle time(second), when LbAt is set to be 0，the LBA function will be shutdown。
- LbA3 LBA heater burnout detection width; Set LBA detection temperature difference range if heater broken. When system is being heated and temperature increase lag behind the allowable temperature difference within the LBA time, it will issue the alarm to warn the heater broken.



- bAr Bargraphic Indicator
  - nonE ：No light, 0%
  - HEAt ：Heating manipulate value, one light represents 10% value.
  - CooL ：Cooling manipulate value, one light represents 10% value.
  - Prog ：Ramp / Soak step indicator (Profiler model only).
    - First light blinking ：Executing first step in ramp stage.
    - First light sustained on ：Executing first step in soak stage.
    - 2nd light blinking ：Executing second step in ramp stage.
    - 2nd light sustained on ：Executing second step in soak stage.
- tr-H Set to re-transfer SV upper limit value.
- tr-L Set to re-transfer SV low limit value.

  When output is configured in the SV re-transfer mode, SV value can be transferred into the corresponding analog 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
- SCEn Enable/Disable the function that transfer analog signal into specific display range

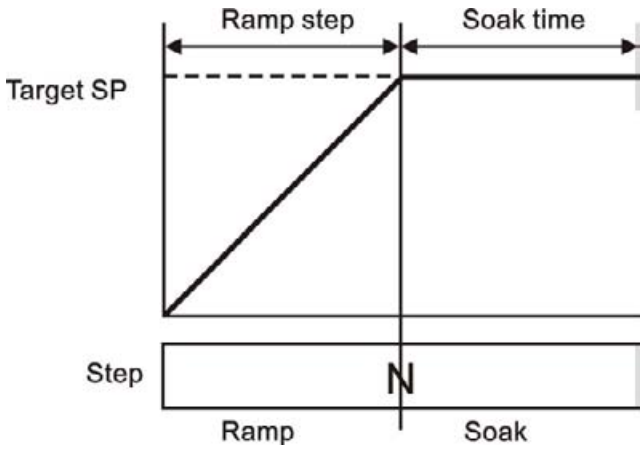
N. PtG9 Parameter Table (Only for Profiler Model)

Code	Parameter	Description	Range	Default
Ptn	Pattern NO.	Pattern number	1~8	1
StEP	Number of steps	Steps needed to be performed within a pattern	1~8	8
SU.1~SU.8	Set Value	Temperature setup	-1999~9999	0
tr.1~tr.8	Ramp time	Time of temperature rinsing/falling period (min)	0~9999	0
ts.1~ts.8	Soak time	Time of temperature holding period (min)	0~9999	0
rPt	Repeat time	Repeat time	0~9999	0
L.nK	Link pattern	Pattern to pattern linkage selection	0~8	0
ts.1S	Time signal1 step	Output signal step 1	tr1~St8	tr1
on1	Signal1 ON time	Signal 1 ON time (min)	0~9999	0
oFF1	Signal1 OFF time	Signal 1 OFF time (min)	0~9999	0
ts.2S	Time signal2 step	Output signal step 2	tr1~St8	tr1
on2	Signal2 ON time	Signal 2 ON time (min)	0~9999	0
oFF2	Signal2 OFF time	Signal 2 OFF time (min)	0~9999	0

PtG9 Section of Parameters is profiler's pattern configuration. Each pattern can perform 8 steps of temperature control. Via link function between patterns, user can cascade up to 64 steps of temperature control.

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

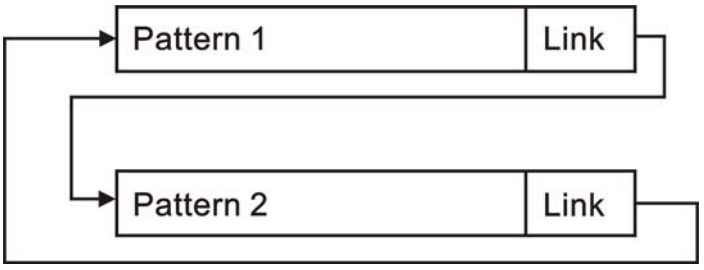
- Ptn Pattern selection; it's also the first executing pattern from the program start.
- StEP Step quantity selection, to set the amount of steps needed.
- SU.1~SU.8 Temperature setup, set target temperature in each step.
  Ex.： SV=50 PV=30 SV1=70 tr1=1 ts1=2 （EHPA->PUSt=PU.）
  SV is accumulating from the current PV value 30 to 70 in one minute since program start (rising speed is faster with lesser ramp time setting), and then keep at 70 for two minutes.
  Note：If EHPA->PUSt=SU., SV is accumulating from the current SV value 50 to 70 in one minute
- tr.1~tr.8 Rising or falling time in each step; Set the required time from current temperature to the next holding temperature (minute)
- ts.1~ts.8 Holding time; Time of holding at target set point after ramp stage. (minute)



- rPt Repeat times; Repeat times for each pattern
  Ex: Repeat times= 0，It equals to execute one times for this pattern.
  Ex: Repeat times= 1，It equals to execute two times for this pattern.

- L, nK Pattern Linkage; Set next executing pattern after current proceeding pattern.

  A special loop setting example is to set Link=2 for Pattern 1, and Link=1 for Pattern 2. The controller will continuously execute the procedure as Pattern 1-->Pattern 2 --> Pattern1 --> Pattern 2--->……

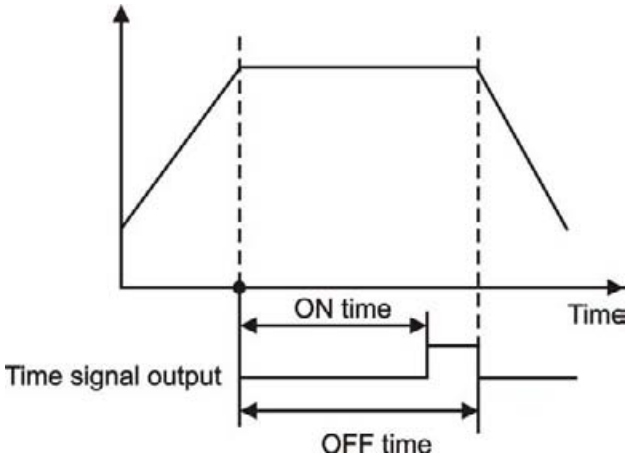


- tS.1S, tS.2S. Output Trigger; Set the time signal output at certain step and time of an executing pattern.

  r 1：Send signal output while executing the first rising step of an executing pattern.
  S.1：Send signal output while executing the first holding step of an executing pattern.
  r 2：Send signal output while executing the 2nd rising step of an executing pattern.
  S.2：Send signal output while executing the 2nd holding step of an executing pattern…….

- on1, on2 Signal lag On; Set the lag time to output in active after entering specific step set in TS1S, TS2S. (minute)

- oFF1, oFF2 Signal lag Off; Set the lag time to output in de-active after entering specific step set in TS1S, TS2S. (minute)



Time Signal will be forced to turn off while entering into next step; it will be only turned on in specific step and time.

O. ALE. Parameter Table

Code	Parameter	Description	Range	Default
SoFt	Soft Start	Alarm soft start	on/OFF	OFF
Pos.1	Position 1	Alarm position 1	-1999~9999	0.0
HYS.1	Hysteresis 1	Hysteresis 1	0000~9999	0.0
dYt 1	Delay Time 1	Delay time 1(sec)	0~99	0
St Y 1	Style 1	Style 1	St Y 1~St Y8、SEnr	St Y 1
LAt 1	Latch 1	Alarm Latch 1	on/OFF	OFF
Pos.2	Position 2	Alarm position 2	-1999~9999	0.0
HYS.2	Hysteresis 2	Hysteresis 2(sec)	0000~9999	0.0
dYt 2	Delay Time 2	Delay Time 2	0~99	0
St Y2	Style 2	Style 2	St Y 1~St Y8、SEnr	St Y 1
LAt 2	Latch 2	Alarm latch 2	on/OFF	OFF
Pos.3	Position 3	Alarm position 3	-1999~9999	0.0
HYS.3	Hysteresis 3	Hysteresis 3(sec)	0000~9999	0.0
dYt 3	Delay Time 3	Delay Time 3	0~99	0
St Y3	Style 3	Style 3	St Y 1~St Y8、SEnr	St Y 1
LAt 3	Latch 3	Alarm latch 3	on/OFF	OFF
Pos.4	Position 4	Alarm position 4	-1999~9999	0.0
HYS.4	Hysteresis 4	Hysteresis 4(sec)	0000~9999	0.0
dYt 4	Delay Time 4	Delay Time 4	0~99	0
St Y4	Style 4	Style 4	St Y 1～St Y8、SEnr	St Y 1
LAt 4	Latch 4	Alarm latch 4	on/OFF	OFF

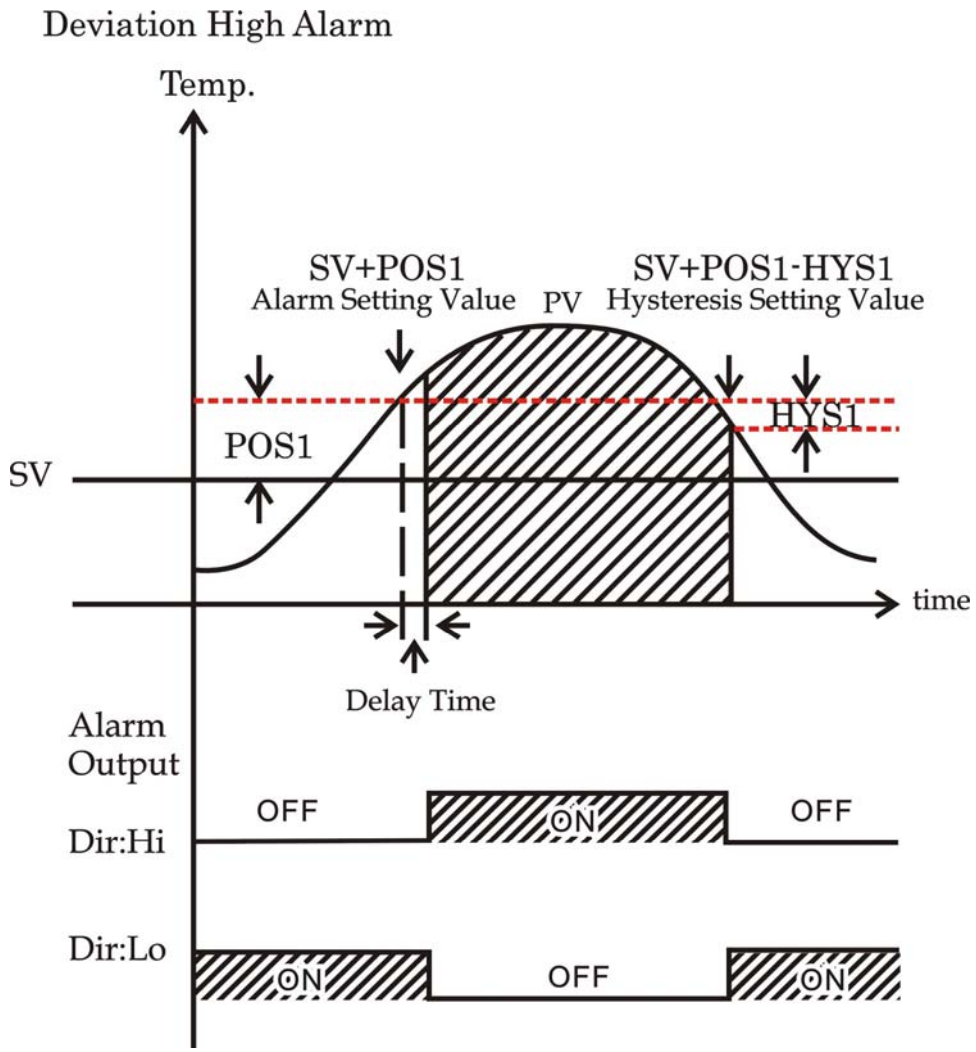
ALE. Four groups alarm parameters designed to fit versatile application conditions. The independent sensor abnormal alarm (ALE.->St YL ->SEnr) provides user extra function to protect system. Press MOD 4 times under SV/PV mode (5 times for Profiler model) to access the ALM main menu, where its sub-menu includes:

