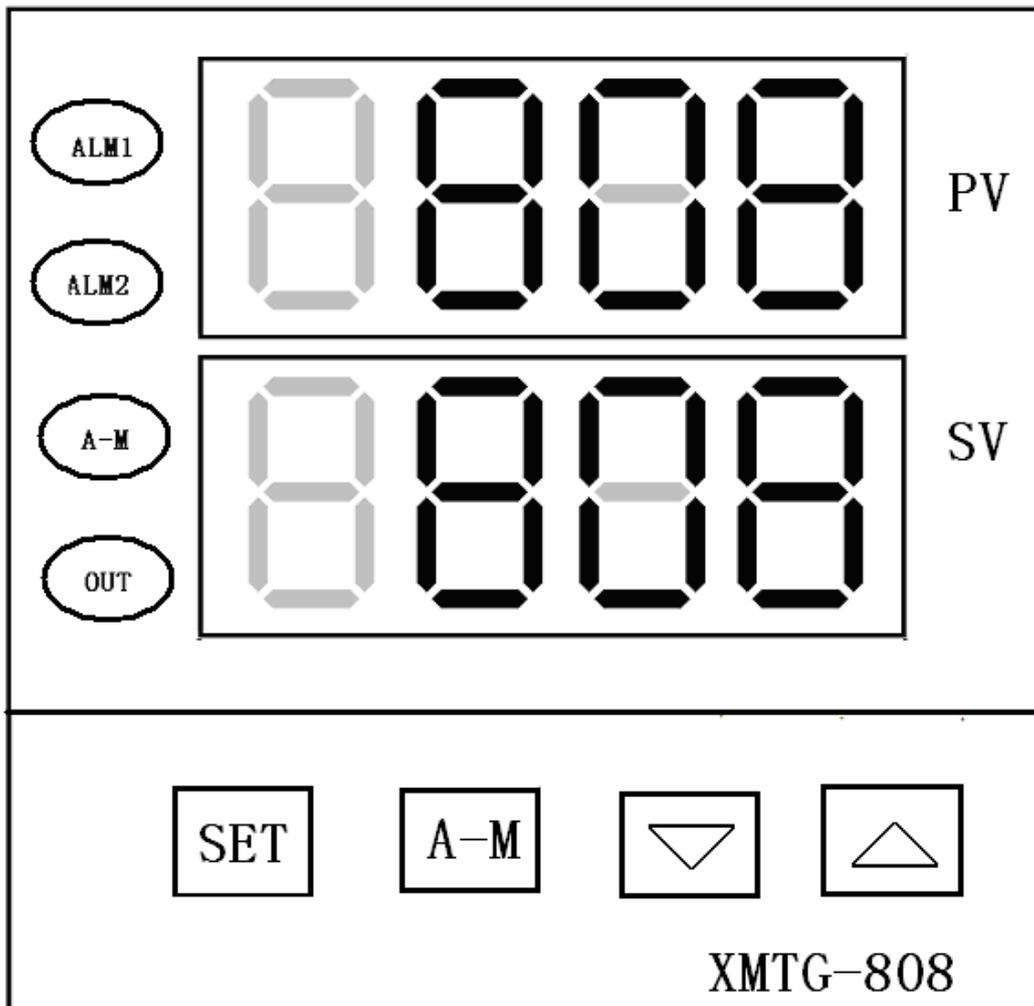


**OPERATION MANUAL**  
**FOR**  
**MICROCOMPUTER BASED**  
**DIGITAL TEMPERATURE CONTROLLER**  
**XMTG-808 ,XMTG-818**  
**(2008 version)**



## **Preface**

Thank you for the purchase of our microcomputer based digital temperature controllers XMTG-808,XMTG-818

This kind of products has received CE approval.

The manual contains instructions about assemblages, functions, operations and cautions on using the XMTG-808,XMTG-818

## **Caution**

**To avoid the misuse of this controller, please ensure to read this manual and confirm the model carefully before using the apparatus.**

- The instrument should be used according to the coach described in the manual ,otherwise, it may conk out or cause fire.
- Be sure to follow the warnings, cautions and notices. If not, it could cause serious injury or malfunction.
- Specifications of the XMTG-808,XMTG-818 and the contents of this instruction manual can be modified without any notice.
- Care has been taken to assure that the manual match with your instrument, if not ,or there are any doubts, mistakes or questions about it, please inform our sales department timely.
- The instrument is designed to be installed in a control panel. If not, tests must be taken to ensure that the operator cannot touch power terminals or other high voltage sections.
- Any unauthorized transfer or copying of this document in part or whole are prohibited.

## **Safety Precautions**

**Be sure to read these precautions before using our products.**

The safety precautions are classified into categories: "Warning" and "Caution".

Depending on circumstances, procedures marked on  Caution may lead to serious results, so be sure to follow the directions for usage.



The sign means dangerous conditions that may cause death or serious injury because of not being carried out properly.



The sign means dangerous conditions that may cause superficial/medium injury or physical damage .And it also can degrade or damage the controller.

## **1. Installation precautions**



This controller should be used under the following environmental conditions:  
Install the controller in the place as below:

- Lack of dust and corrosive gas
- No flammable, explosive gas.
- No mechanical vibration and shocks.
- No exposure to direct sunlight, and an ambient temperature between 0 to 50°C (32 to 122°F) that does not change suddenly.
- An ambient non-condensing humidity between 35%RH and 85%RH
- Little of electromagnetic interference.
- Avoid direct contact with water, oil or chemicals and the vapors of these substance

**Note:**

**Do not install the controller near flammable material even though the shell of the controller is flameproof.**

**Avoid setting this controller directly with flammable material.**

## 2. Wiring precautions



### Caution

- Use solderless terminal with insulation sleeve to connect the M3 screw pole of the rear of the controller as per the connection label affixed to the shell.
- Tighten the terminal screw within the suitable torque.

