SD Series Users' Manual

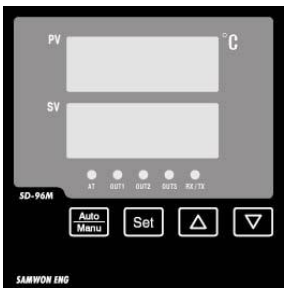
1 Model Types ① ②③④⑤⑥

SD-96 M R R R N

①Dimension	②Input	③OUT1	④OUT2	⑤OUT3	⑥Communication
96 : W96*H96 94 : W96*H48 49 : W48*H96 72 : W72*H72 48 : W48*H48	M : Multi (Same for all models)	R:Relay Output A:Current Output S:SSR Output	R:Relay Output A:Current Output S:SSR Output	R:Relay Output S:SSR Output	N:No Communication 2:232Comm. 4:422Comm. 8:485Comm.

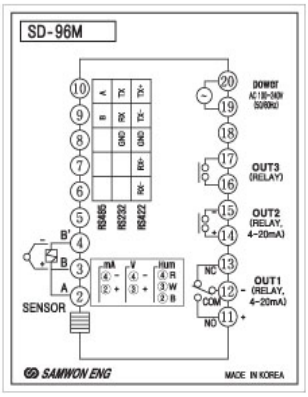
2 Dimension & Connection Diagram

SD-96M



External Dimension 96(L)*96(W)*107(D)

Panel Dimension 90*90(+0.6)



(SD-96M Connection Diagram)

SD-49M

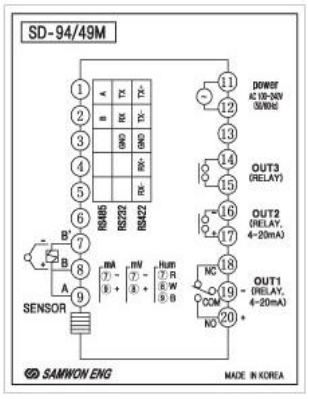
External Dimension 48*96*107

Panel Dimension 45*90(+0.6)

SD-94M

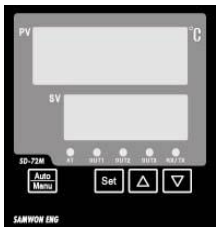
External Dimension 96*48*107

Panel Dimension 90*45(+0.6)



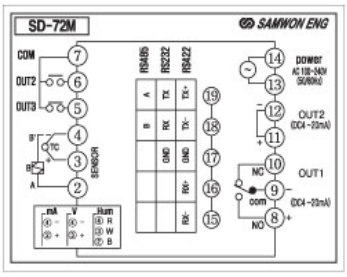
(SD-94/49M Connection Diagram)

SD-72M



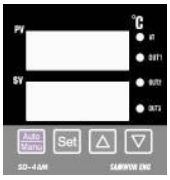
External Dimension 72*72*107

Panel Dimension 68*68(+0.6)



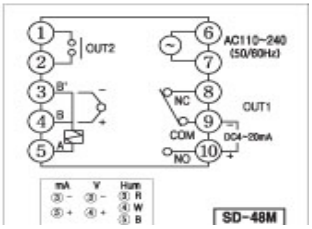
(SD-72M Connection Diagram)

SD-48M



External Dimension 48*48*117

Panel Dimension 45*45(+0.6)

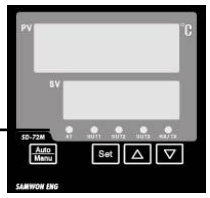


(SD-48M Connection Diagram)

3 Name & Function of Each Part

(LED Lamp's Usage)

AT:Flashing(Auto Tuning)
OUT1 : Output 1
OUT2 : Output 2
OUT3 : Output 3
RX/TX : Communication



