Temperature Controller
PT-76 Series
Operation Instruction

FineTek Co., Ltd
No.16, Tzuchiang St., Tucheng Industrial Park, Taipei Hsien, Taiwan.
TEL：886-2-22696789 FAX：886-2-22686682
E-mail: info@fine-tek.com http://www.fine-tek.com

08-PT76XX-B0-EK, 07/08/2010

Warning

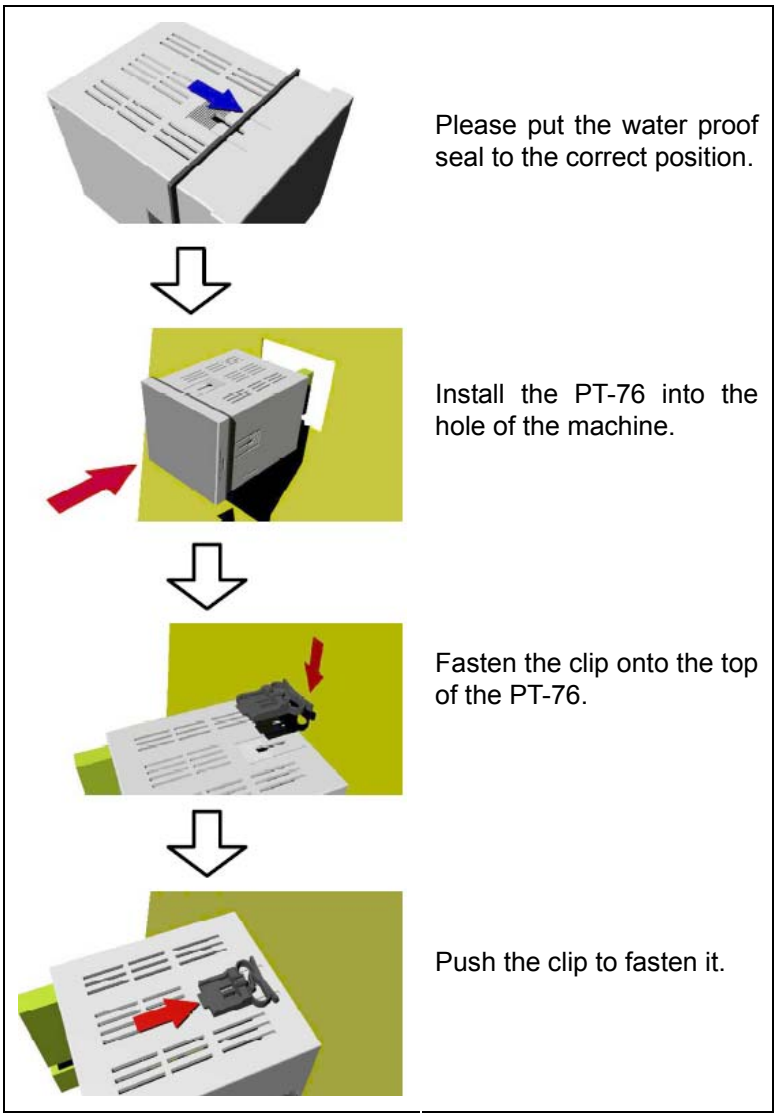
- **Before wiring, please make sure the power is shut down.**
- **After turning on the power, please do not touch the terminal pins.**
- **Please make sure the terminal pins for communication、linear output & pulse output with AC power are connected correctly.**
- **Please do not dismiss, repair or modify the products and components without consulting the factory first.**
- **If the product is damaged during transportation, please do not connect to the power.**
- **Do not install or operate PT-76 in the environment where it contains explosive materials and gas.**
- **Please operate PT-76 under specified voltage.**

General Information:

1. Make sure the product received is correct before opening.
2. Please read the user manual before using it.
3. Try to avoid any direct impact and vibration.
4. Please tighten the screw properly.
5. Please use alcohol to clean PT-76 ; do not use varnish or organic detergent to clean.

Installation：

1. Do not install PT-76 in the environment containing ice, heavy dust and corrosive gas, especially H_2SO_4 and Ammonia place.
2. Do not install PT-76 nearby the equipments that generates high frequency interference or surge, such as high frequency solder machine & cutting machine.
3. Do not install PT-76 in the environment with spraying water & paint.
4. Do not install PT-76 in the environment where the temperature is unstable.
5. Do not install the product near the heating source.
6. Please mount the product horizontally.
7. Please see installation demonstration in the right.



Note for Wiring:

1. There should have a safety distance between High voltage / current and input/output.
2. Do not connect PT-76 with devices like motor、converter、battery and electrical elements etc.
3. If there are many large power supplies or electrical power line around the temperature controller, please add a receiver or noise filter on the input power side to avoid outside signal affecting our system.
4. The surrounding temperature must be lower than 55°C..
5. Please do not put heavy articles on the product.

Content

1. Introduction

According to the dimension of the PT-76 series, there are several models available for selection: PT-7610(W*H 48*24mm)、PT-7620(H*W 48*48mm) 、PT-7630(H*W 96*48mm)、PT-7631(H*W 48*96mm)、PT-7640(H*W 72*72mm)、PT-7650(H*W 96*96mm).

PT-76 series uses a 14 bit analog-digital high resolution converter for signal measurement to enhance the accuracy of measuring signal continuously by sampling it every 250 ms. The PT-76 series uses PID auto calculation for more accurate P.I.D value to enahnce adjusting the value manually.

Using PID+Fuzzy control enables the system to proceed fastly and stably in supporting different output signal control and different alarm model setting to satisfy all your needs.

Using popular communication interface of RS-485 compatible with ModBus (RTU、ASCII)communication helps the users to complete system integration when connecting to PC or PLC.

2. Features

- PID with Auto-Tuning Algorithm。
- Set value shifting with auto tuning.
- ON/OFF、PID+ Fuzzy temperature control.
- Heating、Cooling、Heating/Cooling system control .
- Digital Filter
- Variable Input signals: K、J、R、S、B、E、N、T、PT100、JPT100、DCV、DCI…。
- Variable control output：Relay Voltage Pulse, Linear Voltage, Linear Current.
- Variable Alarm Output。
- Support linear Voltage/current for retransmittion output function.
- Support MODBUS communication function
- Heater loop break alarm.
- Sensor Break Alarm.
- Memory Retention.
- Remote Setting Point.
- Manual Control Output.
- CE Certificate

3. Specification

Product name : PID+FUZZY Temperature Controller

Display : Upper- 4-digit red display with 7 segments
Lower- 4-digit green display with 7 segments

Setting method : Front panel display with 3 buttons

Universal input

Thermocouple : K, J, T, E, R, S, B, N

RTD : Pt100, JPt100, for 3-wire system
Allowable input resistance : 10Ω or less per wire

DC current : 0 - 20mA DC, 4 - 20mA DC, input impedance 5Ω

DC voltage : 0-50mV, 0 - 1V, 0 - 5V, 1 - 5V, 0 - 10V, 2 - 10V
Input impedance 47KΩ
Allowable input voltage < 20V DC

Accuracy

Thermocouple : Within ±0.3% of input full range ±1 digit
B type in 0-600℃(0-1200℉), Accurancy is not guaranteed
R, S type 0-500℃(0-1000℉), within ±8℃(14℉)
K, J, T, E, N, type less than 0℃,
within ±0.4% of input full range ±1 digit

RTD : Within ±0.2% of input full range ±1 digit

DC current : Within ±0.3% of input full range ±1 digit

DC voltage : Within ±0.3% of input full range ±1 digit

Cold Junction Compensation: < ±2℃ (±4℉)

Resolution : 14 bits

Input sample period : 4 / per second

Control output

Relay contact	：	SPST 3A / 250V AC
		SPDT 3A / 250V AC, 100,000 times life cycle
SSR drive	：	12V DC (Max:18V , Min :10V DC), Output current non-protected DC drive
Current	：	0-20mA DC, 4-20mA DC, load resistance max 600Ω
Voltage	：	0-10V DC, 2-10V DC, load resistance min 600Ω
		Short circuit protected for current and voltage drive
Output accuracy	：	Within ±0.5% of output span
Resolution	：	4096

Alarm output

Relay contact	：	SPST 3A / 250V AC , 100,000 times life cycle
Hysteresis	：	0 – 9999
Output delay	：	0 – 99 second
Position range	：	0 – 9999
Direction	：	Normal open (default) , or Normal close
Action	：	deviation high alarm, deviation low alarm, band alarm,,

process high alarm, process low alarm, control output 1, control output 2.

Extra Power supply	：	24V DC / 50mA for loop power product Control

Control action

PID control with auto-tuning

PI control, When derivative is set to 0

PD control, When integral is set to 0

P control, When derivative and integral are set to 0

ON / OFF control

Proportional band	：	0 - 9999
Integral time	：	0–9999 , When 0 are OFF
Derivative time	：	0 - 9999 , When 0 are OFF
proportional cycle	：	0.5 – 999.9 seconds

Note： Relay contact- Control cycle is recommended to be set > 15 seconds to enhance life time of Relay.
SSR drive- Control cycle is recommended to be set as 3 seconds to enhance temperature control.

Control mode： Heater or Cooler (default : Control out1 = Heater Control out2 = Cooler)

Serial communication

Cable length	：	Maximum 1,200 m, Cable resistance within 50Ω
Interface	：	Based on RS-485
Protocol	：	Modbus RTU and ASCⅡ
Address range	：	1 – 255
Baud rate	：	600, 1200, 2400, 4800, 9600, 19200 bps
Character format	：	8 bits
Parity	：	None, Even, odd
Stop bits	：	1, 2
Isolation	：	Safety isolation from inputs and outputs

Note： Three character times = 1.5ms at 19200, 3ms at 9600
6ms at 4800, 12ms at 2400, 24ms at 1200, 48ms at 600 bps.
The maximum number of words that can be read is 10.

Power supply ： 100 - 240 VAC 50 / 60 HZ ； 24V AC / DC 50/60HZ
Allowable voltage fluctuation range ： 100 - 240 VAC、 85 - 265 V AC
24V AC / DC、 20 - 36 AC / DC

Power consumption ： Approx. 7VA
Ambient temperature ： 0 ~ 50℃
Ambient temperature ： -20 ~ 60℃
Ambient humidity ： 20 - 85%RH, Non-condensation
Additional Features

- ◦ Setting value lock
- ◦ EEPROM
- ◦ Automatic cold junction temperature compensation for Thermocouple
- ◦ Indicator burnout of sensor
- ◦ Re-Transmitter PV / SV ◦

4. Standard Measuring Range

Thermocouple range available

Sensor type	Range min in ℃	Range min in ℃	Range min in ℉	Range min in ℉	Resolution
K (default)	-200	1370	-328	2498	1°
K.	-128.0	500.0	-199.9	932.0	0.1°
J	-200	1200	-328	2192	1°
J.	-128.0	500.0	-199.9	932.0	0.1°
T	-200	400	-328	752	1°
T.	-128.0	400.0	-199.9	752.0	0.1°
E	-200	800	-328	1472	1°
R	0	1760	32	3200	1°
S.	0	1760	32	3200	1°
B	0	1820	32	3308	1°
N	-200	1300	-328	2372	1°

RTD range available

Sensor type	Range min in ℃	Range min in ℃	Range min in ℉	Range min in ℉	Resolution
PT100	-200	850	-328	1562	1°
PT100.	-199.9	850.0	-199.9	999.9	0.1°
JPT100	-200	500	-328	932	1°
JPT100.	-199.9	500.0	-199.9	932.0	0.1°