If excessive force is applied to the screw, the screw or shell be damaged

- Please apply appropriate power source to the sensor according to sensor rated power.
- Do not apply the commercial power source to the sensor which is connected to the input terminal, otherwise, input circuit may cause short circuit or burnt out.

- This controller has no built-in power switch, circuit breaker or fuse. It is necessary to install them near the controller.

Recommended fuse installation: Time-lag fuse, rated voltage 250VAC, current 2A.

- When using 24V AC/DC for the power source, do not confuse the polarity when it is DC.

## 3. Running and maintenance precautions



### Caution

- The controller adopt artificial intelligence control, which is a new algorithm using fuzzy logical PID auto-tuning .
- Do not touch the terminals when the controller is working. It may cause electric shock or problems in operation.
- Be sure to turn the power source switch state to OFF when adjusting and touching the terminal, if not it maybe result in electric shock and cause severe injury and death.
- Clean controller only with soft, dry cloth.
- Do not strike or scratch it with a hard object or press hard on them.

## ----CONTENTS-----

<b>1. Main specification-----</b>	<b>4</b>
1.1 Specification-----	4
1.2 Product confirmation-----	4
1.3 Name and functions of the sections-----	4
<b>2. Display status-----</b>	<b>5</b>
2.1 Basal operation description-----	5
2.1.1 Display transfer-----	5
2.1.2 Data setup-----	5
2.1.3 Man/auto mode switch-----	6
2.1.4 Setting parameters-----	6
2.2 Artificial intelligence control and auto tuning-----	6
<b>3. Wiring connection-----</b>	<b>6</b>
<b>4. Setup flow chart-----</b>	<b>7</b>
4.1 Alarm parameter “ALM1”, “ALM2”, “Hy-1”, “Hy-2”-----	9
4.2 Dead band parameter “Hy”-----	9
4.3 Control mode parameter “At”-----	9
4.4 Control action explanations-----	10
4.4.1 “P”, “T”, “D”.-----	10
4.4.2 PID auto-tuning of this controller-----	10
4.4.3 Auto-reset (offset correction) -----	11
4.5 Control period “T”-----	11
4.6 Input specification parameter “Sn”-----	12
4.7 Decimal point setting parameter “dp”-----	12
4.8 “P-SL” and “P-SH”: scale definition parameter for linear input/retransmission output-----	12
4.9 Input shift parameter “Pb”-----	12
4.10 Output definition parameter “OP-A”, “outL”, “outH”-----	13
4.11 Alarm output definition parameter “AL-P”-----	13
4.12 Function parameter “COOL”-----	13
4.13 Communication interface related parameters “Addr” and “bAud”-----	13
4.14 Input digital filter parameter “FILT”-----	14
4.15 Operation condition parameter “A-M”-----	14
4.16 Privilege for parameter setting “Lock”-----	14
4.17 Field parameter definition “EP1-EP8”-----	14
<b>5. Additional remarks of time proportional output-----</b>	<b>15</b>
<b>6. Further description about general work mode-----</b>	<b>15</b>
6.1 ON-OFF control instrument (simple temperature controller) -----	15
6.2 3-point (high, low alarm) control instrument-----	15

# 1. Main specification:

## 1.1 Specification:

### 1.1.1 Input signal and temperature range(six input signal are for selection in a controller):

Thermocouple: S (-50- +1700C), K (-50 - +1300C), E (0 - +800C), J (0 -1000C)

Thermo resistance: Pt100 (-200-+600C) Cu50 (-50-+150C)

### 1.1.2 Precision: $\pm 0.5\%FS \pm 1B$

### 1.1.3 Response time: $\leq 0.5$ s (filter parameter sets 0)

### 1.1.4 Adjusting mode: a. 2-bit (HY adjust) b. artificial intelligence PID control

### 1.1.5 Output: Relay 250V/3A or 30VDC/10A(impedance)

### 1.1.6 Alarm function: top-limit, bottom-limit, top error and bottom error for selection

**Alarm output:** relay contact AC250V 3A(impedance)

### 1.1.7 Insulate resistance voltage: power-relay-signal $\geq 2000V$ ; signal-signal $\geq 600V$

### 1.1.8 Manual function: auto/manual bi-directional non-reference switching.

### 1.1.9 Power supply: 85-242VAC, 50/60Hz.

power consumption  $\leq 4W$

### 1.1.10 Work environment: temperature 0-50°C

Humidity <85%RH

No corrode and strong electromagnetism disturb

### 1.1.11 The controller has received CE approval.

## 1.2 Product confirmation:

### 1.2.1 Product type code:

XMT□ - 8 □ 8 □  
 (1) (2) (3) (4) (5)

### 1.2.2. Meaning of the code:

(1) □ Panel dimension< width ×height (mm)>: G: 48×48

(2) “8”Control Mode: four key set, two display, PID control

(3) □ Alarm output : “0”: no alarm, “1”: one alarm(ALM1)  
 “3”: two alarm (ALM1 and ALM2)

(4) “8”Signal input Type: 6 selected input type

(5) □ Control output:

● “Nothing”: Relay contact

● “A”: Single-phase over-zero spark pulse

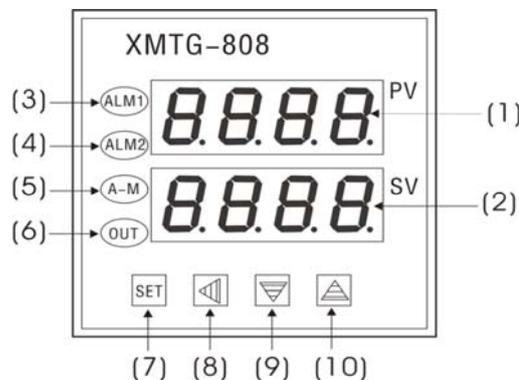
● “C”: 4-20mA

● “G”: 2-bit SSR

● “K”: With communication module (RS485)

(Note: The output “A”, “C”, “G” and “K” require special order)

## 1.3 Name and function of the section:



(1) PV display: Indicate the process variable (PV) with the red LED.