Button Type	Use & Function
Auto Manu	▶If press it for 3 sec, Auto Tuning will proceed ▶If press it for 3 sec during auto tuning, tuning will stop
Set	▶If press it once, SV will flash. At that time, SV value change by ▲ ▼ button ▶If you press it for 3 sec, enter to and return from output group
▲ ▼	▶Move among parameters in the group, if you press it once after entering output group ▶Each function value change ▶Change fast if you press longer than 3 sec
Set + ▲	▶Enter to input group if you press both buttons for 3 sec at the same time ▶Press only SET buton for 3 sec when returning from input group

4 Input Type and Range

Input Singal	Input Type	Input Code	Range	Grade
Resistance Thermometer	PT	PT	−200~600.0	±0.2% of total range
Thermocouple	K	K	−200~1370	±0.3% of total range
	E	E	−200~1000	
	J	J	−200~1200	
	T	T	−199.9~400.0	
	R	R	0~1700	
	B	B	600~1800	
	S	S	0~1700	
	C	C	0~2300	
Humidity Sensor	HUM	HUM	0.0~99.9	±0.3%(Valid Measure Range)
DC Voltage	1-5V	V15	−1999~9999	
	0-10V	V10	−1999~9999	
DC Current	4-20mA	MA20	−1999~9999	

*Digital Letters on the Product's Display are as belows.

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		
									없음				

5 Alarm : Select & Use the appopriate alarm among A1~A6 at OUT2,3 of output group.

Code	Alarm Type	Operation Type
A1	Absolute Alarm Top	▶ Operating above the setting value for the alarm Example) If SV is set at 100 and A1(Absoluet Alarm "Top") is set at 120, the alarm will work at over 120. Even if you change SV setting value, 120 of Absolute Alarm "Top" is fixed that is called "Absolute Alarm"..
A2	Absolute Alarm Bottom	Operating at below Alarm Setting Value
A3	Variation Alarm Top	▶Opeation at above the changed alarm value which is same as the changed SV value Example) If SV is set as 100 and Alarm setting value is set as 5, Alarm will work above 105. If SV is changed to 200, the alarm will operate above 205 that is called "deviation alarm"
A4	Variation Alarm Bottom	Alarm will operate below the changed alarm value which is the same changed SV value.
A5	Absolute Alarm Top & Bottom	▶Both of Absolute "Top" & "Bottom" working from one 'output' **A5H**: Absolute Alarm Top Value **A5L**: Absolute Alarm Bottom Value Example) If A5H is set at 100 and A5L is set at 50, Output ON will be made in both of above 100 and below 50.
A6	Variation Alarm Top & Bottom	▶Vairation Alarm "TOP" & "Bottom" working from one 'output' **A6H**: Variation Alarm "Top" value **A6L**: Variation Alarm "Bottom" value Example) If SV is set at 100 and A6H & A6L are respectilve set at 8 and 10, Output ON will be made over 108 and below 90. If SV setting is changed, the alarm will operate at the valume changed by same amount as SV setting change.

*AHYS (Alarm Histerics): If Alarm starting & finishing time are same, there will be relay vibration problem.
To prevent this problem, set the range of 1~30.

*D.AL (Waiting Alarm) : When Controller start to be operated, the displayed value is alredy in alarming range, the alarm signal does not work, When the value enters into the alarm range again after having entered once into normal range, the alarm signal will work. OFF: D.AL not used ON: D.AL used

6 Input Group

▶Input the configured value for the Input Group first when you prepare for the product's operation, because input group is the base of input type and control method.

▶Input Group Entry: Press "set" button & ▲ button for 3 sec at the same time ▶Return : Press set button for 3 sec.

