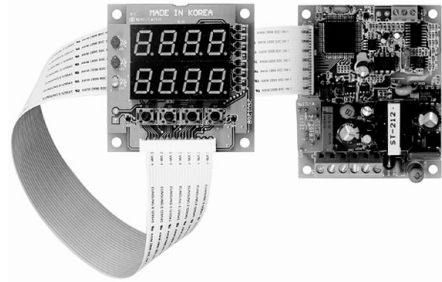## Dual PID control board type
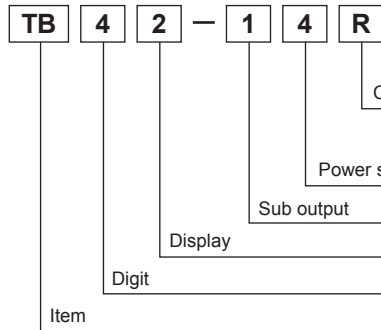
▣ Features

- High quality and economical product
- Convenient organization of panel to use
- Dual PID control
- Time reservation

⚠ Please read "Caution for your safety" in operation manual before using.

CE

▣ Ordering information

| TB | 4 | 2 | — | 1 | 4 | R |

R	Relay output	
S	SSR drive output	
C	Current output(DC4-20mA)	
N	PV Transmission output(DC4-20mA)	
4	100-240VAC 50/60Hz	
1	Event 1 output type	
2	2 Display	
4	9999(4digit)	
TB	Temperature Controller Board	

Control output
Power supply
Sub output
Display
Digit
Item

※PV transmission output type does not have Event 1 output.

▣ Specifications

Model		TB42-14R	TB42-14S	TB42-14C	TB42-14N
Power supply		100-240VAC 50/60Hz ±10%			
Power consumption		Max. 5VA			
Display method		7 Segment(PV: green, SV: red) LED method			
Character size(W×H)		8×10mm			
Input type	RTD	DPt100Ω [Allowable line resistance is max. 5Ω per a wire]			
	Thermocouple	K(CA), J(IC) [Tolerance outer resistance is max. 100Ω]			
Control output	Relay	250VAC 3A 1a	—	—	—
	SSR	—	12VDC ±3V 30mA Max.	—	—
	Current	—	—	DC4-20mA (load 600Ω Max.)	—
	Transmission	—	—	—	DC4-20mA (load 600Ω Max.)
Sub output		• Event 1 output: Relay output(250VAC 0.5A 1a) • Event 2 output: OK monitoring display by LED			
Control method		ON/OFF control, P, PI, PD, PIDF, PIDS control			
Setting type		Front push buttons			
Display accuracy		F.S ± 0.3% or 3℃, select the higher one			
Hysteresis		1 to 100℃(0.1 to 100.0℃) variable (at ON/OFF control)			
Proportional band (P)		0.0 to 100.0%			
Integral time (I)		0 to 3600 sec.			
Derivative time (D)		0 to 3600 sec.			
Control cycle (T)		1 to 120 sec.			
Sampling period		0.5 sec.			
Dielectric strength		2,000VAC 50/60Hz for 1 minute(Between input and power terminal)			
Vibration		0.75mm amplitude at frequency of 10 to 55Hz(for 1 min.) in each of X, Y, Z directions for 2 hours			
Relay life cycle	Main output	Mechanical: Min. 10,000,000, Electrical: Min. 100,000(250VAC 3A resistive load)			
	Sub output	Mechanical: Min. 20,000,000, Electrical: Min. 200,000(250VAC 0.5A resistive load)			
Insulation resistance		Min. 100MΩ (at 500VDC megger)			
Noise resistance		±2kV the square wave noise(pulse width: 1μs) by the noise simulator			
Memory retention		Approx. 10 years (when using non-volatile semiconductor memory type)			
Environment	Ambient temperature	-10 to 50℃, storage: -20 to 60℃			
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH			
Approval		c⦿Nus			
Unit weight		Approx. 113.5g			

※Environment resistance is rated at no freezing or condensation.