PV window shows real time temperature measuring value.

(2) SV display: Indicate the setting value (SV) or manipulated variable (MV) with the green LED.

The value of SV windows can be adjusted by using the key like data shift key, decrease key,

increase Key.

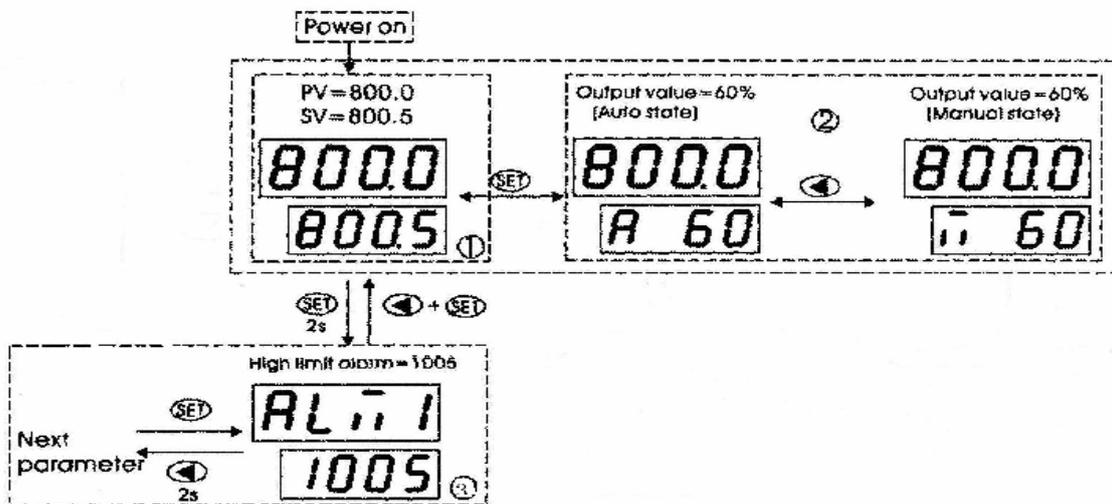
- (3) ALM1 indicator: When ALM1 output is ON, the red LED lights
- (4) ALM2 indicator: When ALM2 output is ON, the red LED lights
- (5) A-M indicator: The programming function is valid, the green LED lights.

At the same time A-M indicator lights on/off means current status run/hold.

- (6) OUT indicator: When OUT is ON, the green LED lights
- (7) Mode key (SET): Switches the setting mode and registers the setting value and selected value respectively. (Setting value and selected value are registered by pressing the mode key.)
- (8) Data shift key or programming function setting key (◀):  
When the ◀ key combined with the other key can made data changing come true.
- (9) Decrease key (▼):Decrease numeric value of the setting value.
- (10) Increase Key (▲):Increase numeric value of the setting value.

## 2. Display Status:

After power on, display status ① will be shown: the upper display window displays four digital



measured value (PV).The lower display window displays four-digit setting value(SV) and can set radix-point (or precision).

You can change the display status ① into the status ② by pressing SET key, then output value will be displayed in the lower display window. The status ① and ② are the basal status of the controller. Between the basal status, SV display window can indicate some certain state of the system by some signals, such as "orAL", "outL", "ALM1", "ALM2", "Hy-1", or "Hy-2".

- If the input signal value beyond the measurement range (caused by wrong setting of sensor spec. or open (short) circuit). "orAL" will be displayed with blinking Then the controller terminate its control function automatically, and the output value is fixed according to the parameter "outL:"
- When alarm occurred, it will display "ALM1", "ALM2", "Hy-1" or "Hy-2". They indicate the high limit alarm, low limit alarm, positive deviation alarm, and negative deviation alarm

## 2.1 Basal operation description

### 2.1.1 Display transfer

Press SET key can change the display status. It can be transferred among the display status ① and ②.

### 2.1.2 Data setup

If the parameter **LOCK** is void, we can setup most of the data displayed in SV display window. For example, set radix point input of display precision as follows:

To set SV value and radix point input must be under status ①. Press ▼ key to decrease the value, press ▲ key to increase the value, Press ◀ key to shift and set radix point, press once the point move one unit forward. When the point shift a certain digit you can change the number of the digit by pressing ▼/▲, in the end please press SET again to confirm the setting.

### 2.1.3 Man/Auto mode switch

Alternate switching between AUTO and MAN can be performed by pressing SET key once. If the controller is working on Manual mode, its output value can be increased or decreased by pressing ▲ and ▼ key under display status ②.

### 2.1.4 Setting parameters

If the controller shows basal display status (display status ① or ②), press SET and hold about 2 seconds until parameter is displayed (display status③). Then the key ▼/▲/◀ be used to modify parameters. Press and hold the ◀ key can return to the preceding parameter. Press ◀ key (don't release) and then press SET key simultaneously can escape from the parameter setup .The controller will escape automatically from the parameter setup operation if no key is pressed within 10 seconds.