▶Parameter shift among groups : Press "set" button once ▶ Value (Function) Change : Press ▲ ▼ button

▶ "- - ▶" : Parameter on the dotted arror route is not displayed, if the related funcion is not selected

set

Parameter	Function
IN Input Sensor	Available Input Sensor : PT,JPT,K,E,J,T,R,B,S,C,HUM V15, V10, MA20 **PONT** Decimal : Range 0~2 ex1) PONT:0 SCH :100 SCL:0 display 0~100 ex2) PONT:1 SCH :200 SCL:0 display 0.0~20.0 ex3) PONT:2 SCH :5000 SCL:0 display 0.00~50.00 **SCH** Display Range "Top": Set the display range "top" value **SCL** Display Range "Bottom" : Set the display range "bottom" value ▪Residence Thermometer : PT(DIN PT), JPT(JIS PT) ▪Thermocouple : K,E,J,T,R,B,S,C,HUM ▪Voltage: V15(1~5V), V10(0~10V) ▪Current: MA20(4-20mA) ▪Humidity Sensor: HUM (R(Red) , W(White) , B(Black) of connection diagram)
FILT	Measurement Value Filter (0~9) : Display Value can be fluctuated if it is installed at strong noise place, which is the characteristics of digital device. Function to reduce the fluctuation (higer value less fluctuation, when display speed is slowing down)
BIAS	Measurement Value Compensation(-50~50) : Compensate the error due to too long sensor wire or old sensor wire example 1) Display 60 if you set BIAS at 10, when the current measurement value is 50 example 2) Display 40 if you set BIAS at -10, when the current measurement value is 50
SETH	Limit the configuration range "Top": If you configure SETH value, SV value cannot be set above the SETH value
SETL	Limit Configuration Range "bottom": cannot be set below the configured value Example) If conigure at SETH:100 , SETL:-10, SV can be set between -10 and 100
COMM	Computer Remote Control : OFF(computer communcation not used) : ON(Communication used) ┌ ADR : Communication ID Number(assign 1~999 for each product) └ BPS : Communication Speed (Selection among 2400, 4800, 9600) *255 units of products can be connected with one computer **Refer to the HomPage for the protocol and monitoring program for demo
C--F	C : Celcius F : Fahrenhei
LOC	OFF : lock cancelled IN : Lock only Input Group ALL : Input & Output Group * If locking system is set as IN, ALL, it is possible to enter into the locking group, but impossible to change the value

7 Output Group

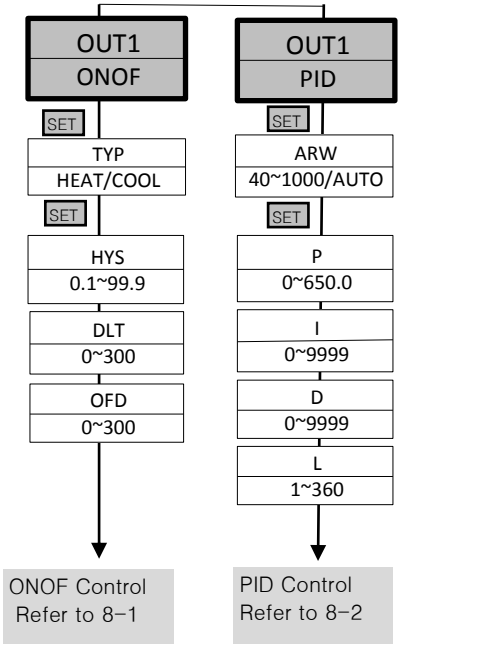
▶Press SET button for 3 sec when you want to finish the output group entry and setting.

▶Press SET button once for the move of parameter

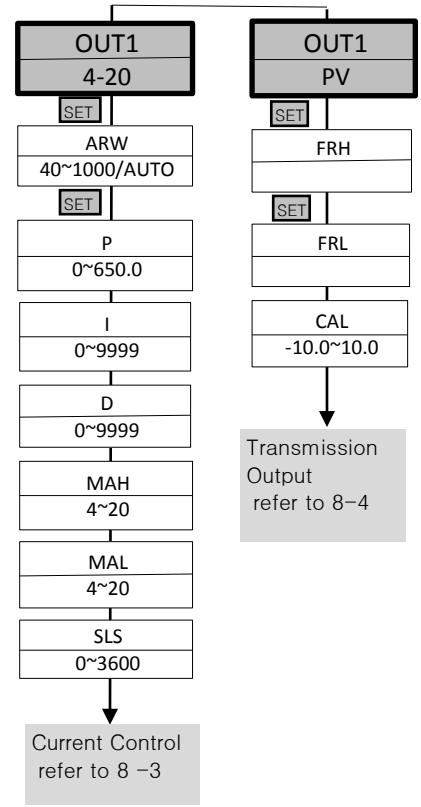
▶The change of value will be done by ▲ ▼ button.