- SoFt Soft Alarm start on/off
  If the soft alarm is active, it will not execute when the PV within the alarm criteria first time.
  Alternatively, it will alarm while the PV falls within the alarm criteria again.
- Pos.1 Set point for alarm 1.
- HYS.1 Hysteresis range of alarm 1.

- dYt 1 Lag time for alarm 1 (sec).
- SbY 1 Style mode for alarm 1 (Please refer to SbYL alarm mode selection description).
- LAt 1 Latch for alarm 1, if the latch is active, it will keep output high once PV falls within the alarm range. The output still keeps high even the PV is out alarm range later,.
  To escape from the latch situation is to set LAT parameter to OFF.
- Po S.2 Set point for alarm 2.
- HY S.2 Hysteresis range of alarm 2.
- dYt 2 Lag time for alarm 2 (sec).
- SbY 2 Style mode for alarm 2 (Please refer to SbYL alarm mode selection description).
- LAt 2 Latch for alarm 2
- Po S.3 Set point for alarm 3.
- HY S.3 Hysteresis range of alarm 3.
- dYt 3 Lag time for alarm 3 (sec).
- SbY 3 Style mode for alarm 3 (Please refer to SbYL alarm mode selection description).
- LAt 3 Latch for alarm 3
- Po S.4 Set point for alarm 4.
- HY S.4 Hysteresis range of alarm 4.
- dYt 4 Lag time for alarm 4 (sec).
- SbY 4 Style mode for alarm 4(Please refer to SbYL alarm mode selection description).
- LAt 4 Latch for alarm 4

SEL Alarm Mode Selection

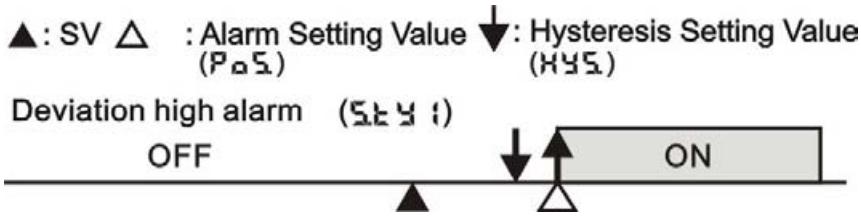
O.1 SEL 1 Deviation High Alarm Begins above SV



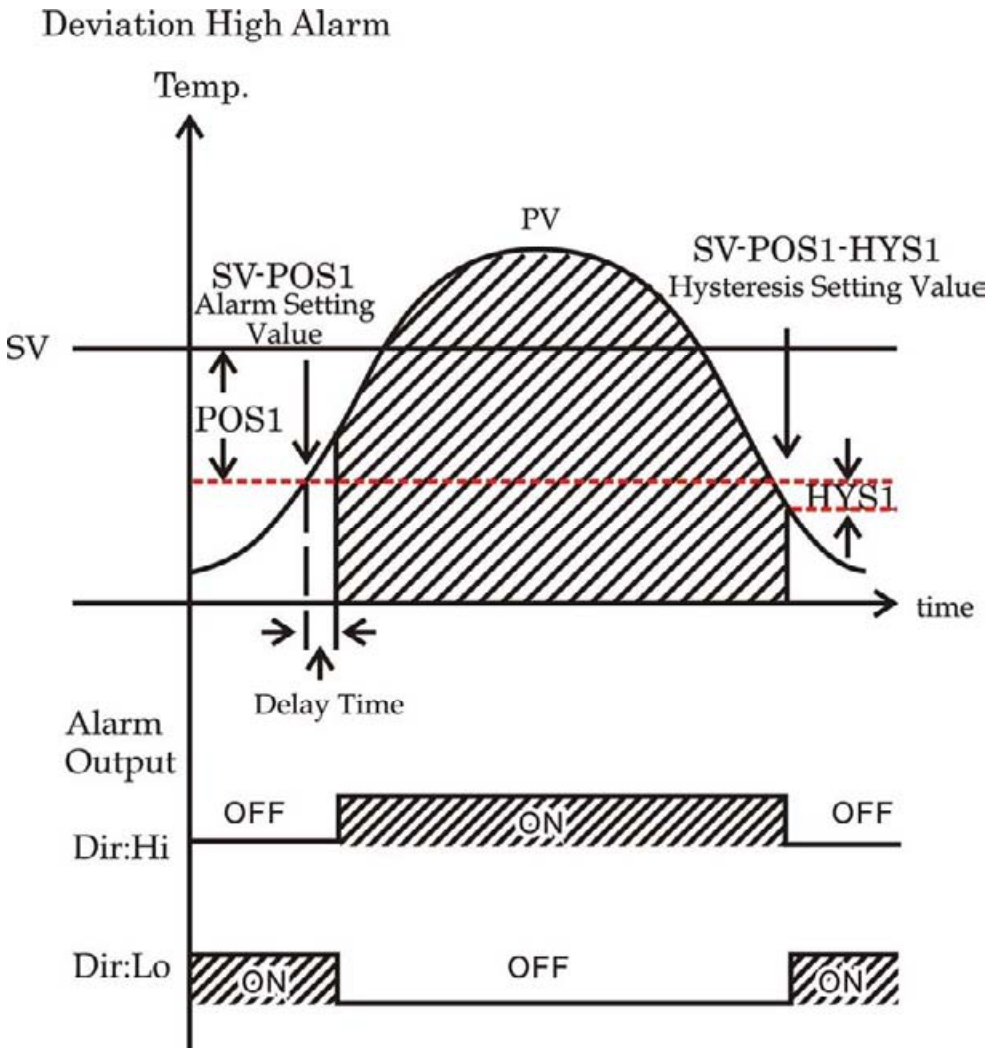
Alarm output being start on when PV>=SV+POS1, then DY1 starts timing. After DY1 finished counting time, then alarm output is active.
Alarm output being shut down when PV<SV+POS1-HYS1, and alarm output is de-active.
Note: User can define their prefer alarm output mode of active in high or active in low, depends on their setting on the Dir: Hi & Dir: Lo

Ex.：
PV= present value, SV= set value, POS1= Alarm set point for deviation, DY1= Delay time to alarm output. If SV=60； POS1=10； HYS1=5； DY1=5; It means when PV>=70, then DY1 starts timing. After DY1 finished counting time, then alarm output is active. If the PV keeps

value above SV+POS1-HYS1 (=65 in this case), the alarm output will keep in active status. Or it will turn to deactivate alarm output when the PV<SV+POS1-HYS1