**Note:** refer to the controller whose parameters are locked by setting parameter "Lock", most of its parameters are inhabited except those defined by field parameter "EP"

## 2.2 Artificial intelligence control and auto tuning

So if you want to execute auto tuning, you must adjust set point to an often-used value first, and then press and hold the ◀ key for about 2 seconds until the "At" symbol is displayed in the lower display window if you want to start up auto tuning function (Auto tuning a not allowed to start up again unless you set parameter "At" to 2 manually if the function has been executed once). During auto tuning, the controller executes on-off control After 2-3 times on-off action, the microprocessor in the controller will analyze the period, amplitude, waveform of the oscillation generated by the on-off control, and calculate the optimal control parameter value. The controller begins to perform accurate artificial intelligence control after parameter auto tuning is finished If you want to escape from auto tuning status, press and hold ◀ key for about 2 seconds until the blinking of "At" symbol is stopped in the lower display window. Generally it will meet your need to perform auto tuning one time only. After the auto tuning is finished, the controller will set parameter "At" to 3(factory set is 3), and now it is not allowed to start up auto tuning by pressing ◀ key on front panel. This will avoid repeat auto tuning by mistake.

## 3. Wiring connection:

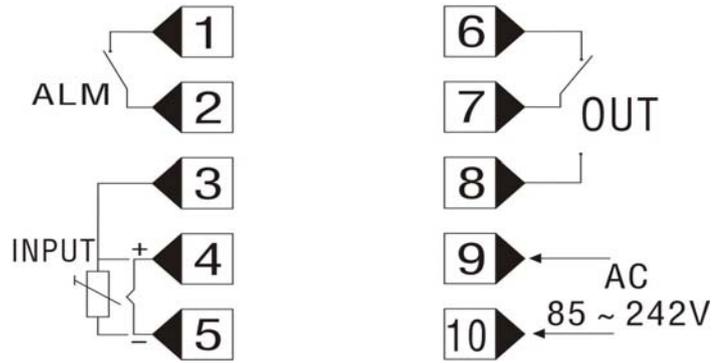


Turn off the power supply of the controller before wiring or checking. Working or touching the terminal with the power switched on may result in electric shock causing severe injury or death.

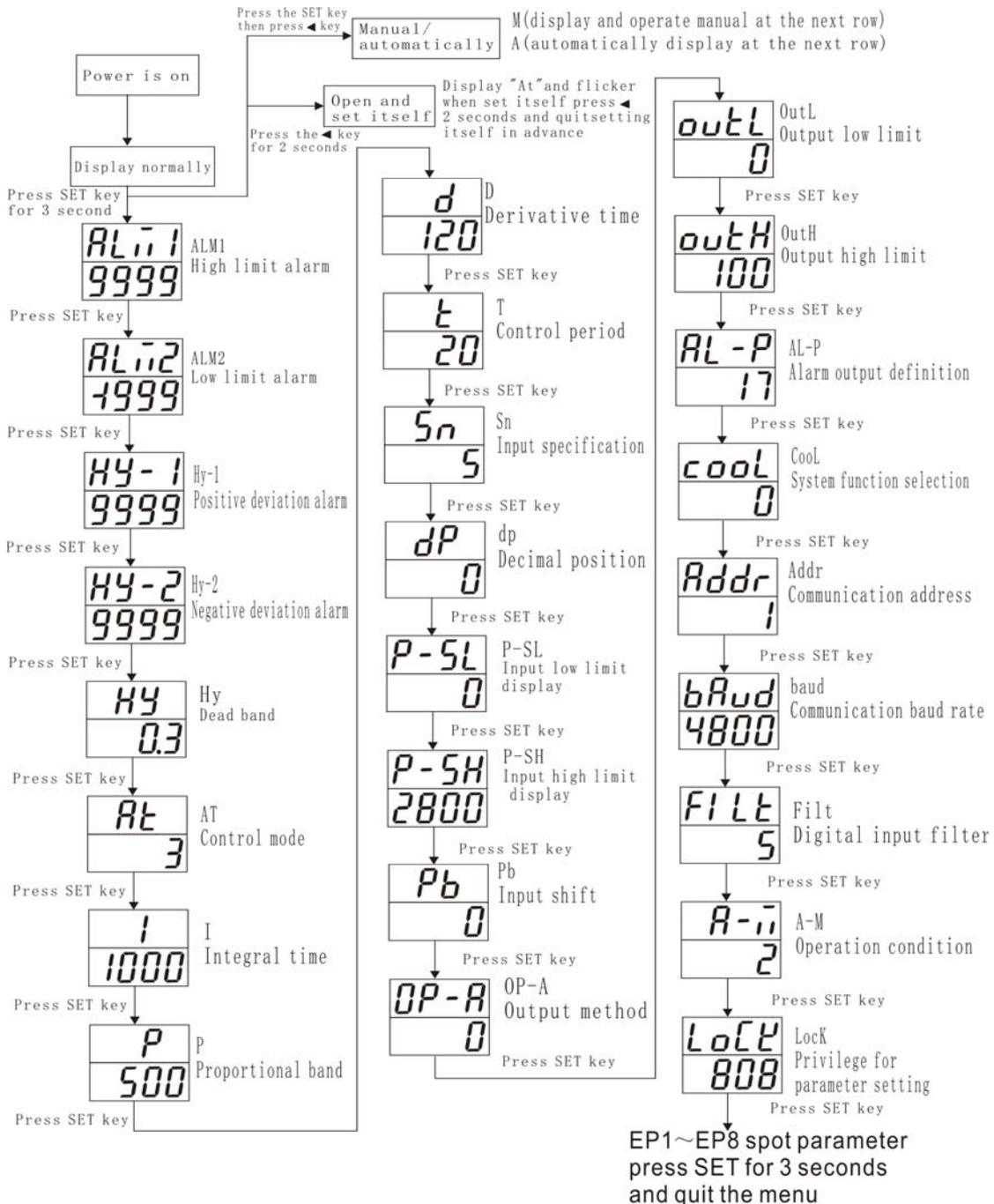
Moreover, the controller must be grounded before the power supply to the controller is turned on.