TB42 Series

◨ Connections

※RTD: DPt100Ω, JPt100Ω(3-wire type)　※Thermocouple: K, J

RTD A
B
T.C
B'
−
+
SENSOR

① ② ③

Power
⑨
⑧
⚠ SOURCE
100-240VAC 50/60Hz

Sub output
⑦
⑥
EVENT1:250VAC 0.5A 1a

Main output
⑤
④

Relay output	SSR drive output	Current output	Transmission output
●CONTACT OUT: 250VAC 3A 1a RESISTIVE LOAD	●SSR OUT: 12VDC ±3V 30mA Max.	●Current OUT: DC4-20mA Load 600ΩMax.	●PV transmission OUT: DC4-20mA Load 600Ω Max.
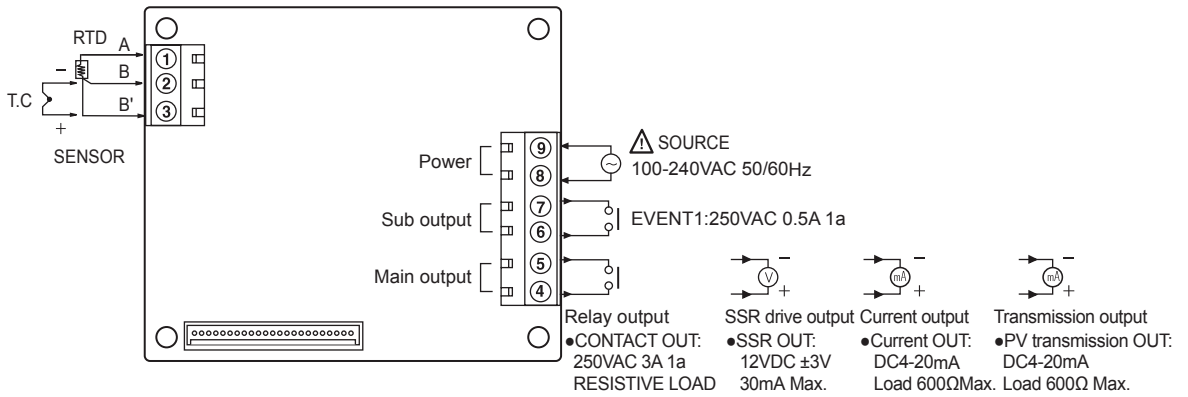
◨ Dimensions

(unit: mm)

● **Display part**

16.5
1.2
15.5
52
60
MD
52
60
4-Ø4

● **Control part**

70
78
57
65
4-Ø4

● **Layout**

60
65
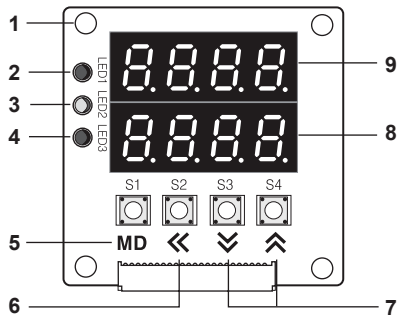60
Display part
Cable 20P
Length: 300
Control part
78
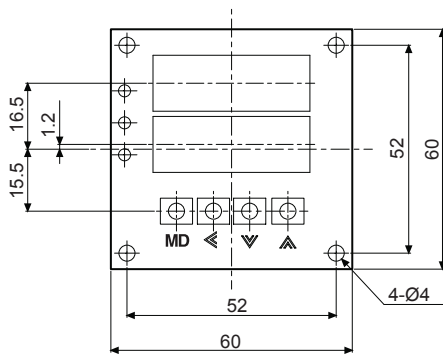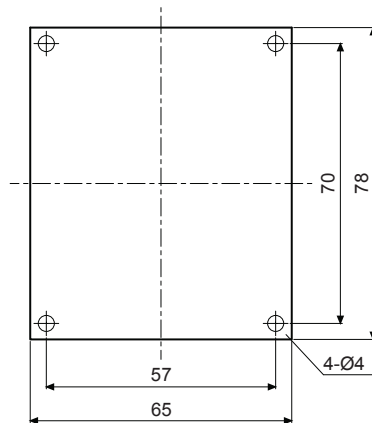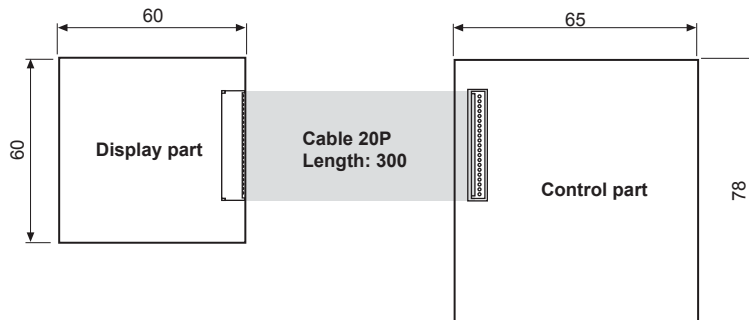
※Cable length is 300mm.
※The size of board is based on user's application. (customizable)

Autonics

▣ Parts description

1. Mounting hole(Ø4.0mm)

2. Main output operation display LED(LED 1)
It indicates the operation status of control output and displayed on "LED 1".
But when it is current output or retransmission output "LED 1" does not operate. (LED indication is OFF)

3. Event 1 output operation display LED(LED 2)
It indicates the operating status of alarm output and displayed on "LED 2".

4. O.K monitor operation display LED(LED 3)
It indicates the operating status of alarm output and displayed on "LED 3".
After setting alarm output in Event 2, if execute Auto-tuning, O.K monitor operation will be displayed after AT function.
(it flashes during AT function, and turns OFF after completing AT function)

5. Mode key(S1)
It is used to enter into every parameter group or move to other parameters. It is "S1" on this PCB.

6. Shift key(S2)
It is used when change the setting value or move to digit at the parameter. It is "S2" on this PCB.

7. Up / Down key(S3/S4)
It is used when change the setting value or select setting function.
Up key is "S4" and Down key is "S3" on this PCB.