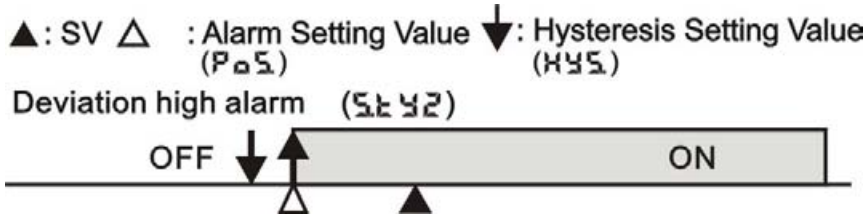


O.2 SEY2 Deviation High Alarm Begins under SV

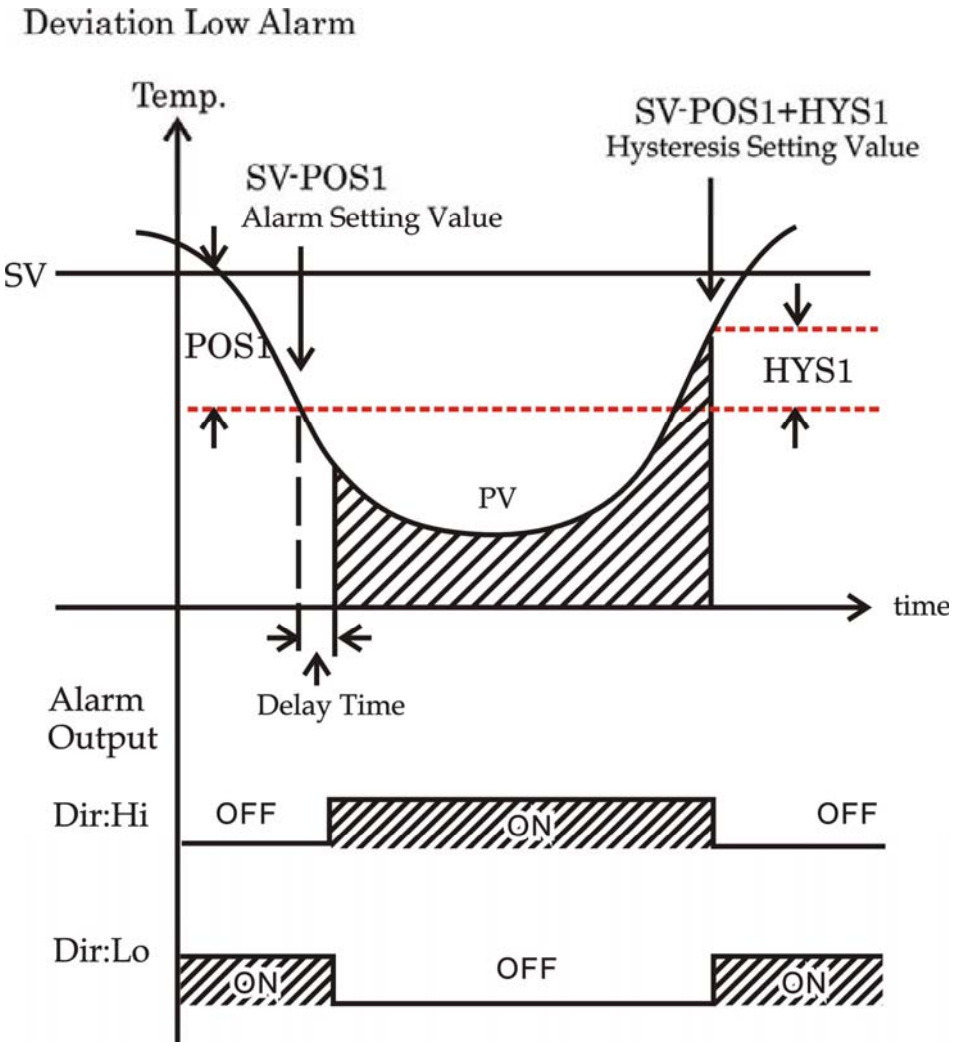


Alarm output being start on when PV>=SV-POS1, then DY1 starts timing. After DY1 finished counting time, then alarm output is active.
Alarm output being shut down when PV<=SV-POS1-HYS1, and alarm output is de-active.
Note: User can define their prefer alarm output mode of active in high or active in low, depends on their setting on the Dir: Hi & Dir: Lo

Ex.：
PV= present value, SV= set value, POS1= Alarm set point for deviation, DY1= Delay time to alarm output. If SV=60； POS1=10； HYS1=5； DY1=5; It means when PV>=50 (=SV-POS1), then DY1 starts timing. After DY1 finished counting time, then alarm output is active. If the PV keeps value above SV-POS1-HYS1 (=45 in this case), the alarm output will keep in active status. Or it will turn to deactivate alarm output when the PV<SV-POS1-HYS1

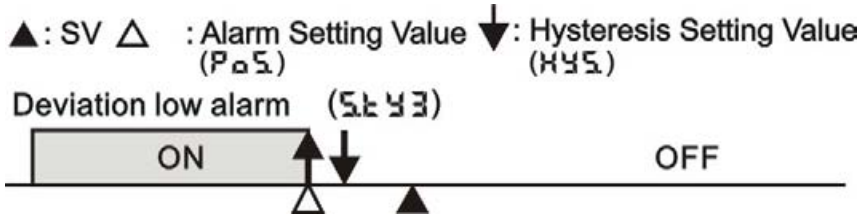

▲: SV △ : Alarm Setting Value (PoS)
: Hysteresis Setting Value (HYS)
Deviation high alarm (StY2)
OFF
ON

O.3 Sb43 Deviation Low Alarm Begins under SV

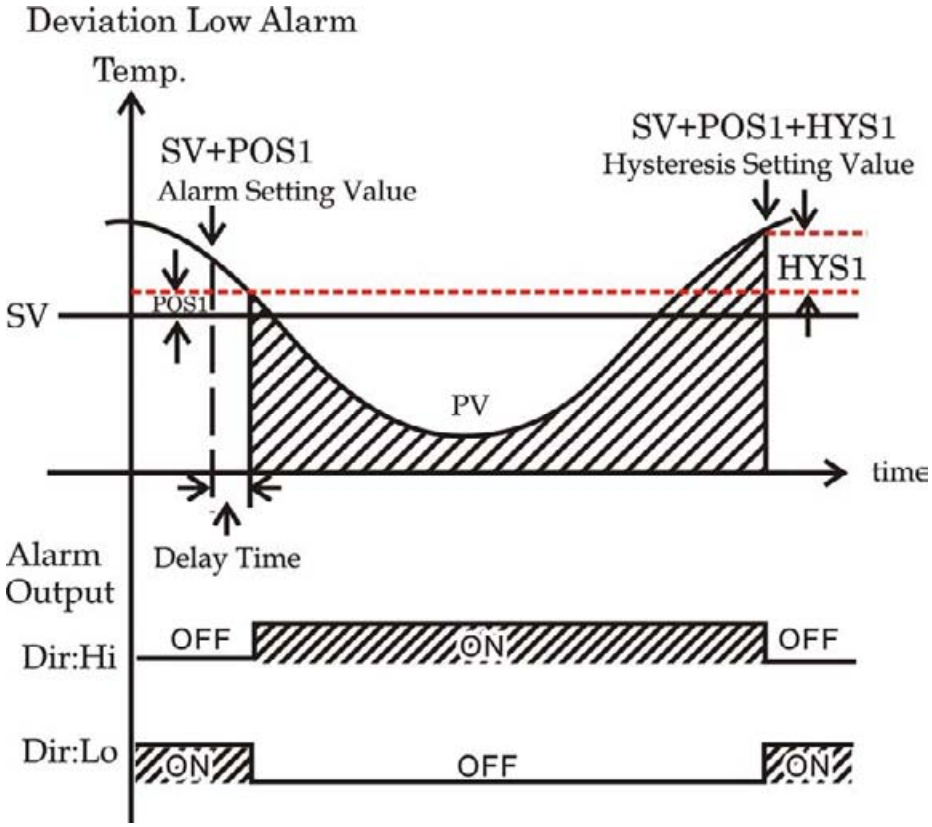


Alarm output being start on when PV<=SV-POS1, then DY1 starts timing. After DY1 finished counting time, then alarm output is active.
Alarm output being shut down when PV>=SV-POS1+HYS1, and alarm output is de-active.
Note: User can define their prefer alarm output mode of active in high or active in low, depends on their setting on the Dir: Hi & Dir: Lo

Ex.：
PV= present value, SV= set value, POS1= Alarm set point for deviation, DY1= Delay time to alarm output. If SV=60； POS1=10； HYS1=5； DY1=5; It means when PV<=50 (=SV-POS1), then DY1 starts timing. After DY1 finished counting time, then alarm output is active. If the PV keeps value under SV-POS1+HYS1 (=55 in this case), the alarm output will keep in active status. Or it will turn to deactivate alarm output when the PV > SV-POS1+HYS1

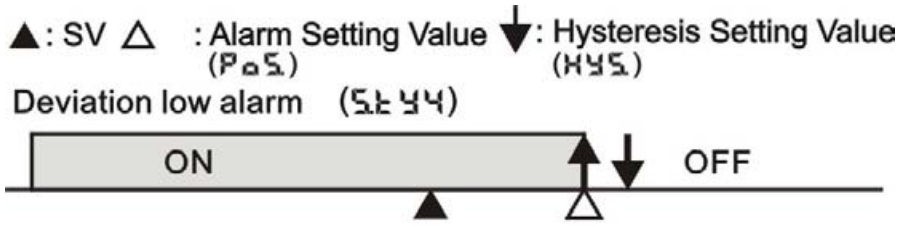

▲: SV △ : Alarm Setting Value (PoS)
: Hysteresis Setting Value (HYS)
Deviation low alarm (StY3)
ON
OFF

O.4 SE44 Deviation Low Alarm Begins above SV

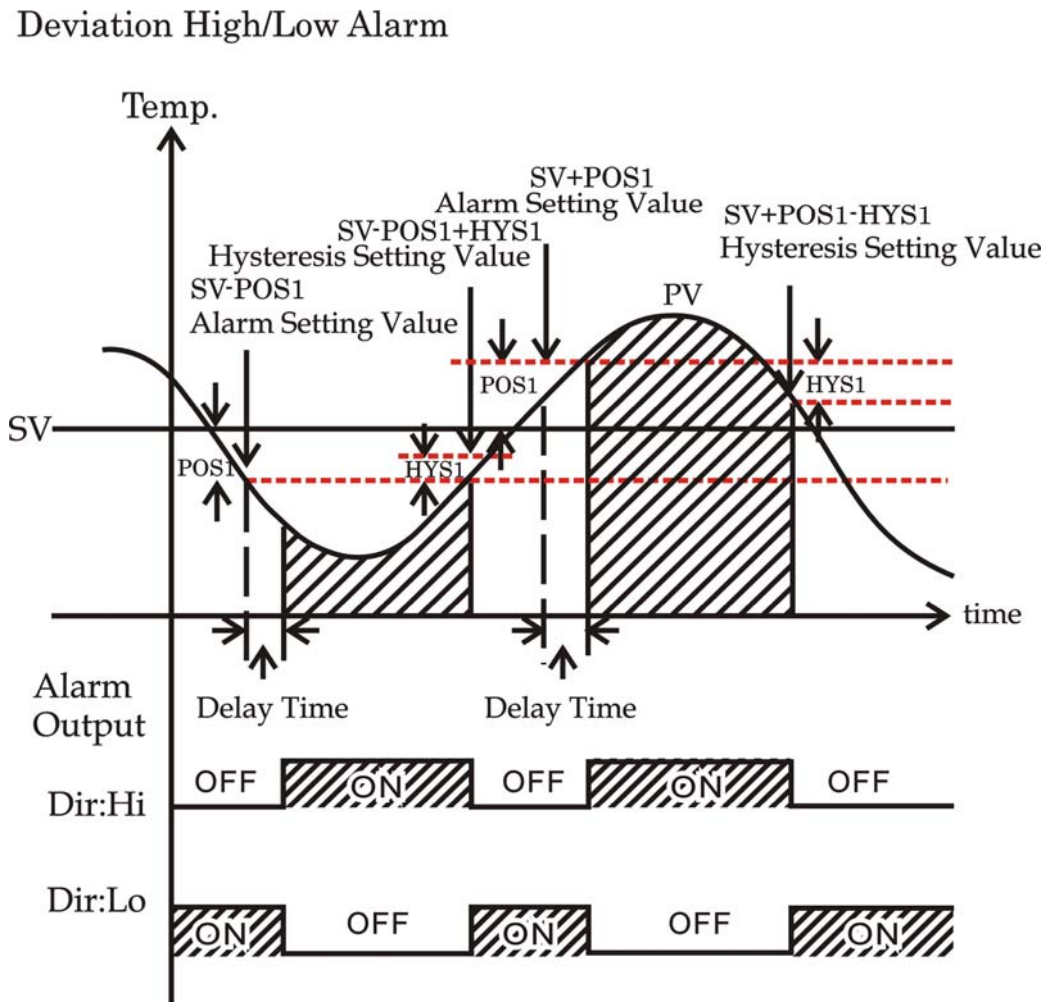


Alarm output being start on when PV<=SV+POS1, then DY1 starts timing. After DY1 finished counting time, then alarm output is active.
Alarm output being shut down when PV>=SV+POS1+HYS1, and alarm output is de-active.
Note: User can define their prefer alarm output mode of active in high or active in low, depends on their setting on the Dir: Hi & Dir: Lo