### Terminal arrangement

# XMTG-818



## 4. Setup Flow Chart:



## Code setting mode

code	description	Setting range	Engineer unit	remarks
ALM1	High limit alarm	-1999~+9999	1 °C defined unit	See the following text for details
ALM2	Low limit alarm	-1999~+9999	1 °C defined unit	
Hy-1	Positive deviation alarm	0~9999	1 °C defined unit	
Hy-2	Negative deviation alarm	0~9999	1 °C defined unit	
Hy	Dead band	0~200.0		ON/OFF control and alarm only
At	Control mode	0~3		See the following text for details
I	Integral time	0~9999	1 °C defined unit	0 disable integral function
P	Proportional band	0~9999		
d	Derivative time	0~2000	sec	
t	Control period	0~120	sec	
Sn	Input specification	0~21		Configure varied resolution. See the following text for details
dP	Decimal point position	0~1		
P-SL	Input low limit	-1999~9999		
P-SH	Input high limit	-1999~9999		
pb	Input shift	-199.9~199.9	0.1°C defined unit	
OP-A	Output mode	0~2		See the following text for details
outL	Output low limit	0~220	0.1mA defined unit	
outH	Output high limit	0~220	0.1mA defined unit	
AL-P	Alarm output definition	0~31		
Cool	System function definition	0~7		
Addr	The communication address	0~63		
bAud	Baud rate	0~9600		
FILT	Digital input filter	0~20		Define digital filter intensity
A-M	Operation condition	0. Manual, 1. automatic 2. automatic and suppress manual		
Lock	Privilege for parameter setting	0~9999		

EP1-EP8	Filed parameter definition	nonE-A-M		
---------	----------------------------	----------	--	--

#### 4.1 Alarm parameter "ALM1", "AIM2", "Hy-1", "Hy-2"

These 4 parameters set controller's alarm function. Alarm signal will be triggered to make controller's relay contact close (NC contact open), if alarm condition is satisfied. Alarm message is displayed in turn in SV display window. When the cause of alarm is removed, then the alarm is cleared automatically.

Alarm condition is following:

- **ALM1**: High limit alarm. If the process value is greater than the value specified as "ALM1+Hy" then the alarm is set, and the alarm will be cancelled if the process value is less than the value of "ALM1-Hy".

- **ALM2**: Low limit alarm. If the process value is greater than the value specified as "ALM2+Hy", then the alarm is set, and the alarm will be cancelled if the process value is less than the value of "ALM2-Hy".

- **Hy-1**: Positive deviation alarm. If PV minus SV is greater than the value specified as "Hy-1+Hy" the alarm is set, and the alarm will be cancelled if the process value is less than the value of "Hy-1-Hy". It also used as the second high limit alarm in case of on-off control.

- **Hy-2**: Negative deviation alarm. If PV minus SV is greater than the value specified as "Hy-2+Hy", the alarm is set, and the alarm will be cancelled if the process value is less than the value of "Hy-2-Hy". It also used as the second high limit alarm in case of on-off control.

- **orAL** -Input over range or under range

Process variable exceeds the configured range (High limit or low limit), caused by error configuration of sensor type, sensor disconnection or short-circuit. In the event of input over range, controller will stop control automatically and the value specified in advance as the parameter "outL"~ is output as the manipulated value.

Among which "orAL" don't need to be configured. Generally users don't need the whole 4 alarms. Limit value can be set to those parameters not used to avoid alarm function. Ex, the following configuration:

ALM1=9999. ALM2=-1999. When the configuration Hy-1=9999(999.9°C for temperature) or Hy-2 =9999 (999.9°C for temperature) is set. Even if the difference value is greater than 9999, Hy-1 or Hy-2 alarm will not be triggered.

#### 4.2 Dead band parameter "Hy"

Dead band parameter "Hy" is set to permits protection of position control output from high switching frequencies caused by process input fluctuation. Dead band parameter is used for position control. 4-alarm control as well as the position control at auto tuning

For example: "Hy" parameter can affect high limit alarm as the following, provided high limit alarm parameter "ALM1" is set as 800°C, "Hy" parameter is set as 2.0°C

- Controller is in normal status at the beginning. When the process value is greater than 802°C (ALM1+Hy), the high limit alarm can be triggered.
- controller is in normal status at the beginning. When the process value is less than 798°C (ALM1-Hy), the high limit alarm can be canceled.

#### 4.3 Control mode parameter "At"

**At=0** ON /OFF control, suitable for the occasions which don't need high precision.

**At=1** It is improved on the basis of PID control and fuzzy control, having more extensive adaptabilities with the process, and this can get a good control to processes .Under the situation, "At" function can work by setting the panel.

**At=2** Auto-tuning function is enabled.(points for attention have been described in preceding text.) When completing the setting, "**At**" is set to 3 automatically.

**At=3** Artificial-intelligence adjusting. The state is automatically set after auto-tuning completing. On this setting, start-up of auto-tuning from the front panel is inhibited to prevent the same function again.

#### 4.4. Control action explanations

##### 4.4.1 "P", "I", "D"

###### (1) Proportional band "p"

Proportional action is the action which the control output varies in proportion to the deviation between the setting value and the processing temperature

If the proportional band is narrowed, even if the output changes by a slight variation of the processing temperature, better control results can be obtained as the offset decreases.

However, if the proportional band is narrowed too much, even slight disturbances may cause variation in the processing temperature, control action changes to ON/OFF action and the so called hunting phenomenon occurs.