OUT1

Relay Output (Basic Spec)

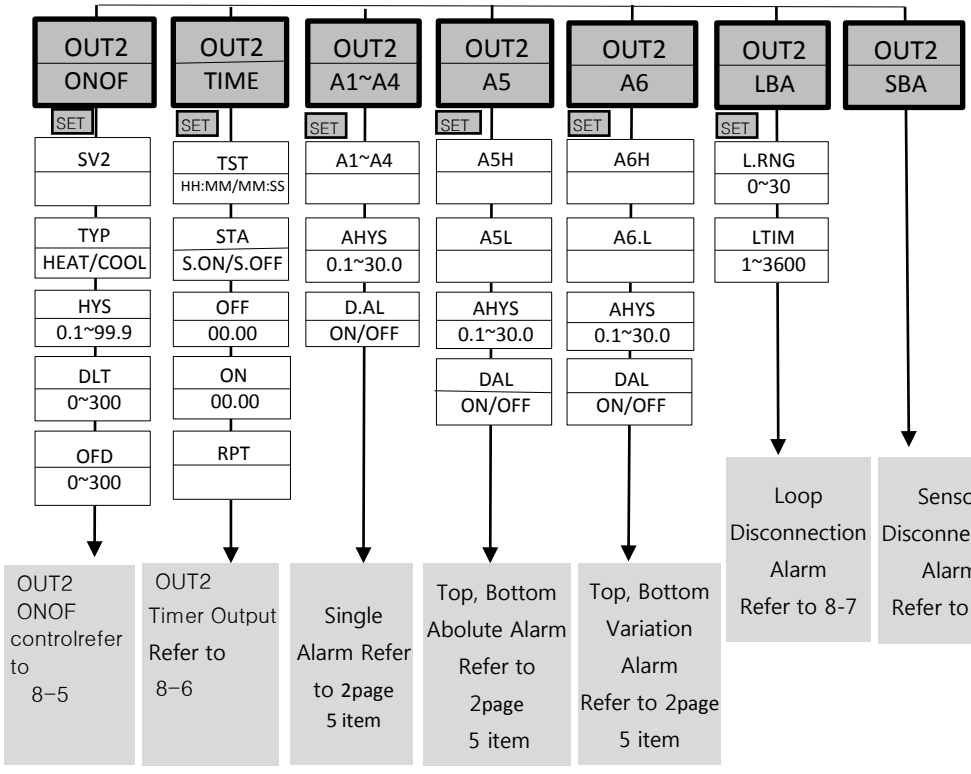


Current Output (Optional Spec)