Ex.：
PV= present value, SV= set value, POS1= Alarm set point for deviation, DY1= Delay time to alarm output. If SV=60； POS1=10； HYS1=5； DY1=5; It means when PV<=70 (=SV+POS1), then DY1 starts timing. After DY1 finished counting time, then alarm output is active. If the PV keeps value under SV+POS1+HYS1 (=75 in this case), the alarm output will keep in active status. Or it will turn to deactivate alarm output when the PV >SV+POS1+HYS1


▲: SV △ : Alarm Setting Value (PoS)
▼: Hysteresis Setting Value (HYS)
Deviation low alarm (SLYY)
ON
OFF

O.5 SEY5 Out Range Alarm



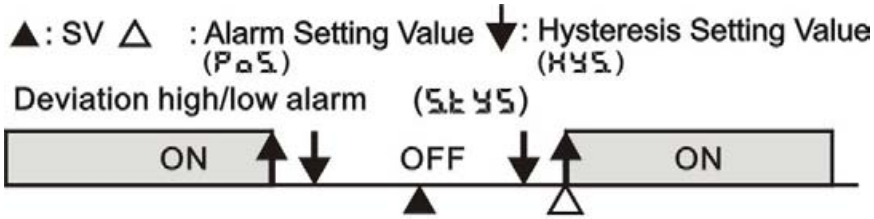
This mode is designed for monitoring if the present value (PV) keeps within a pre-defined range. If the PV out of the range, for example, PV<=SV-POS1or PV>=SV+POS1, then the DY1 starts timing synchronously. After DY1 finished counting time, then alarm output is active.

Alarm output being shut down when PV>=SV-POS1+HYS1 or PV<=SV+POS1-HYS1, and alarm output is de-active.

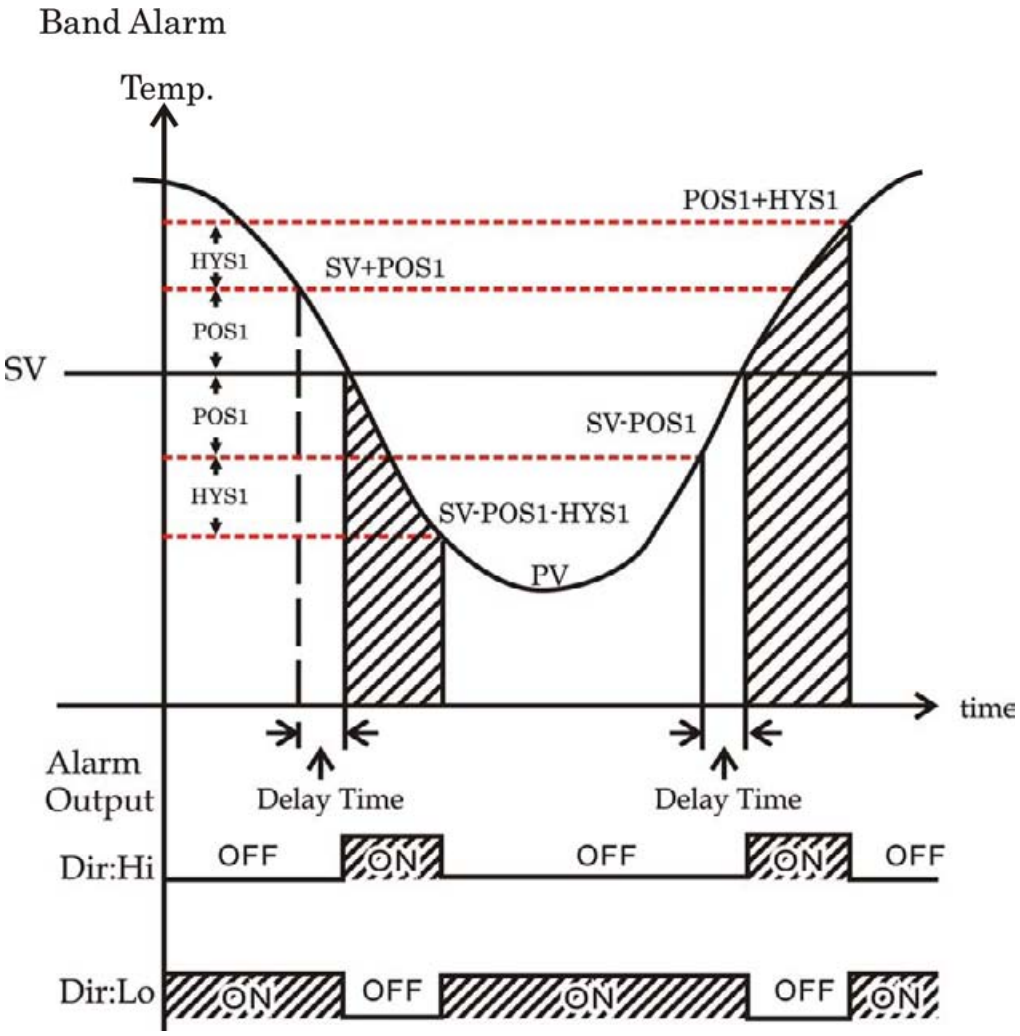
Note: User can define their prefer alarm output mode of active in high or active in low, depends on their setting on the Dir: Hi & Dir: Lo

Ex.：

PV= present value, SV= set value, POS1= Alarm set point for deviation, DY1= Delay time to alarm output. If SV=60； POS1=10； HYS1=5； DY1=5; It means when PV<=50 (=SV-POS1) or PV>=70 (=SV+POS1), then DY1 starts timing. After DY1 finished counting time, then alarm output is active. If the PV keeps value under 55 (=SV-POS1+HYS1 in this case) or above 65 (=SV+POS1-HYS1), the alarm output will keep in active status. It will turn to deactivate alarm output when the PV > =SV-POS1+HYS1 or PV <=SV+POS1-HYS1



O.6 SEY6 In Range Alarm



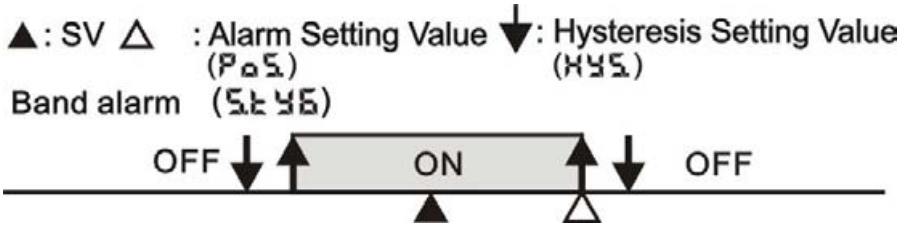
This mode is designed for monitoring if the present value (PV) keeps away outside of a pre-defined range. If the PV access into a pre-define range, for example, while |PV-SV|<=POS1, then the DY1 starts timing synchronously. After DY1 finished counting time, then alarm output is active.

Alarm output being shut down when |PV-SV|>=POS1+HYS1, and alarm output is de-active.

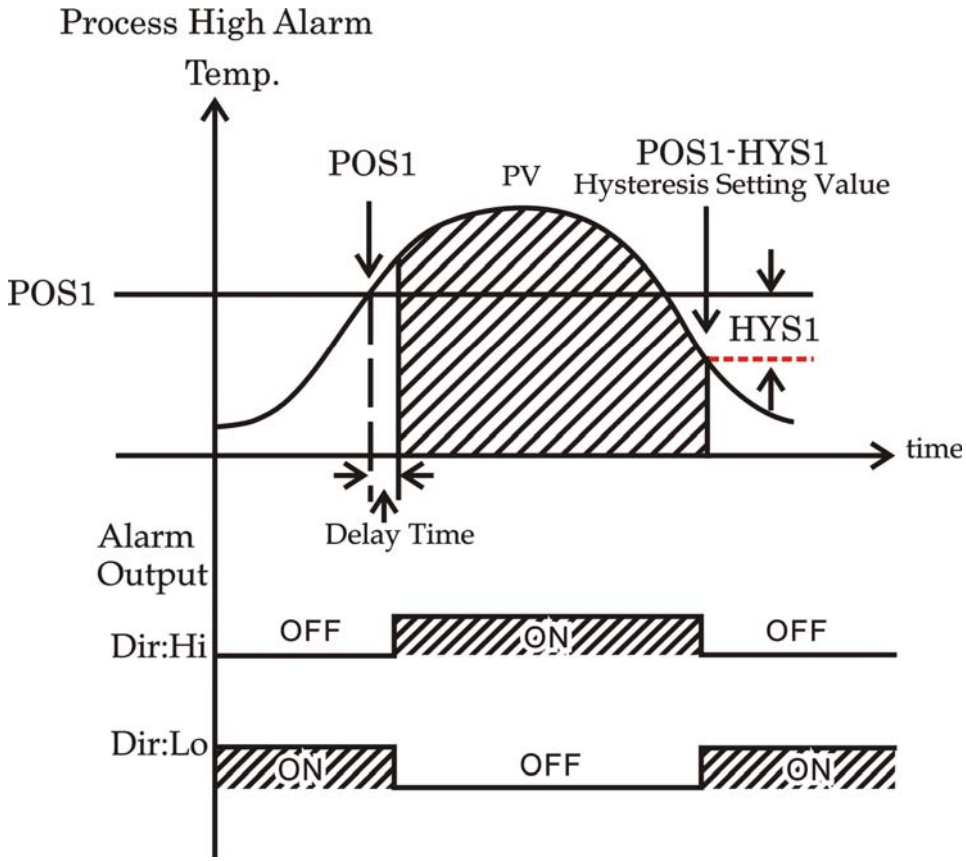
Note: User can define their prefer alarm output mode of active in high or active in low, depends on their setting on the Dir: Hi & Dir: Lo

Ex.：

PV= present value, SV= set value, POS1= Alarm set point for deviation, DY1= Delay time to alarm output. If SV=60； POS1=10； HYS1=5； DY1=5; It means when 50 <=PV<=70 (|PV-SV|<=POS1), then DY1 starts timing. After DY1 finished counting time, then alarm output is active. If the PV keeps value in the range of above 45 & under 75 (|PV-SV|<=POS1+HYS1 in this case), the alarm output will keep in active status. It will turn to deactivate alarm output when the |PV-SV|>=POS1+HYS1.