Therefore, when the processing temperature comes to the balanced position near the setting value and a constant temperature is maintained, the most suitable value is selected by gradually narrowing the proportional band while observing the control results.

###### (2) Integral time "I"

Integral action is used to eliminate offset When the integral time is shortened, the returning speed to the setting point is accelerated However, the cycle of oscillation is also accelerated and the control becomes unstable.

###### (3) Derivative time "D"

Derivative action is used to restore the change in the processing temperature according to the rate of change. It reduces the amplitude of overshoot and undershoot width .

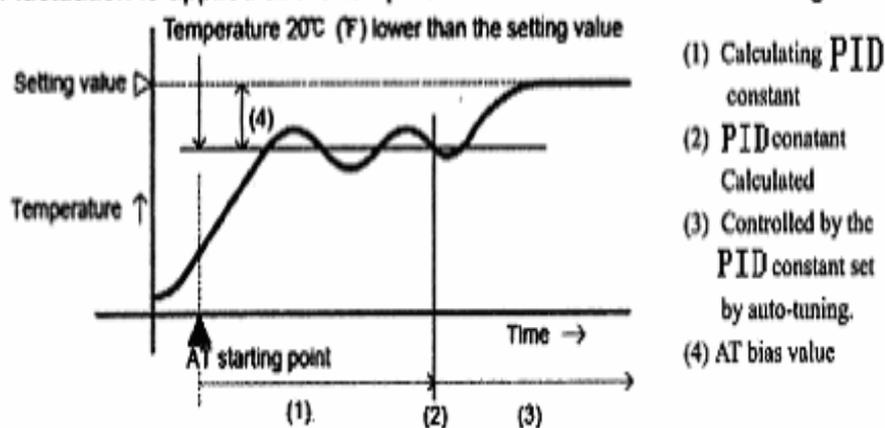
If the derivative time is shortened, restoring value becomes small, and if the derivative time is made longer, an excessive returning phenomenon may occur and the control system may be oscillated

##### 4.4.2 PID auto-tuning of this controller

In order to decide each value of P, I, D and ARW automatically, this system forcibly fluctuates the object being controlled.

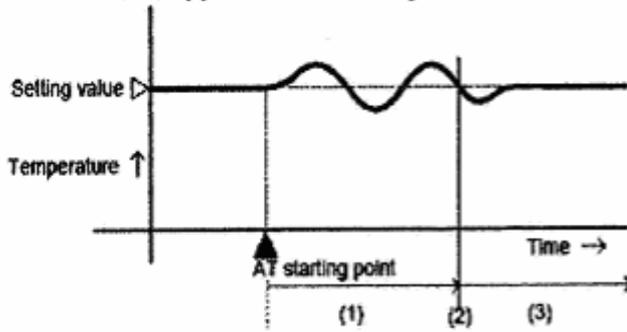
###### (1) When the difference between the setting value and processing temperature is large as the temperature rises.

Fluctuation is applied at the temperature 20°C lower than the setting value.



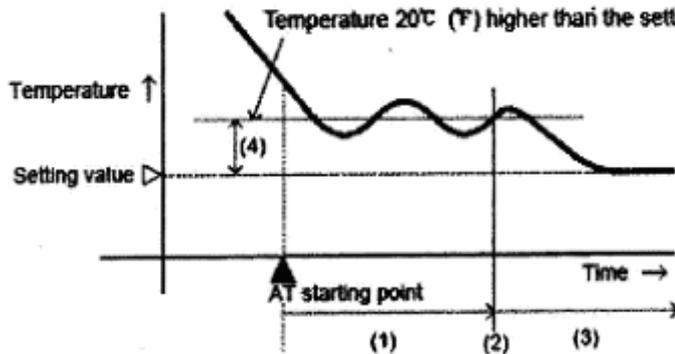
(2) When the control is stable or when control temperature is within  $\pm 20^{\circ}\text{C}$  of setting value.

Fluctuation is applied at the setting value.



- (1) Calculating PID constant
- (2) PID constant Calculated
- (3) Controlled by the PID constant set by auto-tuning.

(3) When the control temperature is  $20^{\circ}\text{C}$  or higher than the setting value. Fluctuation is applied at the temperature  $20^{\circ}\text{C}$  higher than the setting value.



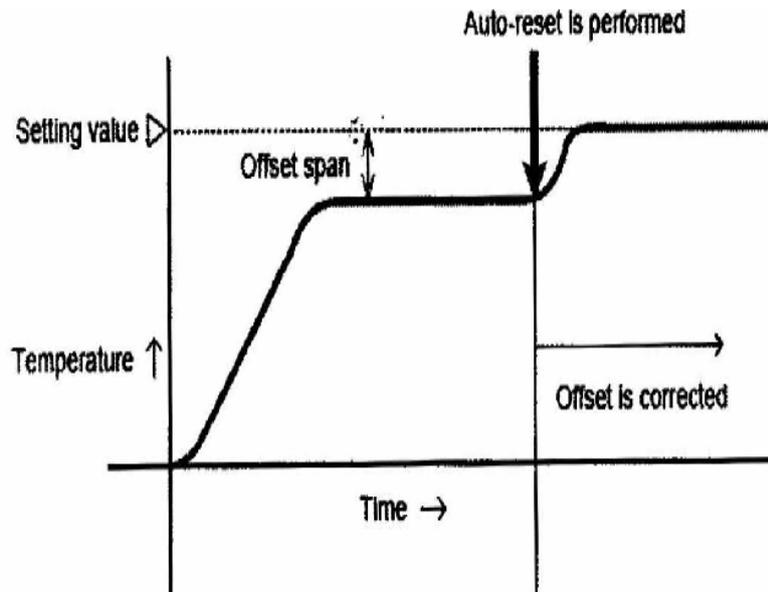
- (1) Calculating PID constant
- (2) PID constant Calculated
- (3) Controlled by the PID constant set by auto-tuning.
- (4) AT bias value

#### 4.4.3 Auto reset (offset correction)

Auto-reset is performed to correct the offset at the point at which PV indication is stabilized within the proportional band during the PD action

Since the corrected value is internally memorized. It is not necessary to perform the auto-reset again as long as the process is the same.