DC linear range available

Type : 0-20 mA, 4-20 mA

: 0-50 mV, 0-1 V, 0-5 V, 1-5 V, 0-10 V, 2-10 V

Scale range : -1999 – 9999

Resolution : 1

Decimal point : 0 - 3

5. Ordering Information

PT-76□□-□□□□-□□-□

Dimension	10---48x24 31---48x96 20---48x48 40---72x72 30---96x48 50---96x96
Power Supply	S---100~240Vac, 50/60Hz T---20~36Vdc (Except 7610)
Output 1	**Control Output** / **Analog Retransmit** 0---None / 5---4~20mA DC Output 1---Relay Output / 6---0~10Vdc Output 2---4~20mA DC Output / 7---2~10Vdc Output 3---0~10Vdc Output / 8---0~5Vdc Output 4---Voltage pulse (12Vdc) for SSR drive / 9---1~5Vdc Output
Output 2	**Control Output** / **Analog Retransmit** 0---None / 5---4~20mA DC Output 1---Relay Output / 6---0~10Vdc Output 2---4~20mA DC Output / 7---2~10Vdc Output 3---0~10Vdc Output / 8---0~5Vdc Output 4---Voltage pulse (12Vdc) for SSR drive / 9---1~5Vdc Output ※PT-7610 only "0" for output 2
Alarm Output	0---None 2---2 Set 1---1 Set ※PT-7610/ 7620 is available for 1 relay
Communication	0---None 1---Isolation RS485
Auxiliary Power	0---None 1---24Vdc/50mA (Except 7610)
Appendix	C --- Termindal protector □ --- None (Except 7610/7650)

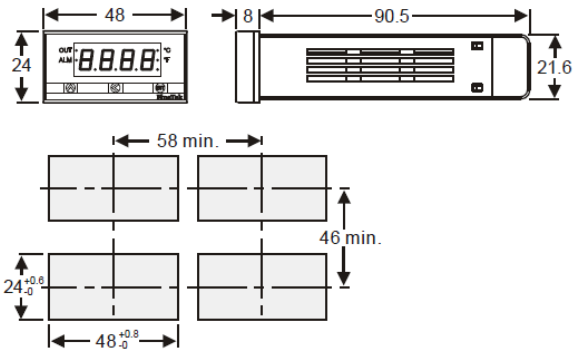
For Example:
PT-7620-S101-00
48x48mm, one relay output and one alarm output

⋆ Please call for customized specifications

6. Dimension/ Panel Cut Out

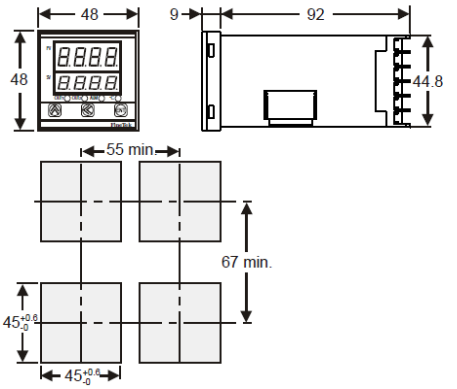
1、PT-7610

PT-7610 48mm(W)x24mm(H)x98.5mm(D)



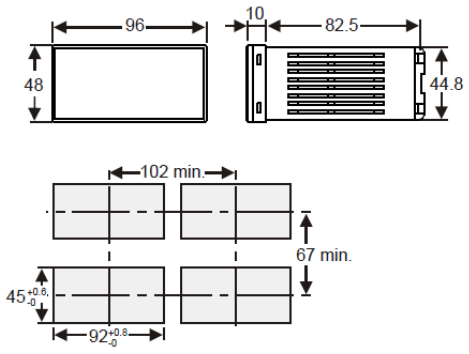
2、PT-7620

PT-7620 48mm(W)x48mm(H)x101mm(D)
(4LED)



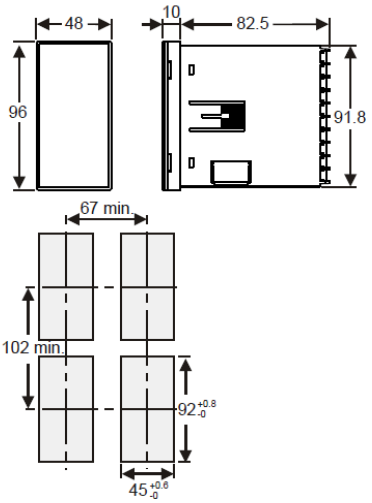
3、PT-7630

PT-7630 96mm(W)x48mm(H)x92.5mm(D)



4、PT-7631

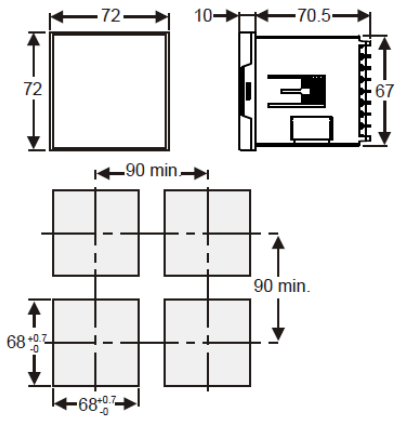
PT-7631 48mm(W)x96mm(H)x92.5mm(D)



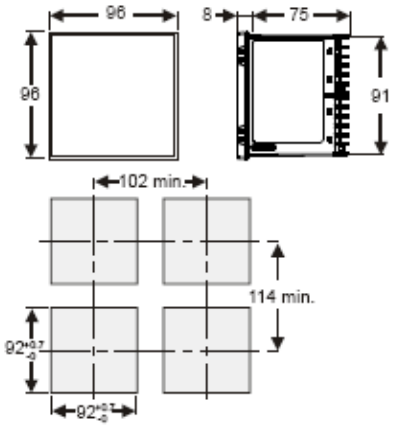
5、PT-7640

6、PT-7650

PT-7640 72mm(W)x72mm(H)x80.5mm(D)

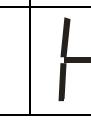
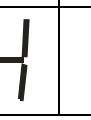
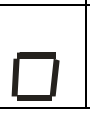
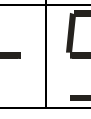
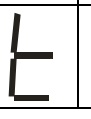
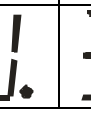
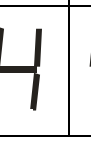


PT-7650 96mm(W)x96mm(H)x83mm(D)



7. Operation

7.1 Character Table

List of Parameters													
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				
													

7.2 Keypad Function

PT-76 series uses three buttons: Enter, Left, Up to operate all functions.

Before pressing any buttons,the temperature controller is in the mode of displaying the present value (PV) on the upper row and the set value(SV) on the lower row. Press ENT button to get into the operating mode.

Operating Mode consists of menu mode and setting mode and they function differently under different modes. Please see below for explanation:

	Menue	Setting
 LEFT	Enter	Shift
 ENTER	Switch	Confirm
 Up	Return	Increase

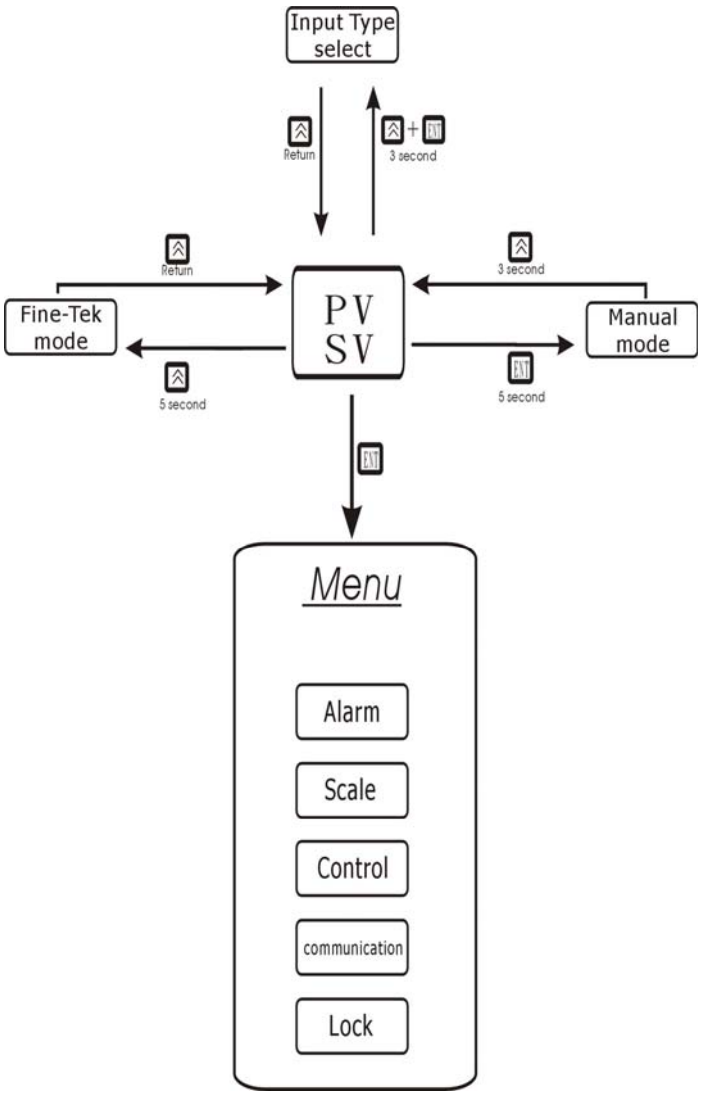
8. Menu Function Description

8.1 Parameters for Main Menu

Parameters for main menu	Name of Parameters for main menu	Description of Parameters
	PV Value SV Value	Present Value Setting Value
ALE.	ALM	Selection for Alarm Setting
SCAL	SCAL	Scale Setting
CtrL	CTRL	Control Setting
CoEE.	INP	Input signal Setting
LoCU	COMM	Communication Setting

In display mode, press ENT Button for circulating to other selection on menu.

Parameter Flowchart on Main Manu



9. Parameters for Alarm Setting

Parameter	Name of Parameters	Description of Parameters	Setting Range	Preset Value
S.oFt	Alarm Standby	Alarm Standby	OFF~2	OFF
PoS.1	Position 1	Alarm Relay Position 1	-1999～9999	0
HYS.1	Hysteresis 1	Alarm Relay Hysteresis 1	0000～9999	1
dY 1	Delay Time 1	Alarm Relay Delay time 1	0～99	0
d ir 1	Direction	Alarm Relay Direction 1	Hi/Lo	HI
S.tY 1	Style 1	Alarm Relay Style 1	Sty1～Sty10	Sty1
Pc5.2	Position 2	Alarm Relay Position 2	-1999～9999	0
HY5.2	Hysteresis 2	Alarm Relay Hysteresis 2	0000～9999	1
dY2	Delay Time 2	Alarm Relay Delay time 2	0～99	0
S.tY2	Style 2	Alarm Relay Style 2	Sty1～Sty10	Sty1
d ir2	Direction	Alarm Relay Direction 2	Hi/Lo	HI

- In the operating mode, press ENT Button once to enter into alarm menu for setting
- S.oFt： Alarm Standby – Alarm standby operation。

  OFF：No standby operation

  1：Standby operation at the time of a power-on

  2：Standby operation in the following case

  At the time of power on

  When each alarm's point is changed

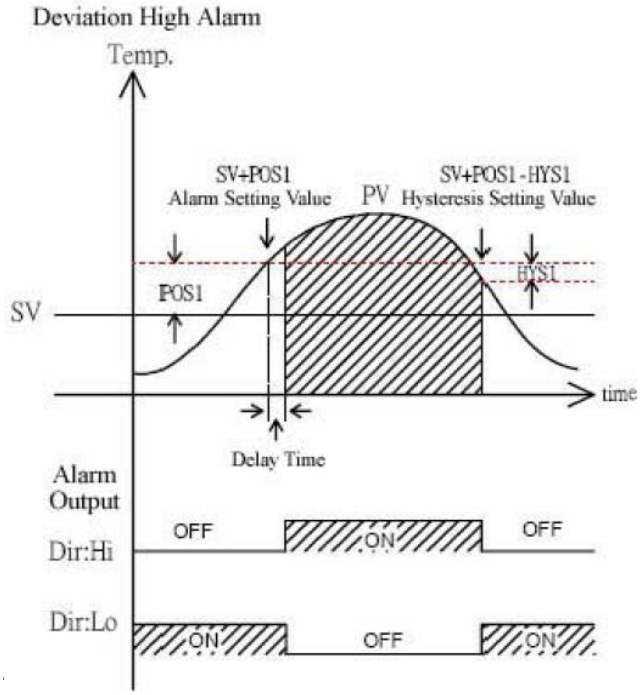
  When deviation alarm's SV is changed
- PoS.： Position – setting of position alarm relay.
- HYS.： Hysteresis – setting of hysteresis alarm relay.
- dY ： Delay - setting of delay alarm relay.
- d ir： Direction –setting direction.
- S.tY： Style - settingalarm style (referring to following alarm styles.