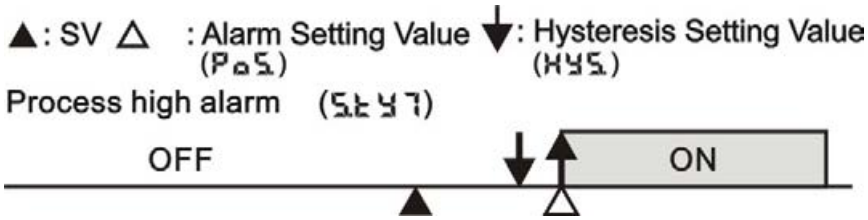
O.7 SEY1 Absolute Value High Alarm



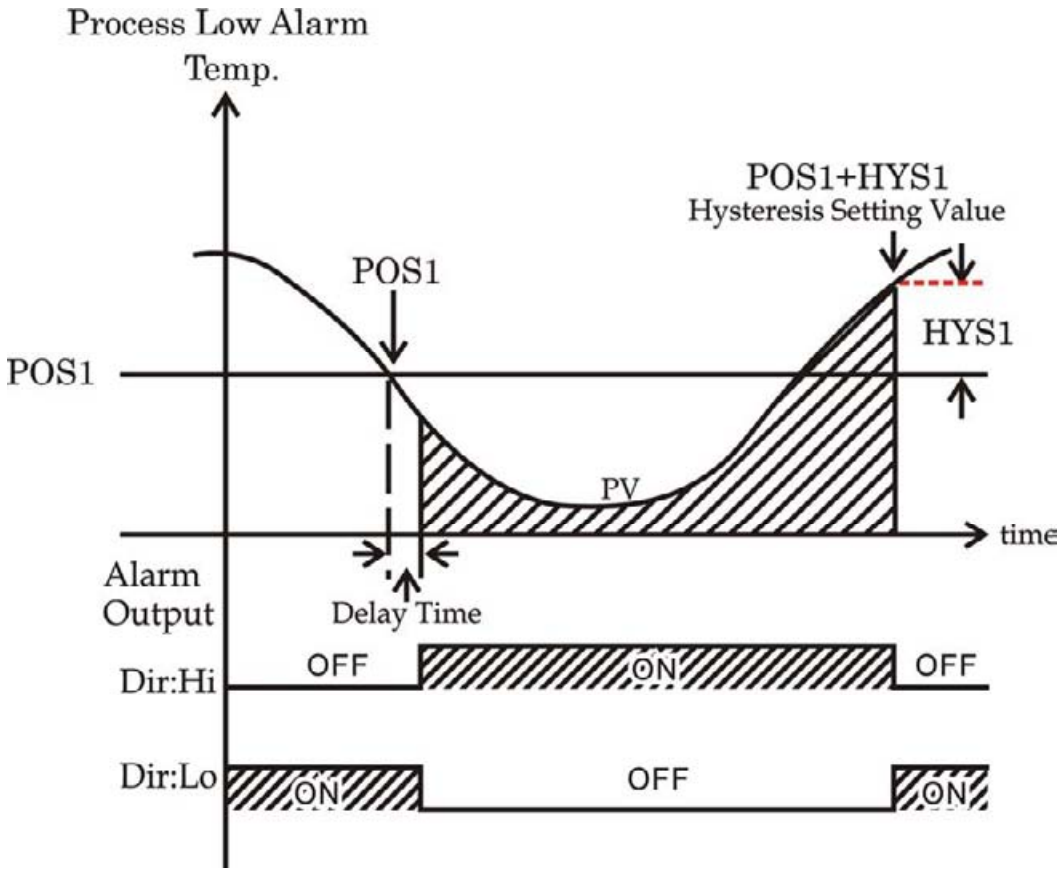
This mode is similar as **High Alarm Begins above / under SV**, but the different is the critic that is the PV itself instead of SV.

Alarm output being start on when PV>=POS1, then DY1 starts timing. After DY1 finished counting time, then alarm output is active.
Alarm output being shut down when PV<POS1-HYS1, and alarm output is de-active.
Note: User can define their prefer alarm output mode of active in high or active in low, depends on their setting on the Dir: Hi & Dir: Lo

Ex.：
PV= present value, SV= set value, POS1= Alarm set point for deviation, DY1= Delay time to alarm output. If SV=10； POS1=60； HYS1=5； DY1=5; It means when PV>=60, then DY1 starts timing. After DY1 finished counting time, then alarm output is active. If the PV keeps value above POS1-HYS1 (=55 in this case), the alarm output will keep in active status. Or it will turn to deactivate alarm output when the PV<POS1-HYS1


▲: SV △ : Alarm Setting Value (PoS)
: Hysteresis Setting Value (HYS)
Process high alarm (SEY7)
OFF
ON

O.8 SLY8 Absolute Value Low Alarm

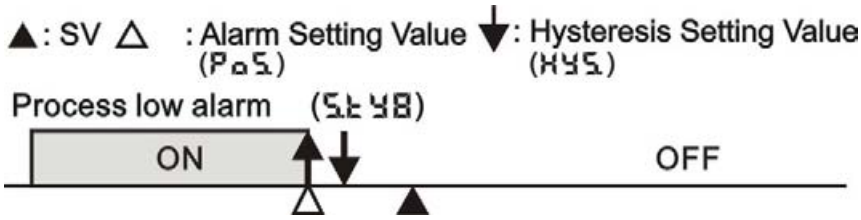


This mode is similar as **Low Alarm Begins above / under SV**, but the different is the critic that is the PV itself instead of SV. Alarm output being start on when PV<=POS1, then DY1 starts timing. After DY1 finished counting time, then alarm output is active. Alarm output being shut down when PV>=POS1+HYS1, and alarm output is de-active.

Note: User can define their prefer alarm output mode of active in high or active in low, depends on their setting on the Dir: Hi & Dir: Lo

Ex.：

PV= present value, SV= set value, POS1= Alarm set point for deviation, DY1= Delay time to alarm output. If SV=60； POS1=10； HYS1=5； DY1=5; It means when PV<=10 (=POS1), then DY1 starts timing. After DY1 finished counting time, then alarm output is active. If the PV keeps value under POS1+HYS1 (=15 in this case), the alarm output will keep in active status. Or it will turn to deactivate alarm output when the PV > POS1+HYS1



O.9 SEnS Signal Error Alarm

Under this alarm mode, alarm will be trigger when PV is in abnormal condition.

Ex: PV indicates any case below will trigger the alarm

[- - - -] – Sensor break

[UUUU] – Out low limit of measurable range

[oooo] – Out up limit of measureable range.

P. STUP Parameter Table

Code	Parameter	Description	Range	Default
OUt 1	Out1	control/alarm/ transmission output	nonE, HEAt, CooL, ALE. 1, ALE.2, ALE.3, ALE.4, HbA, LbA, t-PU, t-SU, tS- 1, tS-2, PEnd, Stg	HEAt
OUt2	Out2			CooL
SUb 1	Sub1			ALE. 1
SUb2	Sub2			ALE.2
AUX. 1	AUX1	AUX input	nonE, tSP, Ct, EUt 1, EUt2, EUt 3, EUt 4	nonE
AUX.2	AUX2			
AUX.3	AUX3			
AUX.4	AUX4			
EUt 1	Event 1	Event input	nonE, StoP, SU2., t-L, E.AnU, tSt, HoLd, AdU	nonE
EUt2	Event 2			
EUt 3	Event 3			
EUt 4	Event 4			
d, t 1	Direction 1	Output direction (forward or reverse)	H, /Lo	H,
d, t 2	Direction 2			
d, t 3	Direction 3			
d, t 4	Direction 4			

Note: ▭ Parameters in gray background will present only on profiler model.

STUP parameter table is to setup the input / output configuration. Each input / output channel can be set appropriate function according to user's preference. To access this table, user can press MOD button five times under SV/PV mode (Six times for Profiler Model) go into STUP menu, where the sub functions are:

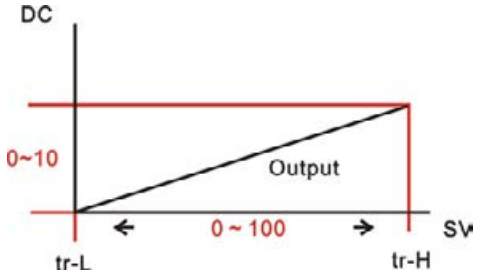
- OUt 1 Out 1 control/alarm/ transmission output： output types selectable
- OUt2 Out 2 control/alarm/ transmission output： output types selectable
- SUb 1 Sub 1 control/alarm/ transmission output： output types selectable
- SUb2 Sub 2 control/alarm/ transmission output： output types selectable

  nonE ：No action
  HEAt ：Heater control output
  CooL ：Cooler control output
  ALE. 1~4 ：Alarm output, this function should be collocated with ALM for detail setup.
  HbA ：Heater break alarm, this function should be collocated with the ues of CT transformer.
  LbA ：Heater loop break alarm by software. This function has to be performed with LU-2→LbAt and LbA3.

tr-PU ：Controller will retransfer PV via output channel by voltage or current analog signal (0-10Vdc, 4-20 mA), where the up / low limit depends on the setting SCAL->SCH、SCAL->SCL of SCAL menu.

tr-SU ：Controller will retransfer SV via output channel by voltage or current analog signal (0-10Vdc, 4-20 mA), detail setting please refer to LU-2→tr-H and LU-2→tr-L in LV-2 menu.

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



tS-1~2 ：In specified steps for Profiler mode, 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 temperature holding stage in step 2, ts1 will be active; and one more minute, ts1 will be de-active. In operation, if the ts-1 / ts-2 “Off “ time exceeds the setting ramp/soak time, system will force to close time signals before program access into next ramp/soak step.

PEnd ：Pattern finished signal. If the ramp / soak execution completed, then Pend will send out a pulse trigger.

Stg ：Step indicator, in each step entry, Stg will send out a pulse trigger.

- AUX1 ：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 (CT) input etc.

none Aux is not available.

rSP Remote SV value setting, it accepts the 0-10V, 0-20mA module input. Please see details for RSP menu.

Ct Current transformer input detection, it needs to collocate with CT module

EVt 1~4 Contact switch to execute predefined command, needs operate with Event module.

- EVt 1 Event 1 input
- EVt 2 Event 2 input
- EVt 3 Event 3 input
- EVt 4 Event 4 input

EVt 1~4：Define the Event command.

Under Stup→EVt1~4 menu，corresponding Event (None, Stop, SV2, Remote-Local, Manual, RST, Hold, Advance) can be set。Simply short the event terminal to perform.

EVENT	Description
nonE	Not Available
St oP	Emergency Stop Terminal short => the output is prohibited during processing (heating or cooling)
SU2	SV⇔SV2 quick switch Terminal short => operates in SV2 setting Terminal open => operates in SV setting
r - L (Remote-Local)	r - L =on RSP function active， r - L =oFF RSP function close Terminal short =>L U - 2 ->r - L =on Terminal open =>L U - 2 ->r - L =oFF
E.AnU (Manual)	Terminal short => exchange between manual & standard control mode

These functions below are only for profiler model.