However, when the proportional band is set to 0, the corrected value is cleared.



#### 4.5 Control period "t"

Parameter "t" can be set between 0 and 120 seconds. It represent the calculate speed of the

controller When  $t$  increased, proportion function will be increased and derivative function will be decreased. If  $t \geq 5s$ , derivative function is absolutely eliminated, then the system is a proportional or proportional-integral system The change of this parameter will nearly have no influence to the system if  $t$ . is less than 1/5 of its original value.

**The following principle is for adjusting parameter "t"**

- In case of time proportional output mode, if SSR (Solid state relay) or PBR is used as executive bodies, then control period can be set smaller (generally 0.5 through 2 seconds) to improve control precision. If relay contact output is used, then parameter "t" should be set to be larger than or equal 4 seconds generally, because a small value set will decrease service life of mechanical contacts. A large value set will increase service life of relay, but will decrease control precision, so select a value to satisfy both sides.

- In case of liner current output, decreasing parameter "t" will speed up output responsibility and improve control precision, but will lead to frequently changed output current and arising there from frequent movement of executive bodies (ex. Control value).

Now increasing parameter "t" appropriately will make value move smoothly.

**4.6 Input specification parameter "Sn"**

The controller is available with varied input function. Different input type such as thermocouple and RTD can be selected in the same controller through parameter setting. Automatic non-linear calibration of high precision for thermocouple and RTD is available in the controller, with measurement input accuracy less than 0.2%F.S. The following table shows input specification corresponding to the set value of parameter Sn .

Sn	Input spec.	Sn	Input spec.
0	K	5	J
1	S	20	Cu50
4	E	21	Pt100

**4.7 Decimal point setting parameter "dP"**

In case of thermocouple or RTD input, dP is used to define temperature display resolution.

**dP=0** , temperature display resolution is 1°C.

**dP=1** , temperature display resolution is 0.1°C.

Adjustment of this parameter only affects the display, and gives no effect on control or retransmission output because the internal temperature measurement resolution is fixed at 0.1°C, then temperature will be display at resolution of 0.1°C: for input below 1000°C and 1°C for input over 1000°C

**4.8 "P-SL" and "P-SH": Scale definition parameter for linear input/retransmission output**

Parameter "P-SL" and "P-SH" are used to define the display span for linear input, and to set the engineering unit for measurement. In case of thermocouple or RTD input Parameter "P-SL" and "P-SH" are not used.

**4.9 Input shift parameter "Pb"**

Parameter "**Pb**" is used to make input shift to compensate the error produced by sensor or input signal itself.

For thermocouple input, parameter "**Pb**" is used to correct reference junction compensation error.

The controller itself will not produce error after a long time used, because the technology of

digital calibration is used in the controller to substitute potentiometer of bad stability, and function of automatic zero modulation will guarantee no zero drift produced in the controller.

Parameter "**Pb**" is used to make input shift to compensate the error produced by measurement. For example, provided input signal keep unchanged, if when parameter "**Pb**" is set to 0.0°C. the temperature measurement of the controller is 500.0°C, then when parameter "**Pb**" is set to 10.0°C. the temperature measurement display will be 510.0°C .

**Note: controller are all calibrated before delivering, and so the default value of parameter "Pb" is zero. Only adjust this parameter when recalibration of measurement is necessary.**

#### **4.10 Output definition parameter "OP-A", "outL" and "outH"**

Parameter "**OP-A**" is used to define the mode of main output signal, and parameter "**outL**" and "**outH**" is used to define output low limit and high limit.

**Note: setting of parameter "OP-A" must conform to the module type installed as main output.**

● **OP-A =0**, the mode of main output is time-proportional output of on-off mode (for on-off control).

If output modules such as SSR voltage output, relay contact discrete output, BCR cross zero trigger output and BCR no-contact discrete output are installed as main output, then "**OP-A =0**" should set.

● **OP-A = 1**, any specification DC current output, continuous output mode. Linear current output module should be installed to main output.

● **OP-A = 2**, actuation is time proportional output of on-off mode.

● **outL, outH**, They restrain minimum value and maximum value of adjust output respectively.

If linear current output module is installed in the controller as auxiliary function module, then parameter "**outL**" and "**outH**" is used to define the scale of liner current for the corresponding retransmission output. And parameter "**outL**" is used to define output low limit and parameter "**outH**" is used to define output high limit The unit is 0.1mA. For example, if a 4-20mA retransmission output need is defined, then you can set like below: **outL =40**, **outH =200**.

#### **4.11 Alarm output definition parameter "AL-P"**

- Setup "AL-P" =17
  - "ALM1" is High limit alarm;
  - "ALM2" is Low limit alarm;
  - "Hy-1" is Positive deviation alarm;
  - "Hy-2" is Negative deviation alarm.

#### **4.12 Function parameter "Cool"**

Parameter "**Cool**" is used to select some system functions

● **Cool =0**, reverse action control mode. When this mode is selected, an increase in PV results in decrease in control output .Ex, heating control.

● **Cool =1**, direct action control mode. When this mode is selected, an increase in PV results an increase in the control output, Ex. cooling control.

#### **4.13 Communication interface related parameters "Addr" and "bAud"**

When RS232C or RS485 communication interface is installed as auxiliary function, parameter "Addr" and "bAud" is used to define the communication address and baud rate define respectively for communication modules in the controller.