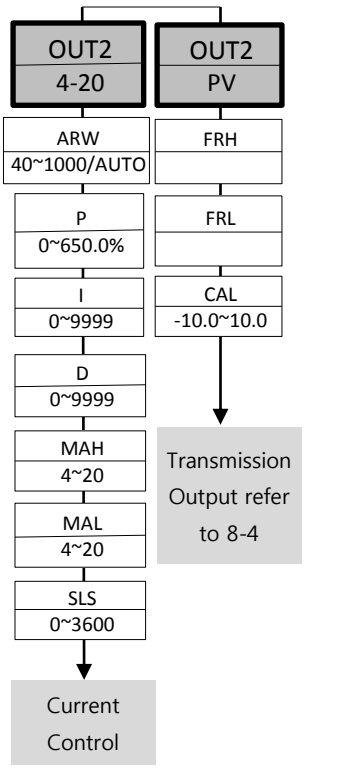


OUT2

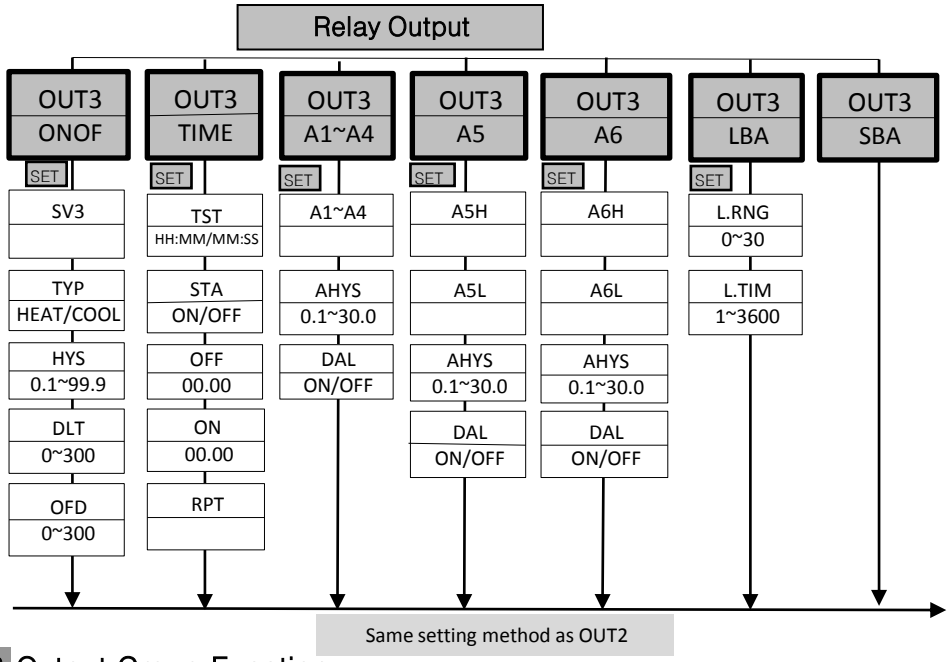
Relay Output (Basic Spec)



Current Output (Optional Sepc)



OUT3



8 Output Group Function

8-1. Relay Output ON/OFF Control

OUT1
ONOF

▶If press SET button for 3 sec, OUT1 in top window and one of ONOF and PID will be displayed.
▶If you wans ON/OFF control, configure as ONOF by pressing ▲ ▼ button one time by one time

TYP
HEAT/COOL

▶If you press SET button once after selecting ONOF in the previous stage, TYP in top window and one of HEAT and COOL in bottom window will be displayed.
▶By pressing ▲ ▼ buttons one time, you can set HEAT for heating control or COOL for cooling control

HYS
0.1~99.9

▶If press SET button 1 time after configuring TYP, HYS will be displaeyd at the top window and numbers of 0.1~99.9 will be displayed in the bottom window. HYS means the range between relay ON and relay Off.

DLT
0~300

▶If press SET button 1 time after configuring HYS, DLT will be displayed at the top window and numbers of 0~300
will be displayed in the bottom window. DLT will be working after a configrued delayed time (second) at DLT.

OFD
0~300

▶If press SET butoon 1 time after configuring DLT, OFD will be dsiplayed at the top window and number of 0~300
will be displayed in the bottom window. OFD will stop after a configured delayed time (second) at OFD.
(The related output display LED is flashing during the delayed time.)