EVENT	Description
r St (Reset)	Reset pattern procedure Terminal short => L U - 0 ->P r o 9 =r St Terminal open => L U - 0 ->P r o 9 =r Un
HoLd	Pause pattern procedure Terminal short => L U - 0 ->P r o 9 =HoLd Terminal open => L U - 0 ->P r o 9 = restore the setting before hold stage
AdU (Advance)	Force to next step Terminal short => L U - 0 ->AdU =on

- d, r 1 Output direction 1(Forward/reverse)

- d , r 2 Output direction 2(Forward/reverse)
- d , r 3 Output direction 3(Forward/reverse)
- d , r 4 Output direction 4(Forward/reverse)

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

Q、EXPA Parameter Table

Code	Parameter	Description	Range	Default
SU-H	Set value upper limit	Set the high limit for SV，where the SV-H>SV-L	-1999~9999	9999
SU-L	Set value lower limit	Set the low limit for SV，where the SV-L<SV-H	-1999~9999	-1999
At-H	AT hysteresis	Hysteresis bandfor Auto Tune	0.0~100.0	0.5
P-on	Power ON	Setup the control mode at power on	hSt/E.rnU/hUn/Con	hSt
PEnd	Pend condition	Final status after Ramp/Soak pattern finish	hSt/SU	hSt
3Ar.t	Wait width	The wait width of ramp/soak pattern	-1999~9999	0
PUSt	PV Start	Program is triggered from PV or SV	PU/SU	PU
hEtn	Return display	The time back to PV/SV screen automatically (sec)	oFF，10，20，30，40，50，60	30
HbL	HBA latch	Latch for heater broken alarm	on/oFF	oFF
FACt	Reset To default	Restore to factory settings	on/oFF	oFF
E.U-H	MV High Limit	Set high limit for MV	0.0~100.0	100.0
E.U-L	MV Low Limit	Set low limit for MV	-100.0~100.0	-100.0
E.UrAt	MV Rate Limit	Set the MV acceleration / deceleration rate range	0.0~100.0	0.0
C-At	Cooler MV Rate Limit	Disarm the acceleration / deceleration rate limit of MV for cooler	on/oFF	oFF

Note: ▭ Parameters in gray background will present only on profiler model.

EXPA parameter table is operated for advance request. Press six times MOD button (seven times for profiler model), then user can access into the EXPA menu, where the functions below are

- SU-H ：Set allowable SV high limit, preset value is 9999.
- SU-L ：Set allowable SV low limit, preset value is -1999, where the default protection will check if the SV-H>=SV-L
- At-H ：Auto Tune hysteresis setup：To avoid signal disturbance during Auto Tune process, which could causes wrong calculation, the At-H value is preset to 0.5. System will be heated to PV+0.5, and cooled to PV-0.5 during Auto Tune process.
- P-on ：Power on Setup; To setup the initial action after power on (None, Reset, Manual, Run & Continue) , Where the Reset, Run & Continue are only for Profiler model.

nonE ：No functionality.

rSt ：Controller turns on. Program mode is into reset condition and turn off control and alarm output.

E.AnU ：Controller is in manual mode when it is turned on.

rUn ：Controller turns on and the profiler program will reset and run automatically.

Con ：Restore the program status before power failure, and continue preceding operation

(rSt、rUn、Con options are effective while LU2->oPEr = Pro9 or P-nF)

- PEnd：Pend status; Set controller's running mode after ramp / soak pattern completed.

  Ex 1: User can set "rSt", it will brings the controller go back to reset status, and stop the control process and alarm output.

  Ex 2: User can set "SU", it will keep the controller controlling at the last step setting.

- 3A,t：Wait Width; When ramp/soak proceeds, it should satisfied the relation of |PV-SV| < WaitWidth before entering into next stage, for tracking pattern curve as similar as possible. Default 0 means disable this function.

- PUSt: To determines Ramp/Soak initial SV setting, the SV initial value of the first step, or SV initial value when skip into ramp step.

  PU：The ramp / soak steps will start from current PV value.

  SU：The ramp / soak steps will start from current SV value.

- rEtn：Auto return to PV/SV; Display will automatically returned to PV/SV main menu when any button doesn't be pressed in a defined time interval. Time interval can be in oFF、10、20、30、40、50、60 (Default 30 sec return to PV/SV automatically，Unit：second)

- HbL ：HBA alarm latch; Setting HBA alarm latch in enable (on) or disable (oFF).

  When latch mode is on, HBA alarm will be latched once triggered even the CT current is out of alarm region. If the user sets HbL in off, the HBA alarm output will be active only while the CT current within the alarm region. (default：oFF).

- FACt：Reset to factory value. This function can retrieve factory default value.

  Caution：in the menu SEtUP oUt1, oUt2, SUb1, SUb2

  in the menu SCAL, rSP, Ct SCH, SCL, SCH, , SCL,

  These parameters will not be changed even user reset to factory value

- E.U-H : MV high limit, set the maximum MV for PID algorithm.

- E.U-L : MV low limit, set the minimum MV for PID algorithm.

- E.Urt : Set the MV acceleration / deceleration rate, limit the maximum vary rate each 0.5 sec in PID MV calculation. This limitation is effective for heating process only." There is no limitation while setting is "0".If user likes to have same limitation on Cooler MV, extra setting of C-RT is needed.

- C-rt : Open / Close the MV acceleration / deceleration rate on Cooler

  Set on : Cooler MV rate will follow the MVRT

  Set oFF : Cooler MV will not be limited by MVRT

R、COMM. Parameter Table

Code	Parameter	Description	Range	Default
Id	ID	Address Identification	1~255	1
bPS.	BPS.	Baud rate	Describe below	9600
Styl	Style	Transmitting Style	Describe below	8n1
Fort.	Format	Transmitting Format	HEX./ASC..	Hex
tout	Time Out	Time out limit	100～9999	100
3.rt	Allow Write	Communication Write allowable	on/oFF	on
S.U.		Allow write SV into Eeprom by communication	on/oFF	on

Note: ▭ Parameters in gray background will present only on profiler model.

COMM. parameter table is operated for communication. Press MOD button seven times (eight times for profiler model), then user can access into the COMM menu, where the functions below are

- Id ：Identify the communication address of control unit
- bPS. ：Selection for communication Baud Rate
  - 600 ：Baud rate 600
  - 1200 ：Baud rate 1200
  - 2400 ：Baud rate 2400
  - 4800 ：Baud rate 4800
  - 9600 ：Baud rate 9600
  - 192- ：Baud rate 19200
  - 384- ：Baud rate 38400
- Styl ：Selection for communication style
  - 8n1 ：None parity check, one stop bit
  - 8n2 ：None parity check, two stops bits
  - 8o1 ：Odd check, one stop bit
  - 8E1 ：Even check, one stop bit
- Fort. ：Selection for communication format
  - HEX. ：Hex mode
  - ASC. ：ASCII mode
- tout ：Time out; the allowable time to wait for receiving data. If out of waiting time to receive data, the controller will clear the data in buffer and restart to be ready for next data sequence. Factory default setting : 100 ms.
- 3.rt : Allow writing, setting parameters writing via communication (ON/OFF)
- S.U. : Enable/disable the SV writing to EEPROM via communication. In general, EEPROM can read/write over 1,000,000 times. User can set COMM.->S.U. setting to oFF, to prevent damage caused by writing time over specification.

S. LoCK Parameter Table

Code	Parameter	Description	Range	Default
LAbE	LABEL	Menu lock	Lb00~Lb04	Lb00
P53d	PassWord	Password protection	0~99	0

Note: ▭ Gray Background will be active only for profiler model, for non profiler model, LABE only support LB00~LB03.

LoCK Parameter table is designed for menu setting protection and security purpose. "LAbE "setting provide various display combination of main menu, to avoid the possibility to mistake setting. Besides, the "P53d" allows user menu under password protection. Press the "MOD" button eight times (night times for profiler model), entering into COMM main menu, and the submenu are listed as below.

➢ LAbE：Lock mode selection, display/hide menu as tabulated.

★Non Profiler Model

	Lb00	Lb01	Lb02	Lb03
PW/SU	●	●	●	●
LU-1	●	●	●	
LU-2	●	●		
ALE.	●	●		
SEUP	●			
EXPA	●			
CoE.E.	●			
LoCK	●	●	●	●
CAL1	●			
E.AnU	●	●	●	●

★Profiler Model

	Lb00	Lb01	Lb02	Lb03	Lb04
PW/SU	●	●	●	●	●
LU-0	●	●		●	
LU-1	●	●	●		
LU-2	●	●	●		
PPo9	●	●		●	
ALE.	●	●	●		
SEUP	●				
EXPA	●				
CoE.E.	●				
LoCK	●	●	●	●	●
CAL1	●				
E.AnU	●	●	●	●	●

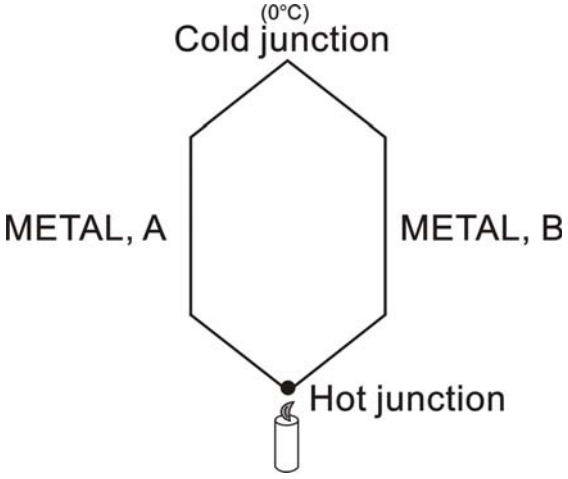
CALI：Calibration MANU：Manual operation

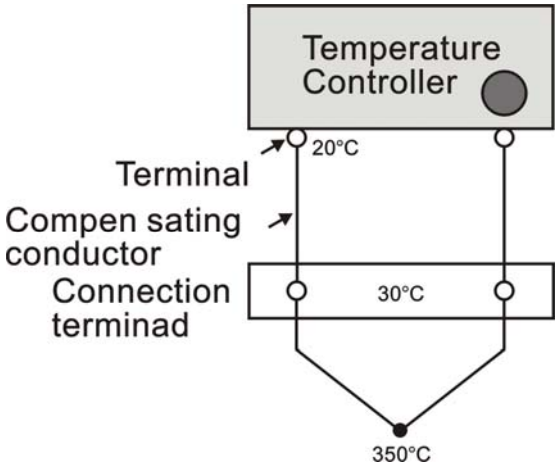
➢ P53d：Password protection, can set 0~99 value. The value of "0" indicates no protection. If the user set the password protection, each times presses "MOD" to enter submenu, it will firstly ask for correct password. If user lost password, user can press the "MOD" key frequently while in the submenu that is asking for password, until the lower row become "YES.", then press the "UP" key to make "YES." blinking, eventually press "MOD" to switch main menu.