Alarm Styles

9.1 Deviation High Alarm

Alarm Output Switch On

When PV>=SV+POS1 is established, DY1 starts counting. When finish counting, alarm relay will be sent out.



Alarm Output Switch Off

When PV<SV+POS1-HYS1, alarm relay will be turned off.

Example：

PV= Present Value Output

SV= Set Value.

POS1= Alarm Relay Position 1

DY1= Delay Time.

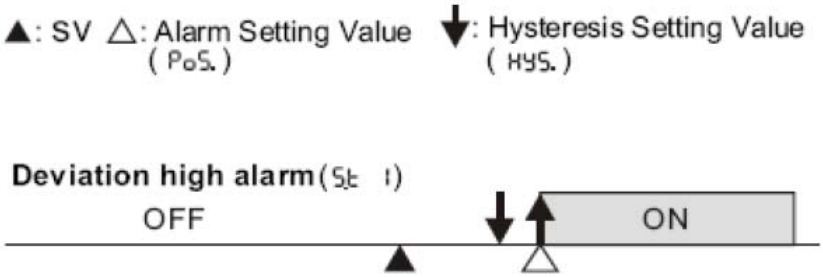
SV=60； POS1=10；

HYS1=5； DY1=5;

When PV>=70, DY1 starts counting.

When counting completes, alarm relay will be sent out.

When PV<65, alarm output stops



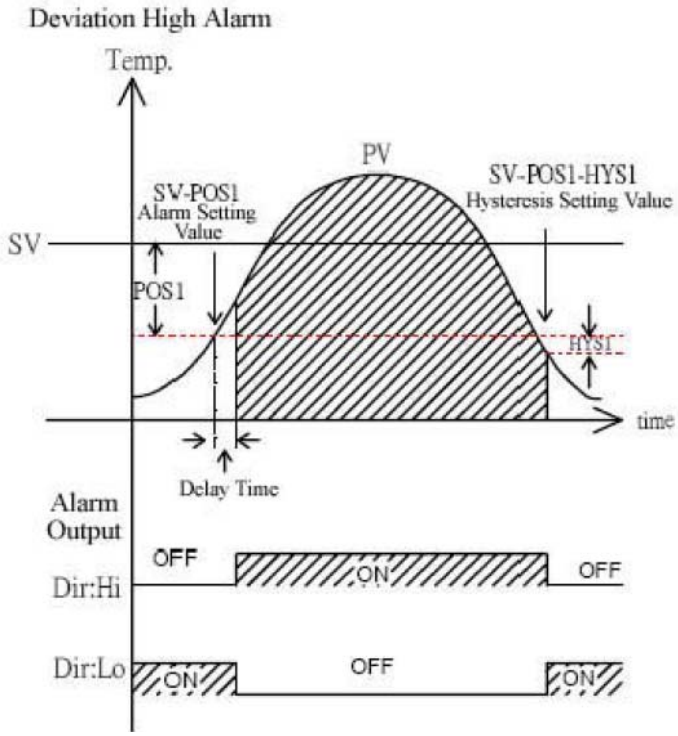
9.2 Deviation High Alarm

Alarm Output Switch On

When PV>=SV-POS1 is established, DY1 starts counting. When finish counting, alarm relay will be sent out.

Alarm Output Switch Off

When PV<=SV-POS1-HYS1, alarm relay will be turned off.



Example：

PV= Present Value Output

SV= Set Value.

POS1= Alarm Relay Position 1

DY1= Delay Time.

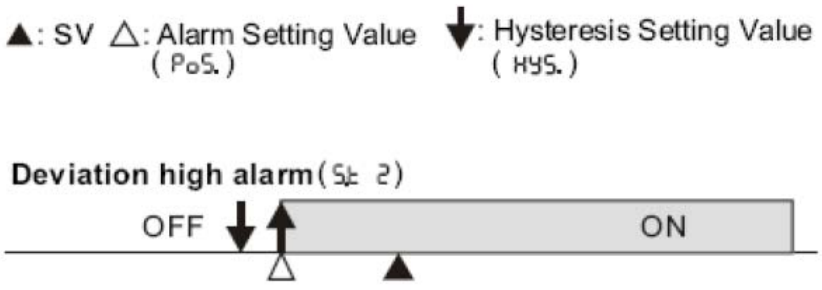
SV=60； POS1=10；

HYS1=5； DY1=5;

When PV>=50, DY1 starts counting.

When counting completes, alarm relay will be sent out..

When PV<45, alarm output stops



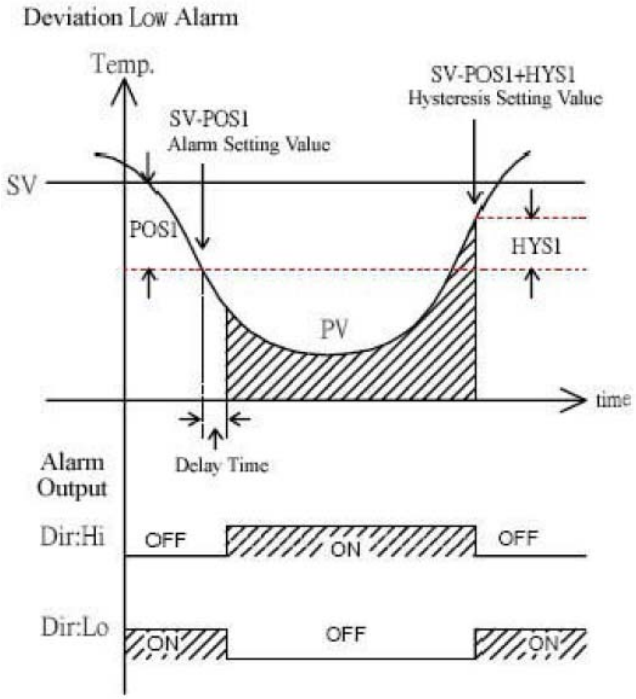
9.3 Deviation Low Alarm

Alarm Output Switch On

When PV<=SV-POS1 is established, DY1 starts counting. When finish counting, alarm relay will be sent out.

Alarm Output Switch Off

When PV>=SV-POS1+HYS1, alarm relay will be turned off.



Example：

PV= Present Value Output

SV= Set Value.

POS1= Alarm Relay Position 1

DY1= Delay Time.

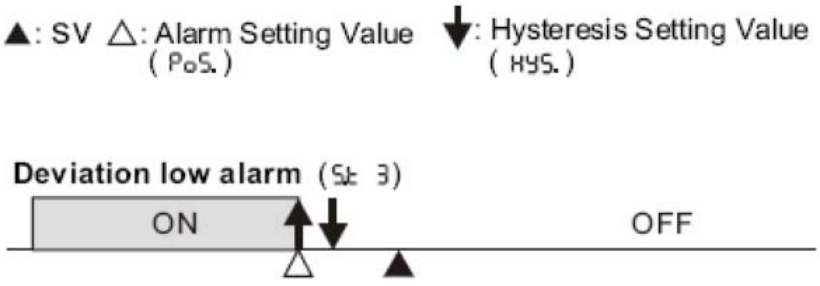
SV=60； POS1=10；

HYS1=5； DY1=5;

When PV<=50, DY1 starts counting.

When counting completes, alarm relay will be sent out..

When PV>=55, alarm output stops



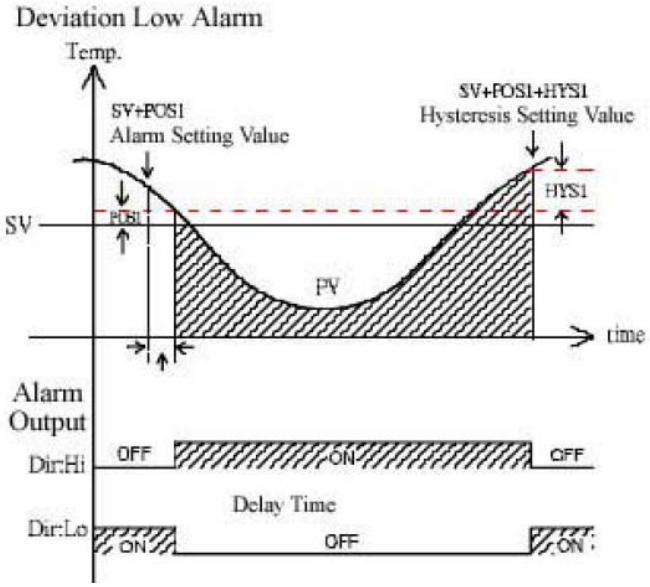
9.4 Deviation Low Alarm

Alarm Output Switch On

When PV<=SV+POS1 is established, DY1 starts counting. When finish counting, alarm relay will be sent out.

Alarm Output Switch Off

When PV>=SV+POS1+HYS1, alarm relay will be turned off.



Example：

PV= Present Value Output

SV= Set Value.

POS1= Alarm Relay Position 1

DY1= Delay Time.

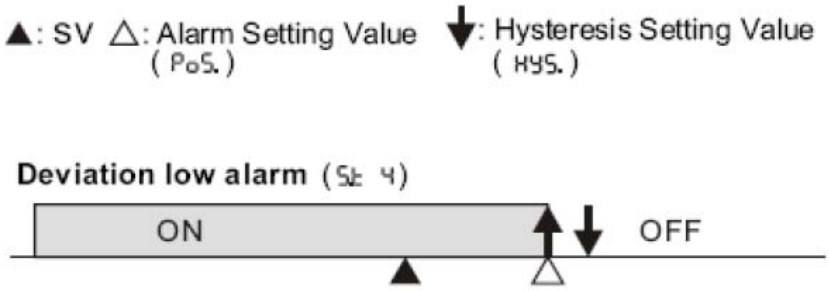
SV=60； POS1=10；

HYS1=5； DY1=5;

When PV<=70, DY1 starts counting.

When counting completes, alarm relay will be sent out..