#### 4.14 Digital input filter parameter "FILT"

If input fluctuates engender due noise, then digital filter can be used to smooth the input. Parameter "FILT" may be configured in the range of 0 to 20, among which, 0 means no filter, 1 means intermediate-value filter and 2-20 means that intermediate-value filter and second order integral filter can be selected simultaneously.

The multiples of second filter is the square parameter "FILT", and can be up to hundreds times. When a large value is set, the measurement input is stabilized but the responsibility at the time is deteriorated. Generally if great interference exists, then you can increase parameter "FILT" gradually to make momentary fluctuation of measurement input less than 2 to 5 values. If the controller is being tested at laboratory, then parameter "FILT" should be sit to 0 or 1 to shorten the time responsibility.

#### 4.15 Operation condition parameter "A-M"

Parameter "A-M" is used to define Auto /Manual status, as below:

- A-M =0 Manual control mode
- A-M =1 Automatic control mode
- A-M =2 Automatic control state ,in this state manual operation is prohibited.

#### 4.16 Privilege for parameter setting "Lock"

When parameter "Lock" is set as 808,you can set all the parameters, while Lock is set the other value ,then you only can set 1~8(EP1~EP8) field parameter and Lock value itself.

Parameter Lock provides several operation privileges, as following:

- Lock=0, allowed to modify field parameters, and set point is allowed.
- Lock=1, allowed to display and view field parameters, and to set point. But the modification of field parameters (except parameter Lock itself) is allowed.
- Lock=2, allowed to display and view field parameters, and to set point. But the modification of field parameters (except parameter Lock itself) is not allowed.
- Lock=808, allowed to set all parameters

If Lock is set to other values than the above mentioned, the result may be one of those above mentioned, and most of them are the same as when Lock=1 is set.

If you set Lock to be 808 during field parameter (EPI-EP8) setting, parameter Lock will automatically turned to be 0 when you finished setting field parameter, but if you set Lock to be 808 after the parameters are unlocked, parameter Lock will be saved as 808 permanently.

#### 4.17 Field parameter definition: "EP1-EP8"

EP1-EP8 define 1-8 field parameters for operators use in parameter table. Their parameter values are parameters except parameter EP itself like "ALM1", "ALM2", etc. when Lock is set to 0,1,2, and so on. Only parameters or setting values of program defined can be displayed, other parameters can not be displayed and modified. This function can speed up the parameter modification and prevent important parameters (like input, output parameters) from modifying falsely.

Parameters from EP1 to EP8 can define 8 field parameters at most, if the number of field parameters is less than 8 (sometimes even none), it is necessary to define useful parameters from EP1 to EP8 in order, the first parameter which are not used is defined as none. For example, two parameters of "ALM1" and "ALM2" need to be modified by field operators, the parameter EP can be set as following:

**Lock=0, EP1=ALM1, EP2=ALM2, EP3=nonE.**

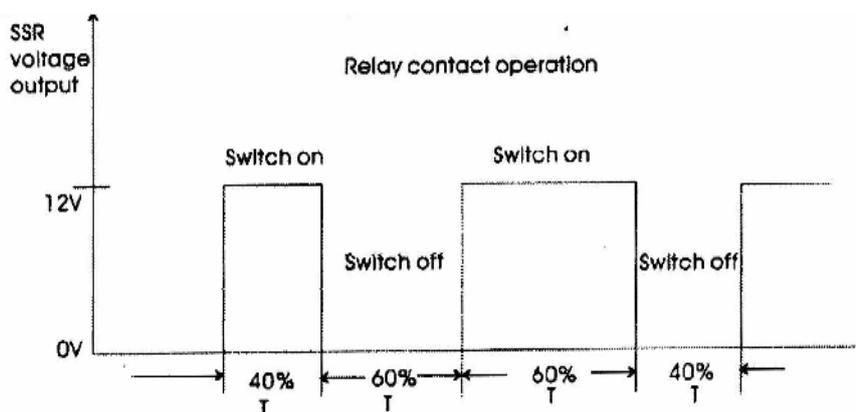
Sometimes field parameters are not needed after we finish adjusting the controller , we can set EP1 parameter as nonE.

## 5. Additional remarks of Time proportional output (when OP-A=0):

In case of time proportional output mode, the output value can change by adjusting, during a fixed base period, the ratio of relay on-off time (or the ratio of the time during which SSR high voltage output or low voltage output is activated).

Time proportional output can be regarded as a square wave, the base period of which equals to control period "T", and the output value of which direct proportional to the on-off ratio of the square wave. The on-off ratio may be configured to be in the range of 0% to 100%. For special applications, the range of time proportional output can be clamped by tuning parameters "outL" and "outH". For example, if the output need to be clamped to between 20% and 60%, then "outL=20, outH=60" may just be set. Normally in case of time proportional output, if "outL=0, outH=100" is set, there will be no output limit.

Below is a schematic diagram for time proportional output (waveform respectively for output being 40% and 60%)



## 6. Further description about general work mode:

### 6.1 ON-OFF control (simple temperature controller)

Dead band of ON-OFF control can be set by parameter "Hy". When controller are used for ON-OFF control, it should be set as below:  $t=0$ . OP-A=0

Parameter for artificial intelligence control, such as P, I, D and T, have no function in this occasion.

LocK=1 : inhibit the modification of field parameters, and the display and modification of other parameters.

EP1=nonE: field parameters are not defined.

### 6.2 3-point (high, low alarm) control

To make the controller have high, low alarm function, the parameters should be set as below:

At=0, OP-A=2, COOL=0, AL-P=17, LocK=0, EP1=ALM1, EP2=none