Appendix：Calibration & Extra Features

In calibration, the PT-83 series support all the calibration function for analog signal. Likes:

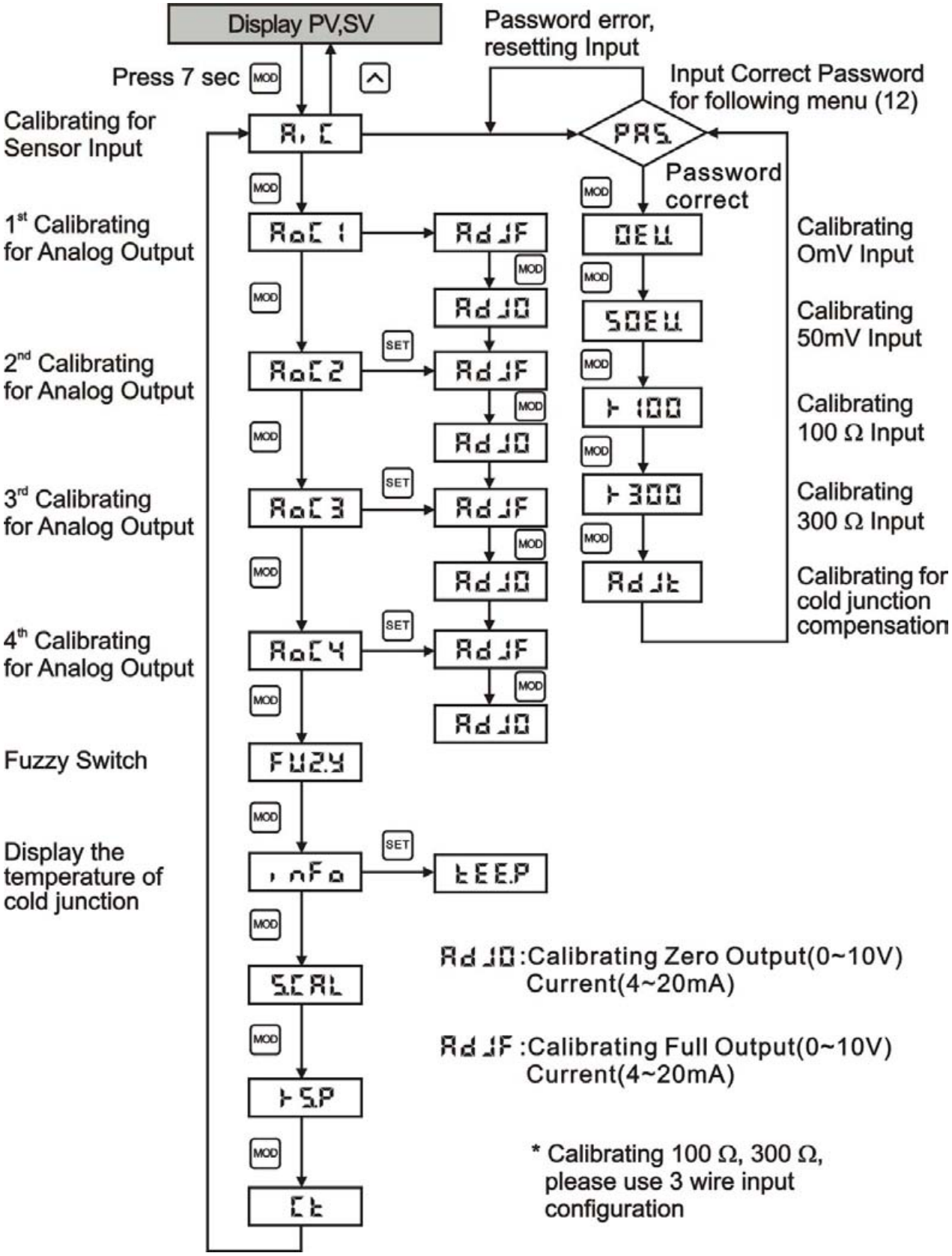
- A , C Support Thermocouple / RTD /mV input calibration
- AoC 1 Support OUT1 analog output calibration on zero & span.
- AoC 2 Support OUT2 analog output calibration on zero & span.
- AoC 3 Support SUB1 analog output calibration on zero & span.
- AoC 4 Support SUB2 analog output calibration on zero & span.
- FU2.Y Support the compensation switch of Fuzzy, user can turn on / off this function to enhance the response and robustness if needs.
- , nFo Support cold junction reference information.
  The measurement theory of thermocouple is base on the temperature difference between the measuring object and the reference point. The real object's temperature is the temperature difference plus the reference (cold junction) temperature.





- S.CAL Support the scale transformation of standard analog input (0-20mA DC, 0-10VDC). Detail please refer S.CAL parameter table.
- rSP Support the calibration between rSP function and standard analog input (0-20mA DC, 0-10VDC). Detail please refer RSP parameter table.
- Ct External CT & CT module calibration. Details please refer Ct parameter table.

Appendix-1 Calibration Flow Chart



Appendix-2 CAL, Parameter Table

Code	Parameter	Description	Range	Default
A, C	Analog input calibrate	Analog calibrate for sensor input		
AoC 1	Analog output 1 calibrate	Analog output 1 calibrate		
AoC 2	Analog output 2 calibrate	Analog output 2 calibrate		
AoC 3	Analog output 3 calibrate	Analog output 3 calibrate		
AoC 4	Analog output 4 calibrate	Analog output 4 calibrate		
FUZ.Y	Fuzzy Switch	Switch On / Off Fuzzy function	on/oFF	on
, nFo	TEMP121 information	Display the temperature detected by built-in IC		
S.CAL	Analog SCAL calibrate	Calibration for analog scale		
r S.P	RSP calibrate	Remote set point setting		
Ct	CT calibrate	Calibration for CT module		

Caution: It should be careful to operate the setting of "CAL, " to avoid the malfunction on PT -83 controller

CAL, calibration can be performed for individual input / output. Press the "MOD" button and hold at least 7 sec under SV/ PV mode to access CALI menu. To return back SV / PV from calibration mode, press  at east twice.

- A, C : Sensor Input Calibration; After calibration, voltage(-10~230mV) and resistance(0~500Ω) can be measured accurately.

  Sub-menu：

  1、PAS. ：Input correct password to enter.(password：12)
  2、0E.U. ：Calibrate 0mv input.
  3、50E.U.：Calibrate 50mV input.
  4、r 100：Calibrate 100Ω input. (be sure to use 3-wire connection)
  5、r 300：Calibrate 300Ω input. (be sure to use 3-wire connection)
  6、Adjt： Cold Junction Compensation calibration.
  (Please see Example 1 for detail)

- AoC 1：Analog Output Calibration; Calibration will be performed for individual analog output to get accurate span & zero adjustment.

  Sub-menu selection：

  1.AdjF ：Calibrate span voltage output(0~10v), current(4~20mA)
  2.Adj0 ：Calibrate zero voltage output(0~10v), current(4~20mA)
  (Please see Example 2 for detail)

- FUZY：Fuzzy Switch; Determins if Fuzzy compensation is active or not for PID control. (Default Value：ON)
- inFo：Temperature Indication; To indicate reference point(cold junction) temperature by built-in IC sensor. Only thermocouple measurement need this information.
  PV = Temperature difference measure from T/C + reference point temperature

Example 1：Calibrate Sensor input

Steps：

1. Connect calibrator to controller’s sensor input
2. Press and hold [MOD] for7 seconds to access Cali menu
3. Select A, C
4. Adjust A, C →PAS. = 12, then press [SET]
5. Set calibrator output to 0mV
6. Press [SET] to enter A, C →0E.U. edit mode. Press [^] until value is stable, then press [SET] to confirm.
7. Set calibrator output to 50mV
8. Press [SET] to enter A, C →50E.U. edit mode. Press [^] until value is stable, then press [SET] to confirm.
9. Set calibrator output to 100Ω
10. Press [SET] to enter A, C →100 edit mode. Press [^] until value is stable, then press [SET] to confirm.
    Note：(Please follow RTD three-wires connecting instruction when calibrating)
11. Set calibrator output to 300Ω
12. Press [SET] to enter A, C →300 edit mode. Press [^] until value is stable, then press [SET] to confirm.
    Note：(Please follow RTD three-wires connecting instruction when calibrating)
13. Press [SET] to enter A, C →Adjt to adjust temperature deviation at reference point.
    Note：(Check present temperature by , inFo →tEE.P, suggest calibrate CJC after warm-up 30 mins.)
14. Calibration complete.
15. Press [^] at least twice to return PV/SV menu.

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

Setup：

1、 Connect calibrator measure terminal with controller’s analog output
2、 Press and hold [MOD] for 7 seconds to access Cali menu
3、 Select AoC 1
4、 Press [SET] to enter AoC 1→Adj F edit mode. Observe calibrator voltage measurement, then press [v]、[^] to get 10.00v. Press [SET] to confirm.
5、 Press [SET] to enter AoC 1→Adj 0 Adj0 edit mode. Observe calibrator voltage measurement, then press [v]、[^] to get 0.00v. Press [SET] to confirm.
6、 Setup complete.
7、 Press [^] at least twice to return PV/SV menu.

AOC1 is for OUT1 setting
AOC2 is for OUT2 setting
AOC3 is for SUB1 setting
ACO4 is for SUB2 setting

Appendix-3 SCAL Parameter Table

Code	Parameter	Description	Range	Default
SCH	Scale Hi	Scale Hi	-1999 ~ 9999	100.0
SCL	Scale Lo	Scale Lo	-1999 ~ 9999	0.0
SEnS	Sensor input to ADC result	ADC Voltage Indication		
SCH,	Sensor Hi	Set Span voltage	-1.999 ~ 9.999	0.250
SCL,	Sensor Lo	Set Zero voltage	-1.999 ~ 9.999	0.100
SCEn	Scale Enable	Enable/Disable the scale transformation	oFF/on	oFF

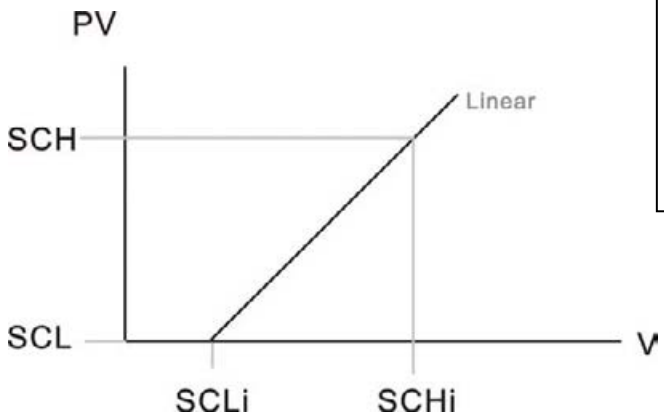
If input is analog signal likes 4-20mA DC or 0-10V DC, corresponding transformation should be set to display physical meaning. The configure steps can refer to example 2 below. Here the retransmission of PV function's high and low limit will also operate according to SCAL->SCH, SCAL->SCL parameters.