When PV>=75, alarm output stops



9.5 Band Alarm 1

Alarm Output Switch On

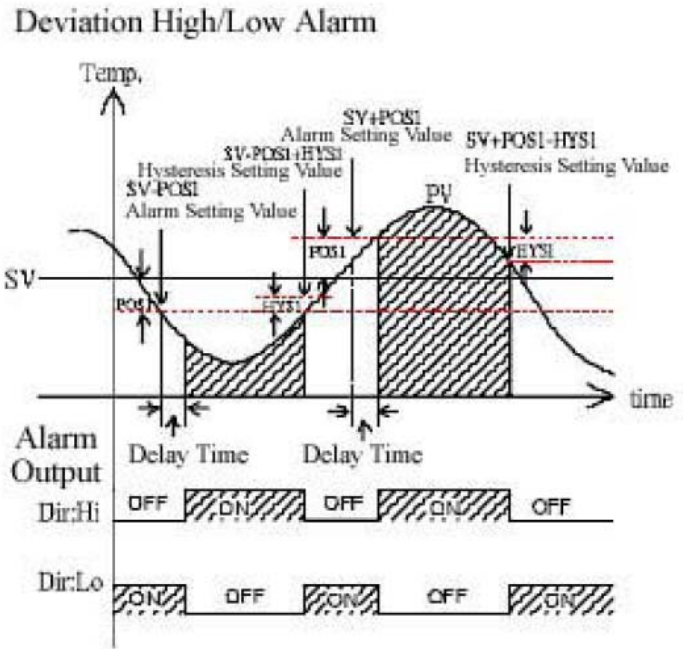
When PV<=SV-POS1or PV>=SV+POS1, DY1 starts counting. When finish counting, alarm relay will be sent out.

Alarm Output Switch Off

When PV>=SV-POS1+HYS1or

PV<=SV+POS1-HYS1

, alarm relay will be turned off.



Example：

PV= Present Value Output

SV= Set Value.

POS1= Alarm Relay Position 1

DY1= Delay Time.

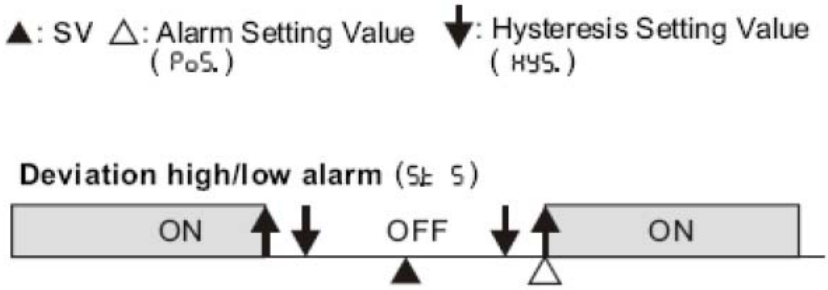
SV=60； POS1=10；

HYS1=5； DY1=5;

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

When counting completes, alarm relay will be sent out..

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



9.6 Band Alarm 2

Alarm Output Switch On

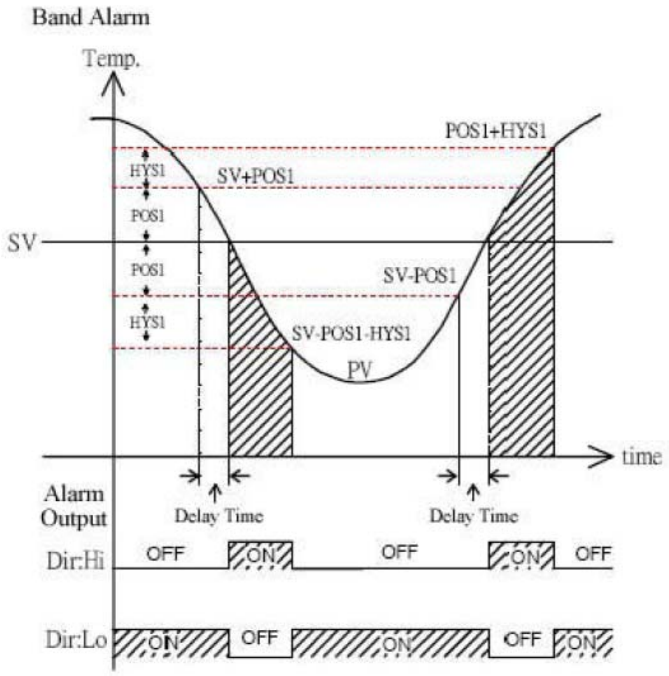
When PV>=SV-POS1or PV<=SV+POS1, DY1 starts counting. When finish counting, alarm relay will be sent out.

Alarm Output Switch Off

When PV<=SV-POS1-HYS1 or

PV>=SV+POS1+HYS1, alarm relay

will be turned off.



Example：

PV= Present Value Output

SV= Set Value.

POS1= Alarm Relay Position 1

DY1= Delay Time.

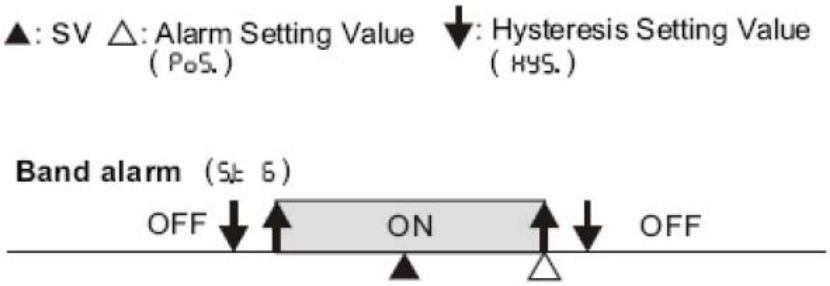
SV=60； POS1=10；

HYS1=5； DY1=5;

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

When counting completes, alarm relay will be sent out..

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



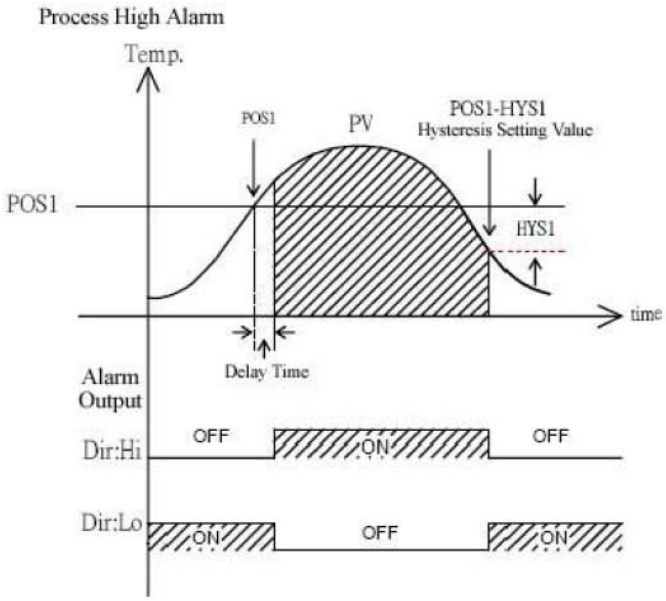
9.7 Process High Alarm

Alarm Output Switch On

When PV>=POS1, DY1 starts counting. When finish counting, alarm relay will be sent out.

Alarm Output Switch Off

When PV<=POS1-HYS1, alarm relay will be turned off.



Example：

PV= Present Value Output

SV= Set Value.

POS1= Alarm Relay Position 1

DY1= Delay Time.

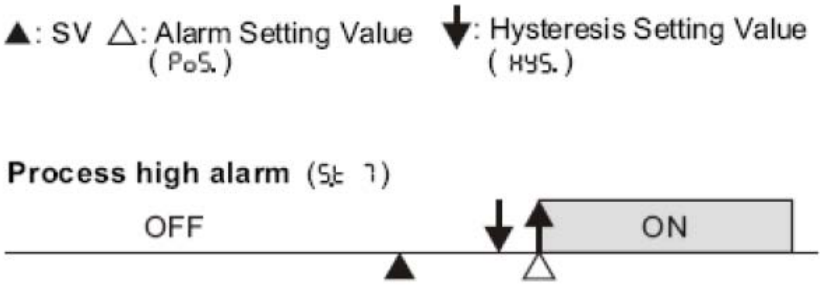
SV=60； POS1=10；

HYS1=5； DY1=5;

When PV>=60, DY1 starts counting.

When counting completes, alarm relay will be sent out..

When PV >=55, alarm output stops



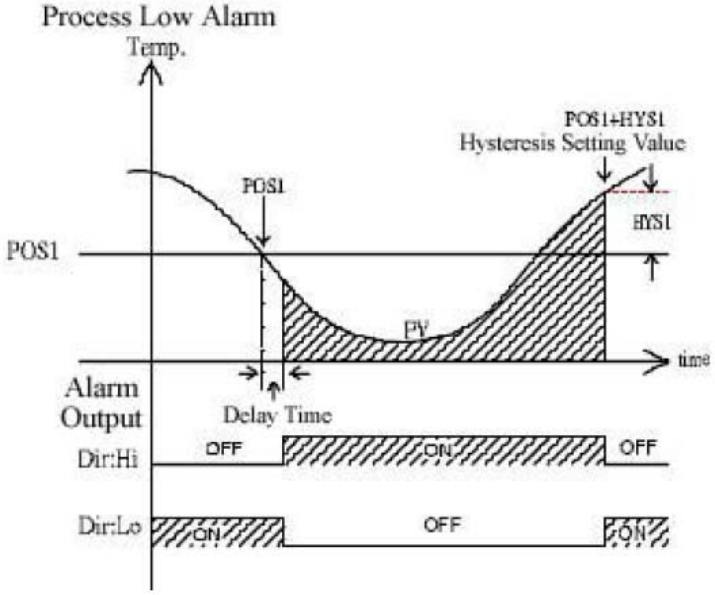
9.8 Process Low Alarm

Alarm Output Switch On

When PV<=POS1, DY1 starts counting. When finish counting, alarm relay will be sent out.

Alarm Output Switch Off

When PV>=POS1+HYS1, alarm relay will be turned off.



Example：

PV= Present Value Output

SV= Set Value.

POS1= Alarm Relay Position 1

DY1= Delay Time.

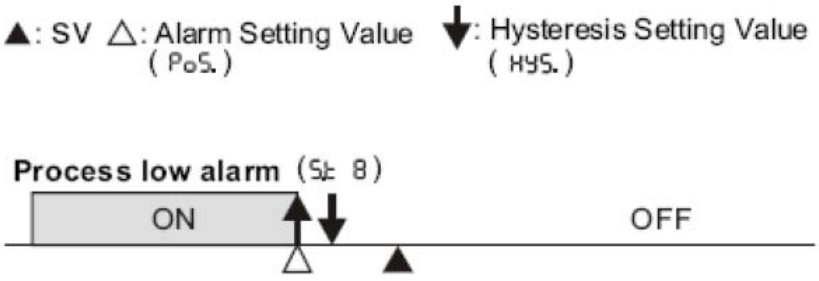
SV=60； POS1=10；

HYS1=5； DY1=5;

When PV<=60, DY1 starts counting.

When counting completes, alarm relay will be sent out..

When PV >=55, alarm output stops



9. 9 Control Output 1

9.10 Control Output 2

Note：When PV is in irregular condition, alarm will be triggered.

When PV shows [——] – broken sensor loop.

[∪ ∪ ∪ ∪] –Exceed maximum measuring range.

[∩ ∩ ∩ ∩] – Exceed minimum measuring range.

10. List of Parameters for Scale Setting

S.CAL parameter is designed to set up input/output linearity.