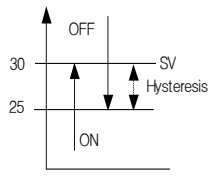


Figure 11-

*Case that SV is set at 30 and the other items are set as below

OUT1	→	TYP	→	HYS	→	DLT	→	OFD
ONOF		HEAT		5.0		15		8

▶Case to start the controller after setting as the above
-It will stop after 8 sec dealy from 30.0, after operating as heating type from 25.0 after 15 sec delay

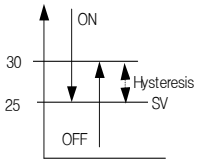


Figure 8-2

*Case that SV is set as 25 and the other items are set as the below

OUT1	→	TYP	→	HYS	→	DLT	→	OFD
ONOF		COOL		5.0		7		3

it will stop after 3 sec delay from 25.0, after operating as ON/OFF control cooling type from 30.0 after 7 sec delay.

8-2. Relay Output PID Control

OUT1
PID

▶If press SET button for 3 sec, OUT1 will be displayed in the top window and one of ONOF or PID will be displayed in the bottom window. If you want heating PID control, configure as PID by pressing ▲ ▼ button once by once.Move to the next step by pressing SET button once.

ARW
40~1000/AUTO

▶if select PID at the previous step and press SET button once, ARW in the top window and number in bottom window will be displayed.

▶Anti Reset Wind up : heaters with many over-shoot or very sensitive device, set the value manually by pressing ▲ ▼ buttons. In the case of device that is impossible to control precisely by auto function, use it by configuring the value manually (default value 180 at factory)

Range is 40~1000%. Lower number, weaker over-shoot. However, it is very slow to find the target point. If you set the value too high, it will be faster to find the target point but over-shoot happen.

Set the proper value for the current system.

*Except the special case, please use AUTO mode or default value (180).

P
0~650.0

▶Proportional Band: If you press SET button once after setting ARW, P in the top window, number of 0~650.0 in the bottom window are displayed.

▶If you execute Auto Tuning, appropriate PID value will be automatically saved after considering the current heating characteristics.

*If there is hunting or over-shooting during the normal process, please manage "P" value.

▪If you set P value lower, over-shoot will be reduced but the speed will be getting slower.

▪If you set P value higher, over-shoot will be increased and the speed will be getting faster.

I
0~9999

▶Integral Value: When the slow hunting happens, please make the I value higher or P value lower a little.

D
0~9999

▶Differential Value : When the small periodic hunting happen, please make D value lower.

* In the case of special cases, set I or D Value. In general, you can control appropriately by the value of Auto tunning.

L
1~360

Control Period Cycle: time for repeating output ON and OFF once by once.

If you set this cycle short, you can control precisely, but the relay life time will be reduced. (10~30sec is proper)

8-3. Current Output (Optional Spec)

OUT1
4-20

▶In the case that Output 1 is ordered as Current Output, one of 4-20 or PV will be displayed when pressing SET button for 3 sec.

▪ Use the Current Control by selecting 4-20 with ▲ ▼ button.

▪4-20 is heating current control output. (if you want 1-5V Voltage control, Connect 250Ω registance to both ends of output point)

ARW
40~1000/AUTO

▶If press SET button once after selecting 4-20 in the previous step, ARW in the top window and AUTO in the bottom window will be displayed.

The setting mehtod is same as ARW of 8-2's relay PID control.

P
0~650.0

▶If press SET button once after configuring ARW in the previous step, P in the top window and the number of 0~650.0 in the bottom window will be displayed.

If you execute Auto Tuning, appropriate PID value will be automatically saved after considering the current heating characteristics.

▶P:Proportional Value of Current Control ▶I:Integral Value of Current Control

▶D:Differential Value of Current Control

*P,I,D value will be automatically calculated and saved if Auto Tuning is excuted.

*If OUT2 is ordered as current control, the setting method is same as OUT1 Current Control and SV value is controlled by SV of OUT1.

(Caution) When auto tuning OUT2, PID or 4-20 should be configured at OUT1.

MAH
4~20

▶Function to limit the ceiling value of 4-20 current output.

Example) if you set MAH as 15, the maximum current value will not be higer than 15mA.

MAL
4~20

▶Function to limi the lowest value of 4-20 current output.
Example) If you set MAL as 8, the lowest current value will not be lower than 8mA.