- SCH : Set the high limit in transformation. This value is the PV at maximum input voltage (span voltage).
- SCL : Set the low limit in transformation. This value is the PV at minimum input voltage (zero voltage).
  SCH, SCL both are the retransmission PV high/low limitation respectively; use for t-PV(Transfer PV) output application. Details please refer to example 1.
- SEnS : Display actual result of AD converter.
  Provide the information needed in SCH, ,SCL,
- SCH, : Set the actual AD result while input span voltage
- SCL, : Set the actual AD result while input zero voltage
- SCEn : Scale transformation enable (On) / disable (Off) switch, transfer the input voltage into the physical value that will be indicated on PV.

Ex: 1 Transmission 0-10V DC output correspond to PV 0-100 for SUB2 terminal.

Steps：

1. Under main menu, set SETUP→SUb2 = t-PU
2. In calibration mode, set SCAL→SCH = 100.0
3. In calibration mode, set SCAL→SCL = 0.0
4. Completed。



Ex: 2 Transfer the input 0-10mv to 0-200 PV.

Steps：

1. Connect the 0-10mV DC to sensor input terminal on controller
2. Set SCAL→SCH = 200.0
3. Set SCAL→SCL = 0.0
4. Input 0mv value and observe SCAL→SEnS indication, then write the reading value into SCAL→SCL,
5. Input 10mv value and observe SCAL→SEnS indication, then write the reading value into SCAL→SCH,
6. Set SCAL→SCEn = on
7. Return back to PV/SV main menu, then input 0mV to check if PV=0, and then input 10mV again, and check if PV=200 or not.
8. Completed

Appendix-4 r SP Parameter Table

Code	Parameter	Description	Range	Default
SCH	Scale Hi	Maximum RSP for SV	-1999 ~ 9999	10.0
SCL	Scale Lo	Minimum RSP for SV	-1999 ~ 9999	0.0
Rd	AD Voltage	Display ADC voltage		
SCH,	Input Hi	Maximum input voltage	-1.999 ~ 9.999	2.264
SCL,	Input Lo	Minimum input voltage	-1.999 ~ 9.999	0.072

Note：LU-2 →r-L must be turned on in order to make RSP function effective (Remote-Local=ON).

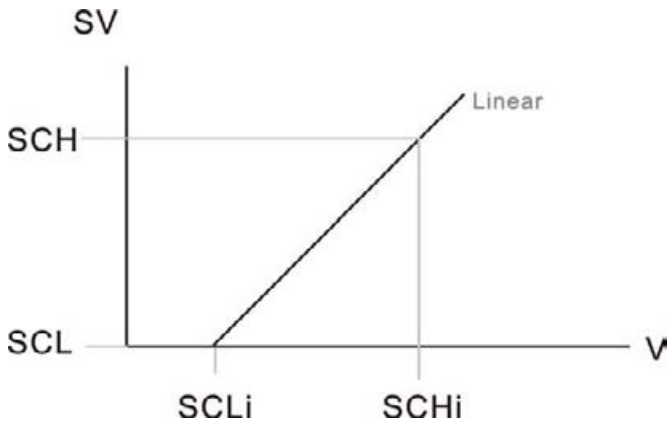
To set the SV on controller remotely, it can conduct by external analog signal 4-20mA DC, 0-10V DC with the RSP module. In this parameter table, user can arrange the corresponding range of SV from external analog input signal.

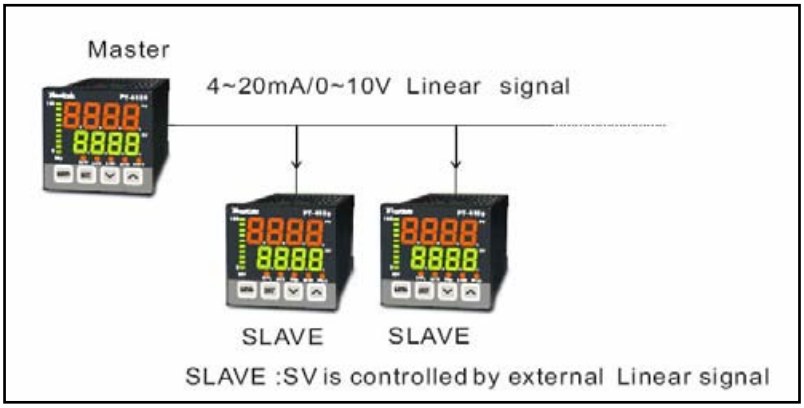
- SCH ：Maximum SV setting correspond to maximum external analog signal (span voltage)
- SCL ：Minimum SV setting correspond to minimum external analog signal (zero voltage)
- Rd ：Display the RSP module actual Ad voltage, this information is generally used for calibrating the maximum / minimum RSP voltage SCH, 、SCL,
- SCH, ：Set the AD voltage result for RSP span voltage
- SCL, ：Set the AD voltage result for RSP zero voltage

Ex.：Input 0~10vdc in AUX1 to remote setting SV in range of 0-100

Steps：

1. Connect 0-10VDC output to PT8 AUX1 terminal (RSP 0-10Vdc signal)
2. Select r SP under SEUP →AUX1 in main menu.
3. Set r SP →SCH = 100.0 in Cali menu
4、Set r SP →SCL = 0.0 in Cali menu
5、Input 0V to observe r SP →Rd. Input the reading into r SP →SCL,
6、Input 10v to observe r SP →Rd. Input reading into r SP →SCH,
7、Select LU-2→r-L = ON in main menu
8、Back to PV/SV main menu
   Input 0v, check if SV = 0.0
   Input 10v, check if SV = 100.0
9、Complete setup





Appendix-5 CT Parameter Table

Code	Parameter	Description	Range	Default
SCH	Scale Hi	Maximum CT	-1999 ~ 9999	35.0
SCL	Scale Lo	Minimum CT	-1999 ~ 9999	0.0
Ad	AD Voltage	Display Ad voltage		
SCH,	Input Hi	Maximum input voltage	-1.999 ~ 9.999	2.5
SCL,	input Lo	Minimum input voltage	-1.999 ~ 9.999	0.1

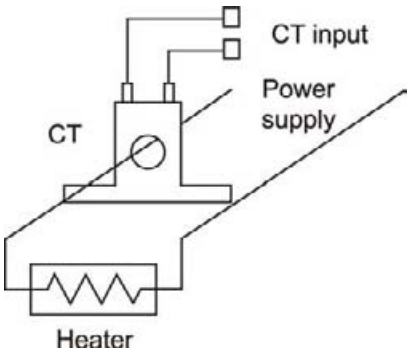
Note：Maximum allowable CT current input is under 30mA

- SCH ：Maximum CT current correspond to span voltage input
- SCL ：Minimum CT current correspond to zero voltage input
- Ad ：Display the CT module actual Ad voltage, this information is generally used for calibrating the maximum / minimum CT voltage SCH, 、SCL,
- SCH, ：Set the AD voltage result for CT span voltage
- SCL, ：Set the AD voltage result for CT zero voltage

Ex.：Use CT module on AUX1 terminal, and set SUB1 as the alarm output for detection the heater break.

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

1、 Connect CT transformer on AUX1 terminal。
2、 Select CT under SETUP→AUX1 in main menu.
3、 Select HbA under SETUP→SUb1 in main menu.
4、 Check if the AD voltage exceeds 0.100v when heater is on under CT→Ad menu. If Ad voltage exceeds 0.100v, it indicates the transformer work successful.
5、 Under main menu, LU-1→CT ，check the indication value while heater shutdown (here we mark this value as CT1), and the indication value while heater is active (CT2)
6、 Under main menu LU-1→Hb , select appropriate value in the range of (CT1 < Hb < CT2), generally set about 70% of CT2.
7、 Completed.



Ex.：Calibrate CT transformer：

Transformer input 5A in a ratio of 1000:1

1. Set CT→SCH = 5.0 under cali menu
2. Set CT→SCL = 0.0 under cali menu
3. Input 0A to observe CT→Ad display，input the reading into CT→SCL,
4. Input 5A to observe CT→Ad ，input the reading into CT→SCH,
5. Complete setup.

Caution: It should be carefully to adopt appropriate wire which can sustain high current to avoid damage caused from fusing.

Appendix-6 E.AnU Parameter Table

Code	Parameter	Description	Range	Default
E.AnU	Manual operation	Display current PV value	-1999~9999	
HEAt	Heater MV	Control heater outputting manipulate value	0.0~100.0	0
Cool	Cooler MV	Control cooler outputting manipulate value	0.0~100.0	0

E.AnU parameter table is designed for manual operation. It can set the MV for heater / cooler, individually. Under the standard operation mode, press and hold MOD + ^ five seconds to access into manual operation mode, and press and hold MOD + ^ five seconds to return back to standard operation mode.

- E.AnU : Display current PV value
- HEAt : Control heater outputting manipulate value from 0.0 to 100.0%
- Cool : Control cooler outputting manipulate value 0.0 to 100.0%

Appendix-7 **Ordering Code**

PT-83□□-S□-□□□□-(□□□□)-(P)

Dimension	20---48x48 31---48x96 30---96x48 40---72x72 50---96x96	
Input Signal	0---T/C & PT & 0~230mV 1---4~20mA 2---0~10VDC	
OUT/SUB select	0---None 3---0~10VDC Output 1---5A RELAY 4---Voltage pulse output (12Vdc) 2---4~20mA DC 5---0~5VDC 6---0~20mA DC	OUT1 OUT2 SUB1 SUB2
Optional	0---RS485 5---Isolated RS 485 1---CT 2---RSP(0~10V) 3---RSP(0~20mA) 48x48, 96x96 is available for AUX 1 only 4---Event 72x72 is available for AUX 1, AUX 2, AUX 3 only	AUX1
	1---CT 2---RSP(0~10V) 3---RSP(0~20mA) 4---Event	AUX2 AUX3 AUX4
	P---Profiler(Ramp/Soak)	