Display of Parameter	Name of Parameter	Description of Parameters	Setting Range	Preset Value
SU	Set Value	Temperature set value	-1999 ~ 9999	0
dot	Dot	Decimal point	0~ 3	0
S.CH	Scale Hi	Maximum PV value	-1999 ~ 9999	1000
S.CL	Scale Lo	Minimum PV value	-1999 ~ 9999	0
L.iE.H	Limit Hi	Maximum SV value	-1999 ~ 9999	9999
L.iE.L	Limit Lo	Minimum SV value	-1999 ~ 9999	-1999

- SU ：Set value：Temperature set value
- S.CH ： Maximum PV value：Maximum display value for analog input(Voltege,current).
- S.CL ： Minimum PV value：Minimum display value for analog input(Voltege,current).
- dot ： Decimal Point：Decimal point place for display value(Only for voltage and current input)。
- L.iE.H： Maximum SV value：Maximum value to set SV
- L.iE.L： Minimum SV value：Minimum value to set SV

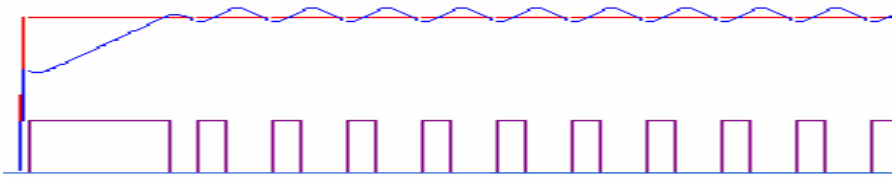
11. List of Parameters for CTRL Setting

CtrL is designed for the end-users to select ON/OFF control or PID control for the most suitable mode. PID control is applied with auto-turning calculation for a more accurate value. With built-in Fuzzy algorithm, it assures the stabilization for your system.

Display of Parameter	Name of Parameters	Description of Parameters	Setting Range	Preset Value
oPEr	Operation	Selection of operation mode	PID/ONOF	ONOF
tUn	Auto Tune	Auto tuning	ON/OFF	OFF
b.AS	Bias	PV compensation	-1999~9999	0
oFS.t	Auto Tune Offset	SV deviation setting for auto turning	-1999~9999	0
P	Proportional Gain	Proportional Parameter	0～9999	3
I	Integral Time	Integral Parameter	0～9999	200
d	Differential Time	Derivative Parameter	0～9999	20
E.rtE	Manual reset	Manual Reset	0.0～100.0	0.0
F.iLt	Filter	Software Filter	1~50	10
E.odE	Mode	Selection of Control	H-C/Cool	H-C
out1	Output	Control Output 1	Heat/Cool	Heat
out2	Output	Control Output 2	Heat/ Cool	Cool
d.ir1	Direction	Relay output direction 1	Hi/Lo	Hi
d.ir2	Direction	Relay output direction 2	Hi/Lo	Hi
CyC1	Cycle Time	Control output cycle time 1	0.5~999.9	15
CyC2	Cycle Time	Control output cycle time 2	0.5~999.9	15
HyS.1	Heater Hysteresis	Control output hystersesis 1	0～9999	1
HyS.2	Heater Hysteresis	Control output hysteresis 2	0～9999	1
FUy	Fuzzy	Fuzzy on/off	ON/OFF	ON
dbon	Dead band	Dead band control	ON/OFF	OFF
dEb1	Dead band of Heater	Dead band of heater	-1999~9999	0
dEb2	Dead band of Cooler	Dead band of cooler	-1999~9999	0
LbA	Loop Break Alarm	Heater loop break alarm(unit:second)	0~9999	0

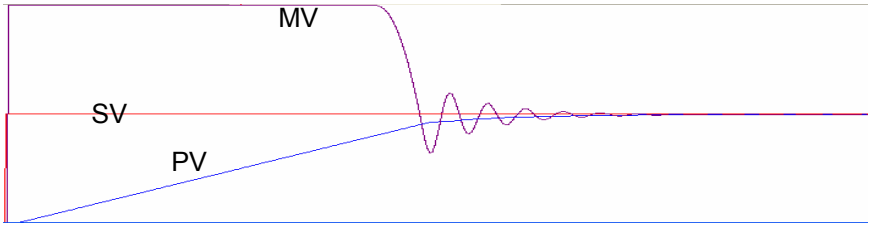
➢ oPEr： Operation Mode； ：ON-OFF/PID

OnOff Mode



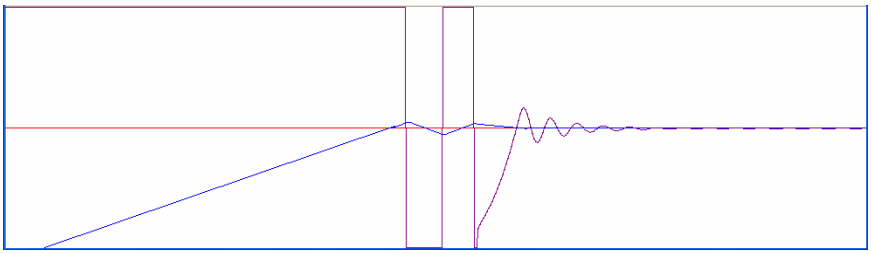
OnOff mode control is a very common and simple control mode. When the control output is programmed as the heating output and the temperature lower than setting value, control output start to activate; if the temperature is higher than setting value, control output deactivate in order to control the temperature. 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 week in order to control the PV value (Present Value) to be closer to SV value (Set Value) and also 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.

➢ tUn： If process auto tune algorithm； ：Turn on ：Turn off



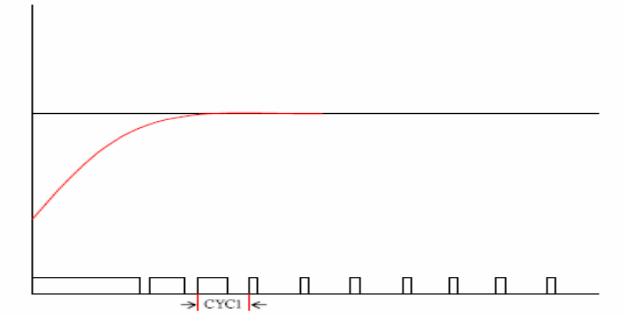
After turning on the auto tuning, the system is programmed for a full speed heating and cooling to oscillate two cycles and then calculate a set of parameters of P、I、D which are used in PID Algorithm control output to achieve the temperature in a certain value .

Adding the oFSt setting is to prevent the status of overheating due to auto tune algorithm resulting in overshooting in system.

➢ P ： Proportional Parameter. It is created by auto-tune calculatingautomatically or set manually. P is only valid in the proportional to the deviation of the system. Once the deviation is appeared, the proportional regulator is started to adjust the value to reduce the deviation. 。

- I : Integral Parameter. It is created by auto-tune calculating automatically or set manually. I is to learn from the past and erase the stable.
  deviation on the system. While the deviation is created, the integral regulator is programmed to adjust the value till erasing all the deviation.
- d : Derivative. It is calculated automatically with auto-tune or set manually. D is to handle the future by a reaction according to the change ratio of deviation on the system foresees the trend of deviation to erase the deviation by the derivative regulator before it is created.
- rSEt : Manual Reset.
  While the I Parameter = 0 and the PV>SV, then
  Output MV value＝MArE setting value.
- bIAS : Auto tune calculation for the SV deviation setting.
  After setting the parameter, the SV + oFSt value is programmed for auto tuning. Eg. When SV is set at 200°C , and OFST is set at -10°C, the formula of SV+OFST=200+(-10)=190°C is applied for auto tuning in order to prevent overheating and damage occurred during the algorithm operating.

- HYS.1 : Control Output Hysteresis 1
- HYS.2 : Control Output Hysteresis 2.
  For example of ONOFF control, when PV>SV, the control output should shut down immediately. When PV<SV, the control output should turn on immediately. During the fast reaction where the control output is shutting down and turning on constantly, setting HYS can mitigate the over reaction for ONOFF. HYS is set at PV>SV+HYS, control output is deactivated, while HYS is set at PV<SV-HYS, control output is activated.
- CYC1 : Control Cycle Time at PID mode for control output 1.
- CYC2 : Control Cycle Time at PID mode for control output 2
  When control output(relay) is non linear analog signal with 12V pulse control output, output signal has only two kinds: on and off. To enhance PID performance, we use time Proportional. For instance, cycle period= 5 seconds, PID = 30%, ，output(ON) 5*0.3=1.5seconds，output(OFF)=70% (5*0.7=3.5seconds)。
  The shorter the cycle time is, the faster the control output is.]



- dbon : Deadband Control.
- dEb1 : Deadband Parameter of Heater

➢ dEb2： Deadband Parameter of Cooler

When the control output is in heating mode；

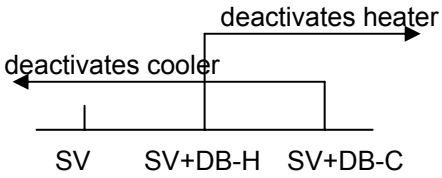
If PV>SV+DEB1, then deactivate heater.

When the control output is in cooling mode；if PV<SV+DB-C, then deactivate cooler.

DB-H>0；DB-C>0

Over SV+DB-H, deactivates heater

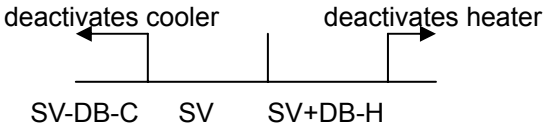
Under SV+DB-C, deactivates cooler



DB-H>0；DB-C<0

Over SV+DB-H, deactivates heater

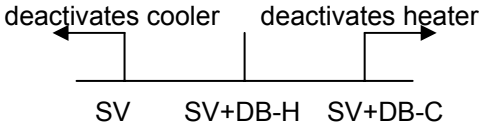
Under SV-DB-C, deactivates cooler



DB-H<0；DB-C<0

Over SV-DB-H, deactivates heater

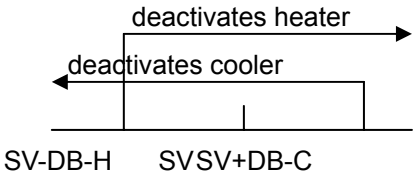
Under SV-DB-C, deactivates cooler



DB-H<0；DB-C>0

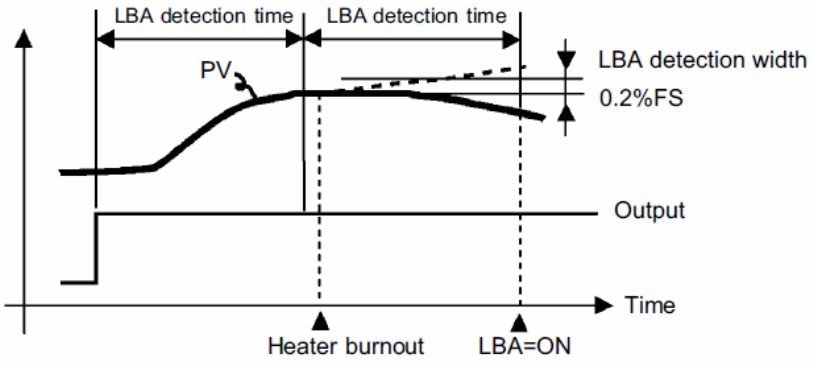
Over SV-DB-H, deactivates heater

Under SV+DB-C, deactivates cooler



➢ LbA： Time setup for heater loop break alarm。Unit:second (0 = OFF)

When LBA=ON, PV starts blinking and triggers the alarm.(ALARM)



➢ FUY ： Fuzzy on/off

12. List of Parameters for INP Setting

inP is used to select different method of input type depending on your requirement.