SLS
0~3600

▶Time to take from the first current to maximum current, that operates the controller as the slow start function.
▶It is used for the device, which can be damanged by too much current during starting operatio
▶ if you input the time, it means the time to take to reach maximum (20mA). (Unit : Second, Range : 0~3600)
Exmaple) If you set SLS as 60, it will take 60 seconds for current value to reach 20mA,

8-4. Transmission Outpu (Optional Spec)

OUT1
PV

▶When OUT1 is ordered as current output, OUT1 in the top window and one of 4-20 or PV in the bottom window will be displayed if pressing SET button for 3 sec.
Select PV for using transmission output.

FRH

▶Transmission Output "Top" value

FRL

▶Transmission Output "Bottom" value
Example) When setting FRH:100, FRL:0, 4mA and 20mA Current will be output respectively at 0℃ and 100℃.

CAL
-10.0~10.0

▶Function to compensate the current error when the current error happens at the transmission output.
▶If you put 1.00, 1mA will be increased. If you put -1.00, 1mA will be decreased.
▶The setting method of OUT2 transmission oupt is same as OUT1's one. .

8-5. OUT2 ON/OFF Control

OUT2
ONOF

▶If you set OUT1, move into OUT2,
▶In the case that OUT2 is relay output, one of ONOF,TIME,A1~A6,LBA, or, SBA will be displayed.
▶Set ONOF in the case that OUT2 is used as ON/OFF.

SV2

▶if you press SET button once after setting OUT2 as ONOF, SV2 in top and the target value in bottom will be displayed.
SV2 is the target value of OUT2, which is separate SV (OUT1' target value).
It is separately working not related to OUT1. In the case of TYP,HYS,DLT, setting method is same as OUT1.

8-6. OUT2 Timer Outpu

OUT2
TIME

▶In the case that OUT2 is used as timer, set one of ONOF,TIME,A1~A6,LBA,SBA as TIME by pressing ▲ ▼ button once by once.

TST
HH:MM/MM;SS

▶Set hour, minute, second unit
HH.MM(99hours 59minutes), MM.SS(99minutes, 59seconds)

STA
S.ON/S.OFF

▶Set Start type
S.ON:start from ON,
S.OFF:start from OFF

OFF
00.00

▶Stopping Time of Timer Output

ON
00.00

▶Operating Time of Timer Output

Timer Operation Example:
Example 1) TST: HH.MM , STA:ON , OFF:00.50, ON: 00.30, RPT: 10 - Power On-50mintues stop after 30 mintues operation from ON time at the same time of operation, which will be repeated 10 times.
Example 2) TST: MM.SS , STA:OFF, OFF:00.20, ON: 00.40, RPT: 0 - Power on-40 seconds operation from ON time at the same time of operation after 20 seconds stop, which will be repeated endlessly
Example 3) TST: HH.MM , STA:ON , OFF:00.00, ON: 08.00, RPT: 1 - Power on - after 8 hours timere operation from ON time at the same time of operation and stop

RPT

▶Repeating number of Operationg & Stop
1:Repeat Once, 100:Repeat 100 times, 0:Repeat indefinitely

8-7. OUT2 LBA Output

OUT2
LBA

▶Press ▲ ▼ button once by once, in order to set LBA(Loop Break Alarm)

L.TIM
1~3600

▶If you press SET button once after selecting LBA, LTIM in top and Time in bottom window will be displayed.
L.TIM : Loop Break Monitoring Time

L.RNG
0~30

▶L.RNG : Alram Range

Example) L.TIM:60 L.RNG:2

▪ It will oplerate, if the detected temperature is not changed more than 2℃ or the temperature is changed in reverse way when heater or cooler operated for 60 seconds on 100% ON.

LBA (Loop Break Alarm) : function to check whether the controlled device has problem or not

If there is no temperature change as much as set during LBA setting time through monitoring the temeprature by temperature sensor after controller send the operation signal, LBA output will be ON.