Measurement	Input Type	Indication	Range
TC (°C)	K Type	K C (default)	-200~1370°C
	K Type	K. C	-128.0~500.0°C
	J Type	J C	-200~1200°C
	J Type	J. C	-128.0~500.0°C
	T Type	t C	-200~400°C
	T Type	t. C	-128.0~400.0°C
	E Type	E C	-200~800°C
	R Type	r C	0~1760°C
	S Type	S C	0~1760°C
	B Type	b C	0~1820°C
	N Type	n C	-200~1300°C
RTD (°C)	PT Type	Pt C	-200~850°C
	PT Type	Pt. C	-199.9~850.0°C
	JPT Type	JPt C	-200~500°C
	JPT Type	JPt.C	-199.9~500.0°C

Measurement	Input Type	Indication	Range
TC (°F)	K Type	K F	-328~2498°F
	K Type	K. F	-199.9~932.0°F
	J Type	J F	-328~2192°F
	J Type	J. F	-199.9~932.0°F
	T Type	t F	-328~752°F
	T Type	t. F	-199.9~752.0°F
	E Type	E F	-328~1472°F
	R Type	r F	32~3200°F
	S Type	S F	32~3200°F
	B Type	b F	32~3308°F
	N Type	n F	-328~2372°F
RTD (°F)	PT Type	Pt F	-328~1562°F
	PT Type	Pt. F	-199.9~999.9°F
	JPT Type	JPt F	-328~932°F
	JPT Type	JPt.F	-199.9~932.0°F

Measurement	Input Type	Indication	Range
V	0~50mV	E.U.	-1999~9999
	0~1V	0- 1	-1999~9999
	0~5V	0- 5	-1999~9999
	1~5V	1- 5	-1999~9999
	0~10V	0- 10	-1999~9999
	2~10V	2- 10	-1999~9999
mA	0~20mA	A020	-1999~9999
	4~20mA	A420	-1999~9999

13. List of Parameters for COMM Setting

CoEE. It supports RTU or ASCII. Highest baud rate can be up to 19200bps.

Paramter	Name of Parameter	Description of Parameter	Setting Range	Preset Value
id	ID	Identification	1～255	1
bPS	BPS.	Baud rate	600：Baudrate600。	9600
			1200：Baudrate 1200。	
			2400：Baudrate 2400。	
			4800：Baudrate 4800。	
			9600：Baudrate 9600。	
			192-：Baudrate 19200。	
StYL	Style	Transmitting Style	8n1：None Parity Check，Stops one bit	8n1
			8n2：None Parity Check，Stops two bits	
			8o1：Odd Check，Stops one bit.	
			8E1：Even Check，Stops one bit.	
FotE.	Format	Transmitting Format	HEH.：Hex Mode	Hex
			ASCI：ASCII Mode	

14. List of Parameters for LOCK Setting

LAbE is designed for the purpose of wrongful setting.

Parameter	Name of Parameter	Description	Setting Range	Preset Value
LAbE	LABEL	Lock	LB00：Not set LB01：Set alarm, SV, and CTRL LB02：Set SV LB03：Set Lock	LB00
P5.3d	Password	Password setup(0=no password)	000~999	0
P3.5.U.	SV HotKey Lock	Password protection for SV quick setup mode	YES/NO	NO
E.AnU	Manual Lock	Manual control mode	ON/OFF	ON
P EE	Protect EEPROM	Protection of EEPROM	ON/OFF	OFF
dEF	Default	Return to default setting	YES/NO	No
rEtn	Return	Main menu auto return(unit:second)	0~99	10

LAbE

	LB00	LB01	LB02	LB03			LB00	LB01	LB02	LB03
ALM						FILT	●	●		
SOFT	●					MODE	●	●		
POS1	●	●				OUT1	●	●		
HYS1	●					OUT2	●	●		
DY1	●					DIR1	●	●		
DIR1	●					DIR2	●	●		
STY1	●					CYC1	●	●		
POS2	●	●				CYC2	●	●		
HYS2	●					HYS1	●	●		
DY2	●					HYS2	●	●		
DIR2	●					DBON	●	●		
STY2	●					DEB1	●	●		
SCAL						DEB2	●	●		
SV	●	●	●			LBA	●	●		
DOT	●					COMM				
SCH	●					ID	●			
SCL	●					BPS	●			

LIMH	●					STYL	●			
LIML	●					FORM	●			
CTRL						TOUT	●			
OPER	●	●				LOCK				
TUN	●	●				LABE	●	●	●	●
BIAS	●	●				PSWD	●	●	●	●
OFST	●	●				PWSV	●	●	●	●
P	●	●				MANU	●			
I	●	●				P EE	●			
D	●	●				DEF	●			
MARE	●	●				RETN	●			

- PS.3.d : Menu password can be set under this mode. If password is set as “0”, menu will not be protected by password.
- P3.S.U. : Password can be set to protect SV quick setup function. If password is set as “0”, this function will be obsolete.
- E.AnU : Manual mode can be opted under this mode. Note: Press and hold ENT for 5 seconds to enter the manual mode.
- P EE : EEPROM can be protected by turning this mode “ON” during MODBUS communication. When this mode is on, communication will not overwrite EEPROM value.
- dEF : Set value returns to default setting.
- rEtn : Time to return to the main menu(PV/SV). Unit:: second.
  When set as “0”, system will not return automatically.

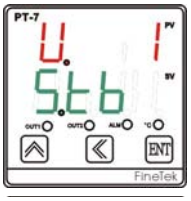
15. Calibration

1. Power up your PT-76 series with proper wiring information and power supply of AC110/220 or DC20~36V.
2. Please refer to page 33 for wiring information.
3. Press and hold button for 5 seconds to enter calibration mode.

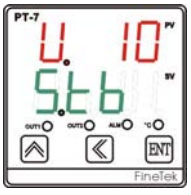
   Password: 0012.
4. Press button to enter A ıc ı under calibration mode.
5. Green LED will indicate different value according to the 0 mV voltage change supplied by calibrator(3 sets). When green LED indicates S.tb, please press ENT to end calibration. (Figure 16.1)

6. Green LED will change display value accordingly when calibrator outputs 50mV to calibrate 50mV. When green LED indicates S.tb, please press ENT to end calibration. (Figure 16.2)

7. Green LED will change display value accordingly when calibrator outputs 1V to calibrate 1V. When green LED indicates S.tb, please press ENT to end calibration. (Figure 16.3)



8. Green LED will change display value accordingly when calibrator outputs 10V to calibrate 10V. When green LED indicates S.tb, please press ENT to end calibration. (Figure 16.4)



9. Green LED will change display value accordingly when calibrator outputs 4mA to calibrate 4mA. When green LED indicates S.tb, please press ENT to end calibration。【Figure 16.5】

10. Green LED will change display value accordingly when calibrator outputs 20mA to calibrate 20mA. When green LED indicates S.tb, please press ENT to end calibration。【Figure 16.6】

11. Green LED will change display value accordingly when calibrator outputs 100Ωto calibrate 100Ω. When green LED indicates S.tb, please press ENT to end calibration。【Figure 16.7】

12. Green LED will change display value accordingly when calibrator outputs 300Ωto calibrate 300Ω. When green LED indicates S.tb, please press ENT to end calibration。【Figure 16.8】

13. Cold junction compensation calibration- Use K-TYPE 0℃(temperature compensation wire is required) and observe PV value after 30 minutes. Write temperature difference into AdJt, and press ENT to confirm. 【Figure16.9】

《Figure16.9》

(Example：PV=3.0, ADJT = -3.00)

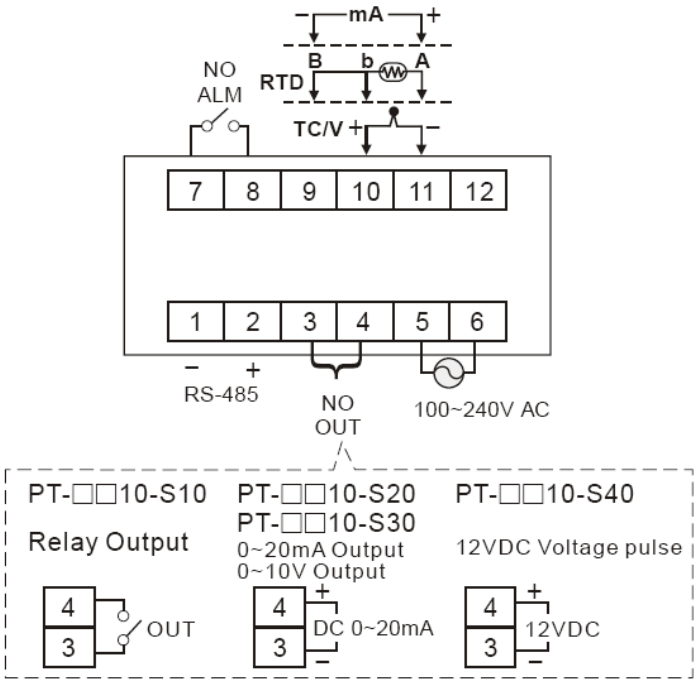
14.Product model calibration- input correct model number.

Example: If correct model number =PT-7620-S**201**-00, E.odL=201.

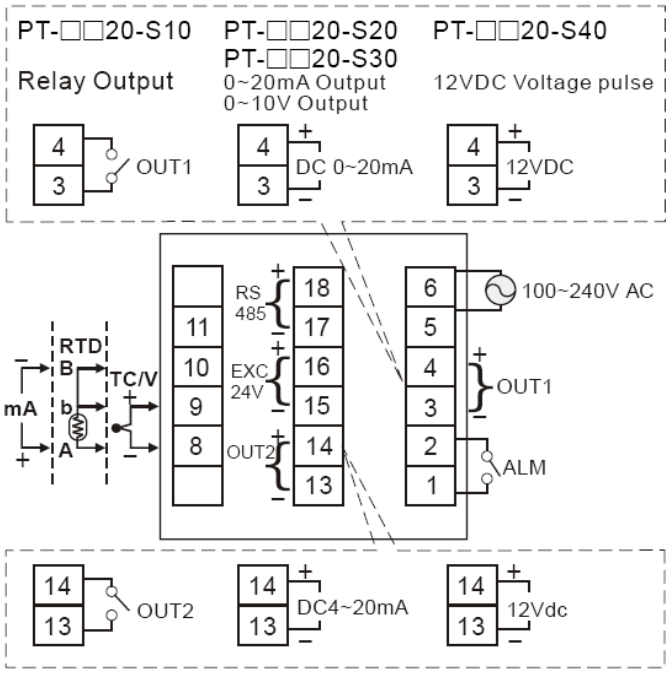
15.After calibration, press ⩓ to return to the main screen.(All setting will return to factory default)

16. Wiring information

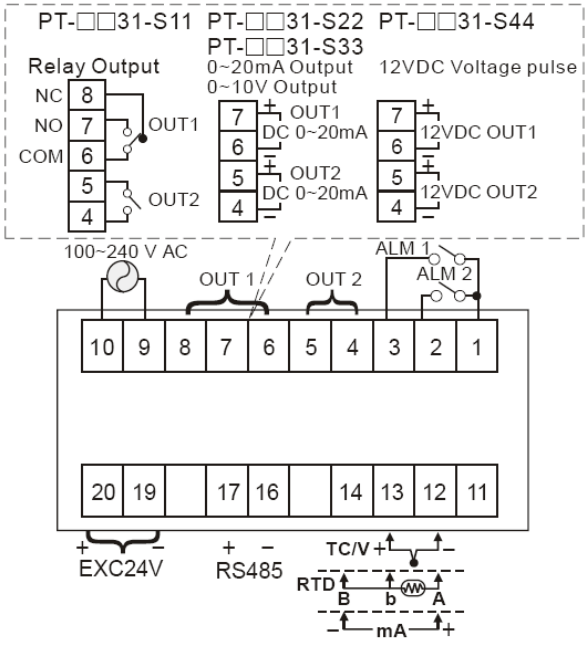
1. PT-7610



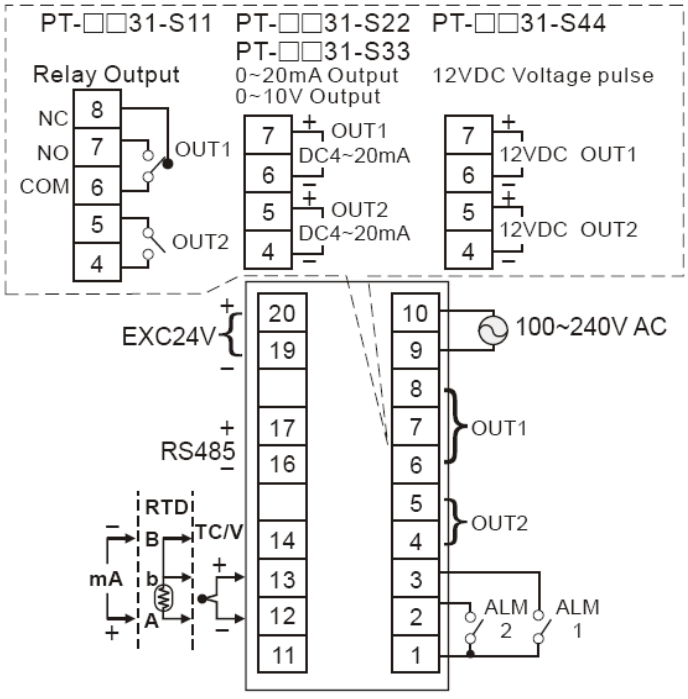
2. PT-7620



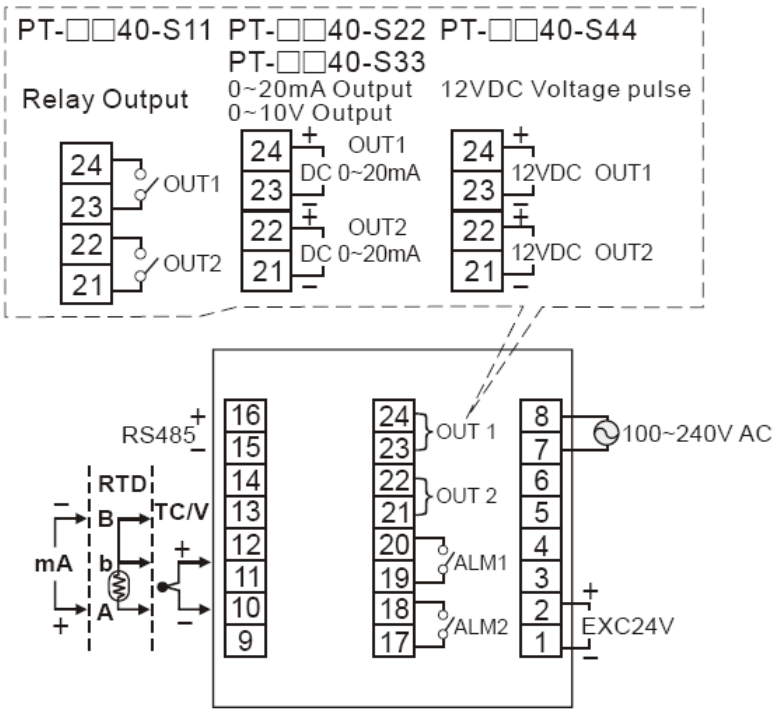
3. PT-7630



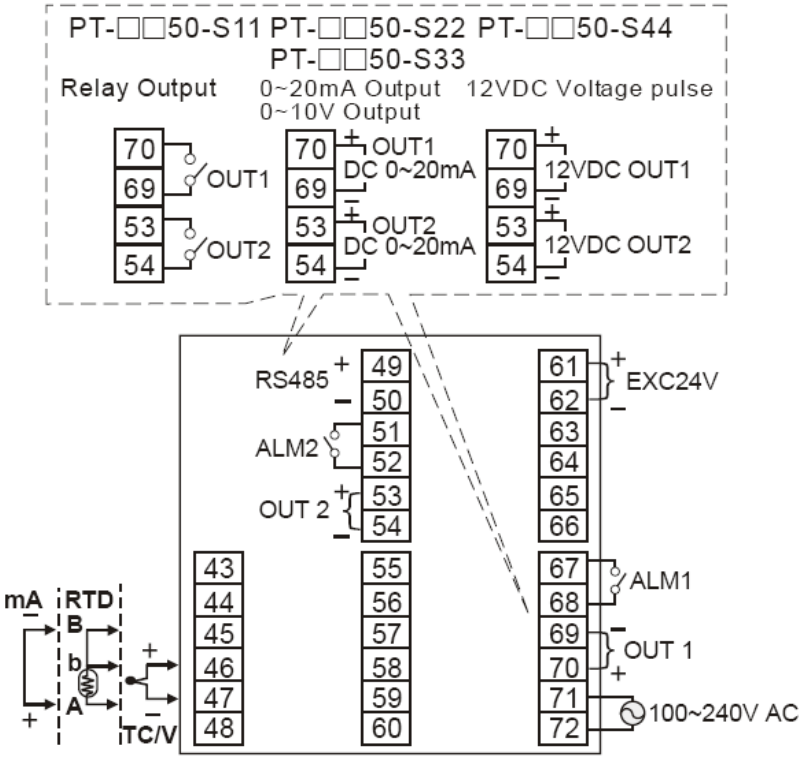
4. PT-7631



5. PT-7640



6. PT-7650



17. Communication Protocol(MODBUS)

17.1 Format

QUERY			
	Example	ASCII	RTU
Field Name	(Hex)	Characters	8-Bit Field
Header		: (colon)	None
Slave Address	06	0 6	0000 0110
Function	03	0 3	0000 0011
Starting Address Hi	00	0 0	0000 0000
Starting Address Lo	6B	6 B	0110 1011
No. of Registers Hi	00	0 0	0000 0000
No. of Registers Lo	03	0 3	0000 0011
Error Check		LRC (2 chars.)	CRC (16 bits)
Trailer		CR LF	None
	Total Bytes:	17	8

Master Query with ASCII/RTU Framing

RESPONSE			
	Example	ASCII	RTU
Field Name	(Hex)	Characters	8-Bit Field
Header		: (colon)	None
Slave Address	06	0 6	0000 0110
Function	03	0 3	0000 0011
Byte Count	06	0 6	0000 0110
Data Hi	02	0 2	0000 0010
Data Lo	2B	2 B	0010 1011
Data Hi	00	0 0	0000 0000
Data Lo	00	0 0	0000 0000
Data Hi	00	0 0	0000 0000
Data Lo	63	6 3	0110 0011
Error Check		LRC (2 chars.)	CRC (16 bits)
Trailer		CR LF	None
	Total Bytes:	23	11

Slave Response with ASCII/RTU Framing

17.2 Address

PT-76 Communication Address for RS-485 Protocol

Information					
Address	Command	Range	Attribute	Remark	Description
0	COM_VerCode	None	R		Firmware Version
29	COM_TemperatureValue	None	R		PV
30	DDCOM_ScalSv1	-1999~9999	R/W		SV
160	COM_TmCtrl_MV1	None	R		Control energy of output1
161	COM_TmCtrl_MV2	None	R		Control energy of output2
162	COM_DaValue1	None	R		
163	COM_DaValue2	None	R		
164	COM_TmValue	None	R		

Alarm Menu					
Address	Command	Range	Attribute	Remark	Description
107	COM_AlmStb	0~2	R/W	0：OFF	Alarm Standby 1
1	COM_AlmPos1	-1999~9999	R/W		Alarm 1
2	COM_AlmHys1	0~9999	R/W		Hysteresis 1
3	COM_AlmDyTime1	0~99	R/W		Delay Time 1
4	COM_AlmDir1	0~1	R/W		Direction 1
5	COM_AlmStyle1	0~9	R/W		Style 1
100	COM_AlmPos2	-1999~9999	R/W		Alarm Standby 2
101	COM_AlmHys2	0~9999	R/W		Alarm 2
102	COM_AlmDyTime2	0~99	R/W		Hysteresis 2
103	COM_AlmDir2	0~1	R/W		Delay Time 2
104	COM_AlmStyle2	0~9	R/W		Direction 2

Scale Menu					
Address	Command	Range	Attribute	Remark	Description
6	COM_ScalSv1	-1999~9999	R/W		SV
7	COM_ScalDot	0~3	R/W		Decimal point
8	COM_ScalSch	-1999~9999	R/W		Maximum PV value
9	COM_ScalScl	-1999~9999	R/W		Minimum PV value
10	COM_ScalLimtH	-1999~9999	R/W		Maximum SV value
11	COM_ScalLimtL	-1999~9999	R/W		Minimum SV value

Input Type Menu					
Address	Command	Range	Attribute	Remark	Description
28	COM_InpSel	0~37	R/W		Signal Input

Input Signal					
Value	Type (°C)	Value	Type (°F)	Value	Type (V)
0	K Type(K C)	15	K Type(K F)	30	0~50mV(E.U.)
1	K Type(K. C)	16	K Type(K. F)	31	0~1V(0 - 1)
2	J Type(J C)	17	J Type(J F)	32	0~5V(0 - 5)
3	J Type(J. C)	18	J Type(J. F)	33	1~5V(1 - 5)
4	T Type(t C)	19	T Type(t F)	34	0~10V(0 - 10)
5	T Type(t. C)	20	T Type(t. F)	35	2~10V(2 - 10)
6	E Type(E C)	21	E Type(E F)		
7	R Type(r C)	22	R Type(r F)		
8	S Type(S. C)	23	S Type(S. F)	Value	Type (mA)
9	B Type(b C)	24	B Type(b F)	36	0~20mA(A020)
10	N Type(n C)	25	N Type(n F)	37	4~20mA(A420)
11	PT Type(Pt C)	26	PT Type(Pt F)		
12	PT Type(Pt. C)	27	PT Type(Pt. F)		
13	JPT Type(JPt C)	28	JPT Type(JPt F)		
14	JPT Type(JPt.C)	29	JPT Type(JPt.F)		

Lock Menu					
Address	Command	Range	Attribute	Remark	Description
118	COM_LockLable	0~3	R/W		Lock Setup
119	COM_Password	0~999	R/W		Password setup
120	COM_HotkeyLock	0~1	R/W		SV password lock
121	COM_ManualLock	0~1	R/W		Manual Mode
122	COM_Protect_Eeprom	0~1	R/W		RS485 with Eeprom protection
123	COM_SetDefault	0~1	R/W		Default setup
124	COM_ScreenBreakTime	0~99	R/W	Default: 10s	Menu return time

Control Menu					
Address	Command	Range	Attribute	Remark	Description
16	COM_CtlSelOper	0~1	R/W	0：ON/OFF 1：PID	Selection of operation mode
19	COM_CtlTun	0~1	R/W		Auto tuning
25	COM_CtlBias	-1999~9999	R/W		PV compensation
114	COM_CtlOffset	-1999~9999	R/W		SV deviation setting for auto turning
20	COM_CtlP	0~9999	R/W		Proportional Parameter
21	COM_CtlI	0~9999	R/W		Integral Parameter
22	COM_CtlD	0~9999	R/W		Derivative Parameter
26	COM_CtlManualReset	0~1000	R/W		Manual Reset
27	COM_CtlFilter	0~100	R/W		Software Filter
115	COM_CtlMode	0~1	R/W		Selection of Control
116	COM_CtlOut1	0~1	R/W		Control Output 1
117	COM_CtlOut2	0~1	R/W		Control Output 2
23	COM_CtlDir1	0~1	R/W		Relay output direction 1
110	COM_CtlDir2	0~1	R/W		Relay output direction 2
24	COM_CtlCycleTime1	0~9999	R/W		Control output cycle time 1
113	COM_CtlCycleTime2	0~9999	R/W		Control output cycle time 2
17	COM_CtlHys1	0~9999	R/W		Control output hystersesis 1
106	COM_CtlHys2	0~9999	R/W		Control output hysteresis 2
105	COM_CtlDeadbandEnable	0~1	R/W		Fuzzy on/off
111	COM_CtlDeadband1	-1999~9999	R/W		Dead Band 1
112	COM_CtlDeadband2	-1999~9999	R/W		Dead Band 2
18	COM_CtlFuzzy	0~1	R/W		Fuzzy Control
108	COM_CtlLBA	0~9999	R/W	0:OFF	Loop Break Alarm

17.3 Introduction for MODBUS Communication

17.3.1 Explanation

1. Basic structure of commands (16 Hexadecimal)

START	ADDRESS	FUNCTIONN	DATA	CRC CHECK	END
T1~4	8Bit	8Bit	n x 8Bit	8Bit	T1~4

START ：at least 4 data bits without transmitting data.