▶The major reason when LBA is ON

①disconnection or break of sensor wiring (*LBA will be immediately ON when "----" is displayed due to the break of sensor wiring) ②Problem with the external device such as magnet, sub relay etc.

③Abnormal load on heater, Cooler etc ④Disconnection, worng connection or damage of external wiring.

▶If LBA output is ON, this alarm will be continuously ON even if the problem is solved. (In order to operate properly, please switch off and switch on again. .

8-8. Sensor Break Alarm (SBA) :If select SBA at OUT2,3, it will be Sensor Break Alarm.

SBA **(Sensor Break Alarm) :**

The sensor is disconnected or unmatchable sensor is conntected, "----" will be displayed at PV in the top window, and SBA output will be made. If sensor is normally connected, SBA ouput will stop.

* If you connect the thermocouple seonsor, of which feactures are different from the sensor type set at IN of Input Group, it will be recognised as no sensor disconnection.

9 AUTO TUNING

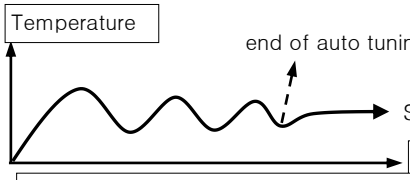
PID Auto Tuning is the control preparation for the response characteristics and precise control. It is to calculate PID modification number for the optimal control and to set the value, by measuring the thermal characteristics and thermal response speed of various controlled device.

▶It should be done at the first stage after attaching the controller. .

▶It operates by pressing autotuning button for 3 sec that is placed in the front part of the product..

▶Tuning stop when up and down repeat 3 times like the right figure

▶Press autotuning buttone for 3 sec during tuning process, in order to stop.



*Auto tunning will be finished, after repeating 3 timies of OFF over 2℃ of SV value after ON below 2℃ of SV value.

10 Cautions & Prodct Specification

Input type RTD : PT100Ω
TC : K, J, R, S, B, E, T, C
Humidity Sensor : HUM
DC voltage : 1-5V, 0-10V DC Current: 4-20mA
*When using DC voltage input, use 1.2K ohm resistor at both end of input sensor
(In the case of no-resistor, the numbers are displayed even if the seonsor is not connected to input part.)
.0~10V : Disconnected to Input part (1.2K use) - Display the minimum value
.1~5V : Disconnected to input part (1.2K use) - Display - - - - - -
Sampling Period 250mS
Allowable Signal Source Resitance Thermalcouple:100Ωbelow
Votage :2KΩbelow
Allowable LIne Resistance resitance thermometer: 5Ω below (conductor residence of 3 lines should be same)
Allowable Input Voltage Within ±10V
Standard Contact Point Error ±1.5℃ (15~35℃) ±2.0℃ (0~50℃)
Relay Control Output Contact Point Capacity (Main): 240VAC 5A, 30V DC 5A(Resistor Load)
Relay Life Cycle: Mechanical over 1M times Electrical over 30K times

11 Cooling PID Function (Used only for special case, so that it is not displayed in general setting to avoid users' confusion.)

11-1 CPID Control (Cooling PID Control)

OUT1
CPID

▪CPID will be displayed if pressing only DOWN button continuously 7 times after selecting ONOF by DOWN button,

when entering into Output Group by pressing SET button more than 3 seconds.

▪The detailed function is same as heating PID control's one.

▪Return to Main Screen by pressing SET button for 3 sec, after finishing the configuration

11-2. 20-4 Control (Cooling Current Control)

OUT1
20-4

▪For the cooling current control, enter into the output group by pressing SET button for more than 3 seconds.

Now, 20-4 will be displayed when pressing only DOWN button continuosly 7 times after selecting 4-20 by UP,DOWN button.

▪The detailed function is same as 4-20 current control's one.

▪Cooling Current Control can be used at OUT2. The entry method is same.