ADDRESS ：read or control the address of meter.

(address range: 1~255).

FUNCTION ：03H: read the data of Meter.

H: write out the data into Meter.

DATA ：Include address of the register and the number of words for read.

CRC CHECK ：16bit CRC，the details of calculation showing in following

END ：at least 4 data bits without transmitting data.

2.Bit Per Byte

4 Modes：

Start Bit	Data Bit	Parity	Stop
1	8	None	2
1	8	Even	1
1	8	Odd	1
1	8	None	1

3.CRC algorithm

Two ways of CRC algorithm: **logical algorithm** and **check list** .

CRC column is a 2 hex bytes, calculating from **address** to **data end**. If the CRC value from PC calculation is different from received value, then the data is an error.

Address	**Function**	**Data Count**	**Data**	**Data**	**Data**	**Data**	**CRC Lo**	**CRC Hi**

4.Logical algorithm:

Procedures:

(1) Install a one -16 Hexadecimal bytes into FFFF (Hex), defining as CRC register.

(2) Let the low byte of CRC and the 1st byte of Message to be excluded or Exclusive OR，then the result saves to CRC register.

(3) Right Shift 1 byte of the CRC register, then set zero as the high byte of CRC register, comparing to the removed byte and defining as SLSB.

(4) If SLSB=0, repeat procedure 3. If SLSB=1，let CRC register and parameter A001 (Hex) to be excluded, then save to CRC register.

(5) Repeat procedure 3 & 4, until complete the 8 bytes.

(6) Repeat procedure 2-5, until all Bytes to be completed.

(7) The calculated value required to be exchanged by the high/low byte.

Example of Logical Algorithm (For C)

```
unsigned int addCRC( unsigned CRC,unsigned char b )
{
unsigned char i,bh,bl;
bh=CRC/256;
bl=CRC%256;
bl^=b;
CRC=bh*256+bl;
for(i=0;i<8;i++)
f(CRC&0x0001) CRC=(CRC/2)^0xA001;
else              CRC=CRC/2;
  return CRC; }
unsigned char Check_CRC(void)
{ unsigned int i,CRC;
 CRC=addCRC(0xFFFF,ID);
  for(i=1;i<(TXD_CNT-2);i++) CRC=addCRC(CRC,TXDB[i]);
  return CRC;
```

1. Checksum

static const unsigned int CRCtbl[256] = {

0x0000, 0xC0C1, 0xC181, 0x0140, 0xC301, 0x03C0, 0x0280, 0xC241,
0xC601, 0x06C0, 0x0780, 0xC741, 0x0500, 0xC5C1, 0xC481, 0x0440,
0xCC01, 0x0CC0, 0x0D80, 0xCD41, 0x0F00, 0xCFC1, 0xCE81, 0x0E40,
0x0A00, 0xCAC1, 0xCB81, 0x0B40, 0xC901, 0x09C0, 0x0880, 0xC841,
0xD801, 0x18C0, 0x1980, 0xD941, 0x1B00, 0xDBC1, 0xDA81, 0x1A40,
0x1E00, 0xDEC1, 0xDF81, 0x1F40, 0xDD01, 0x1DC0, 0x1C80, 0xDC41,
0x1400, 0xD4C1, 0xD581, 0x1540, 0xD701, 0x17C0, 0x1680, 0xD641,
0xD201, 0x12C0, 0x1380, 0xD341, 0x1100, 0xD1C1, 0xD081, 0x1040,
0xF001, 0x30C0, 0x3180, 0xF141, 0x3300, 0xF3C1, 0xF281, 0x3240,
0x3600, 0xF6C1, 0xF781, 0x3740, 0xF501, 0x35C0, 0x3480, 0xF441,
0x3C00, 0xFCC1, 0xFD81, 0x3D40, 0xFF01, 0x3FC0, 0x3E80, 0xFE41,
0xFA01, 0x3AC0, 0x3B80, 0xFB41, 0x3900, 0xF9C1, 0xF881, 0x3840,
0x2800, 0xE8C1, 0xE981, 0x2940, 0xEB01, 0x2BC0, 0x2A80, 0xEA41,
0xEE01, 0x2EC0, 0x2F80, 0xEF41, 0x2D00, 0xEDC1, 0xEC81, 0x2C40,
0xE401, 0x24C0, 0x2580, 0xE541, 0x2700, 0xE7C1, 0xE681, 0x2640,
0x2200, 0xE2C1, 0xE381, 0x2340, 0xE101, 0x21C0, 0x2080, 0xE041,
0xA001, 0x60C0, 0x6180, 0xA141, 0x6300, 0xA3C1, 0xA281, 0x6240,
0x6600, 0xA6C1, 0xA781, 0x6740, 0xA501, 0x65C0, 0x6480, 0xA441,
0x6C00, 0xACC1, 0xAD81, 0x6D40, 0xAF01, 0x6FC0, 0x6E80, 0xAE41,
0xAA01, 0x6AC0, 0x6B80, 0xAB41, 0x6900, 0xA9C1, 0xA881, 0x6840,
0x7800, 0xB8C1, 0xB981, 0x7940, 0xBB01, 0x7BC0, 0x7A80, 0xBA41,
0xBE01, 0x7EC0, 0x7F80, 0xBF41, 0x7D00, 0xBDC1, 0xBC81, 0x7C40,
0xB401, 0x74C0, 0x7580, 0xB541, 0x7700, 0xB7C1, 0xB681, 0x7640,
0x7200, 0xB2C1, 0xB381, 0x7340, 0xB101, 0x71C0, 0x7080, 0xB041,
0x5000, 0x90C1, 0x9181, 0x5140, 0x9301, 0x53C0, 0x5280, 0x9241,
0x9601, 0x56C0, 0x5780, 0x9741, 0x5500, 0x95C1, 0x9481, 0x5440,
0x9C01, 0x5CC0, 0x5D80, 0x9D41, 0x5F00, 0x9FC1, 0x9E81, 0x5E40,
0x5A00, 0x9AC1, 0x9B81, 0x5B40, 0x9901, 0x59C0, 0x5880, 0x9841,
0x8801, 0x48C0, 0x4980, 0x8941, 0x4B00, 0x8BC1, 0x8A81, 0x4A40,
0x4E00, 0x8EC1, 0x8F81, 0x4F40, 0x8D01, 0x4DC0, 0x4C80, 0x8C41,
0x4400, 0x84C1, 0x8581, 0x4540, 0x8701, 0x47C0, 0x4680, 0x8641,
0x8201, 0x42C0, 0x4380, 0x8341, 0x4100, 0x81C1, 0x8081, 0x4040 ,

};

```
unsigned addCRC( unsigned CRC,char b )
{
    return ( CRC >> 8 ) ^ CRCtbl[ ( CRC & 0xFF ) ^ b ];
}
```

4.Read the Register of Meter (Function Code＝03 Hex)

Request：

Slave Address	1 Byte	1~255
Function code	1 Byte	03
Start Address	2 Byte	0x0000~0xFFFF
Quantity of Register	1 Byte	1~10
CRC Check	2 Byte	

Response：

Slave Address	1 Byte	1~255
Function code	1 Byte	03
Byte Count	1 Byte	2 x N
Register Value	N x 2 Byte	
CRC Check	2 Byte	

5. Write out Meter Register (Function Code＝06 Hex)

Request：

Slave Address	1 Byte	1~255
Function code	1 Byte	06
Register Address	2 Byte	0x0000~0xFFFF
Register Value	2 Byte	0x0000~0xFFFF
CRC Check	2 Byte	

Response：

Slave Address	1 Byte	1~255
Function code	1 Byte	06
Register Address	2 Byte	0x0000~0xFFFF
Register Value	2 Byte	0x0000~0xFFFF
CRC Check	2 Byte	

17.3.2 ASCII MODE

1、 Basic Structure of Command (16 Hexadecimal)

START	ADDRESS	FUNCTION	DATA	LRC CHECK	END
1CHAR	2CHAR	2CHAR	nCHAR	2CHAR	2CHAR CR LF

(1).START ：Fixed as":"(3AH)。

(2).ADDRESS ：Read or control the address of Meter

(Address rang:1~255)。

(3).FUNCTION："03":Read the data of Meter。

"06":Write out the data into Meter。

(4).DATA ：Include the address of the register and the number of word for read。

(5).LRC CHECK：8bit LRC，the detail of calculation is shown in following chapter。

(6).END ：CR(0DH), LF(0AH)。

2、Bit Per Byte

9 Types:

Start Bit	Data Bit	Parity	Stop
1	8	None	1
1	7	None	2
1	7	Odd	1
1	7	Even	1
1	8	None	2
1	8	Odd	1
1	8	Even	1
1	7	Odd	2
1	7	Even	2

3、 LRC algorithm

The common LRC algorithm is Logical algorithm in which LRC column is a one-16 Hexadecimal, calculating from address to data end. If the LRC value from PC calculation is different from received value, then the data is an error.

Procedures：

(1). Install a one-8 bytes register into 00(Hex), defining as LRC register.

(2). The high bytes value of the Message to be transmitted from ASCII to Binary, then moving 4 bits to left hand side and adding low byte value from ASCII to Binary.

(3). Repeat procedure 2, until 3 bits are completed. +

(4). The calculated LRC value requires of having complement 2 for transforming and installing into Message.

START	ADDRESS	FUNCTION	DATA	LRC CHECK	END
1CHAR	2CHAR	2CHAR	nCHAR	2CHAR	2CHAR CR LF
0	1,2	3,4	5,6,7,8	9,10	11,12

```
unsigned char CharToBinary(char Code)
{   Unsigned char b=0xff;
    if(Code>='0' && Code<='9') b=Code-'0';     // 0-9
    else
    if(Code>='A' && Code<='F') b=Code-'A'+10; // A-F
    return b;
}
unsigned char Check_LRC(void)
{
    unsigned char i, LRC=0;
    for(i=1;i<=7;i+=2)
    LRC+=(CharToBinary(RXDB[i])<<4 + CharToBinary (RXDB[i+1]) );
    LRC =0x00-LRC;
    return LRC;
}
```

4、Read the Register of Meter. (Function Code＝"03" ASCII)

Request：

Start	1 Byte	":"
Slave Address	2 Byte	"01"~"FF"
Function code	2 Byte	"03"
Start Address	4 Byte	"0000"~"FFFF"
Quantity of Register	4 Byte	"0001"~"0040"
LRC Check	2 Byte	"XX"
End	2 Byte	CR(0x0D),LF(0xOA)

Response：

Start	1 Byte	":"
Slave Address	2 Byte	"01"~"FF"
Function code	2 Byte	"03"
Byte Count	2 Byte	"02"~"80"
Register Value	N x 4 Byte	"0000"~"FFFF"
LRC Check	2 Byte	"XX"
End	2 Byte	CR(0x0D),LF(0xOA)