8. SV display part
The setting temperature is displayed in red LED.
But when timer function is used, the setting time will be displayed at t-5u.
If time function is OFF, it will return to the setting temperature.

9. PV display part
It displays measured temperature in green LED.

▣ Input type and range

Input sensor		Display	Temperature range (℃)	Temperature range (℉)
Thermocouple	K(CA)	ʁ CA	-100 to 1300	-148 to 2372
	J(1C)	J I C	0 to 800	32 to 1472
RTD	JPt H	JPt.H	0 to 500	32 to 932
	JPt L	JPt.L	-199.9 to 199.9	-199.9 to 392.0
	DPt H	Pt .H	0 to 500	32 to 932
	DPt L	Pt .L	-199.9 to 199.9	-199.9 to 392.0

■ SV setting

Example of setting 100℃

1.
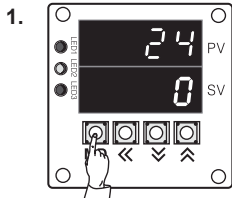
When PV and SV are displayed, press the MD key(S1).

2.
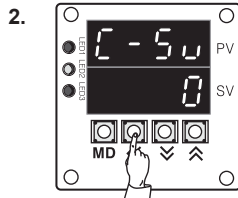
C-Su is displayed in the PV display part, 0 is displayed in the SV display part. Press the ≪ key(S2).

3.
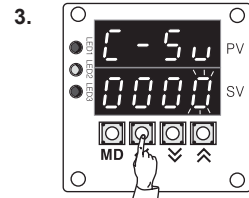
10^0 digit flashes in the SV display part. Move the digit by pressing ≪ key(S2) twice.

4.
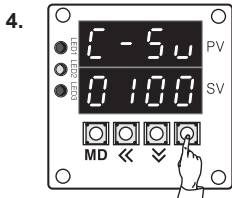
Press the ⌃ key(S4) and set 1 at 10^2 digit and press the MD key.

5.
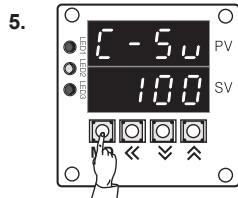
Now SV value is set, then move to Eu-1 by pressing the MD key once.

※S1, S2, S3, S4 are on on this PCB Board.

■ Parameter setting group

Run mode

| MD | MD 5 sec. | MD + ⌃ (S4) 5 sec. |

Parameter 1 group

| C-Su | 0 |
| MD |
| Eu-1 | 10 |
| MD |
| Eu-2 | 10 |
| MD |
| t-Su | 0.1 |
| MD |
| $StSP$ | 0 |
| MD |

Parameter 2 group

| At | oFF |
| MD |
| P | 3.0 |
| MD |
| I | 0 |
| MD |
| d | 0 |
| MD |
| t | 20 |
| MD |
| $rESt$ | 0.0 |
| MD |
| HYS | 2 |
| MD |

Parameter 3 group

| In-t | KCA |
| MD |
| H-SC | 400 |
| MD |
| L-SC | 0 |
| MD |
| $Unit$ | $℃$ |
| MD |
| In-b | 0 |
| MD |
| $PIdt$ | 2 |
| MD |
| Eu-1 | AL-1 |
| MD |
| AL-t | AL-A |
| MD |
| Eu-2 | AL-4 |
| MD |
| LoC | oFF |
| MD |

※It will return to Run mode, if pressing the MD key for 5 sec. in parameter 2 or 3 group.

※It will return to Run mode, if no key entered for 90 sec. in parameter setting mode.

※ This parameter might not be displayed depending on other parameter settings.

Autonics

Board Type

▣ Parameter 1 group

Run mode

MD

※To set SV, press the ≪ key and SV of the SV display part flashes. Press the ⌃, ⌄ keys and change SV and press the MD key to save the value and SV of the SV display part flashes.
※The value in every parameter is factory default.
※Entering parameter 1 group is not available in transmission output type.(TB42-14N)
※Some parameter is able to set decimal point by temperature sensor type.
※When pressing MD key for 5 sec. at each parameter or there is no key operation for 90 sec. it returns to RUN mode.
※⌐⌐⌐ This parameter might not be displayed depending on other parameter settings.

C-Su   0

Set SV(setting value).
Set range: Within the rated temperature range by input sensor

MD

Eu-1   10

Set temperature of Alarm operation which has been set in Event 1 of parameter 3 group.
Set range: Within the rated temperature range by input sensor
※If setting Alarm operation as AL-0 in Eu-1 of parameter 3 group, this parameter is not displayed.

MD

Eu-2   10

Set temperature of Alarm operation which has been set in Event 2 of parameter 3 group.
Set range: Within the rated temperature range by input sensor
※If setting Alarm operation as AL-0 in Eu-2 of parameter 3 group, this parameter is not displayed.

MD

t-Su   0.1

When it is used as timer function, this parameter is for setting the time of using.
Set range: 0.1 to 999.9 hour
※If selecting as 0 in StSP, this parameter is not displayed.

MD

StSP   0

Select timer function.
0: No Timer function
1: Cut off output after stop the time
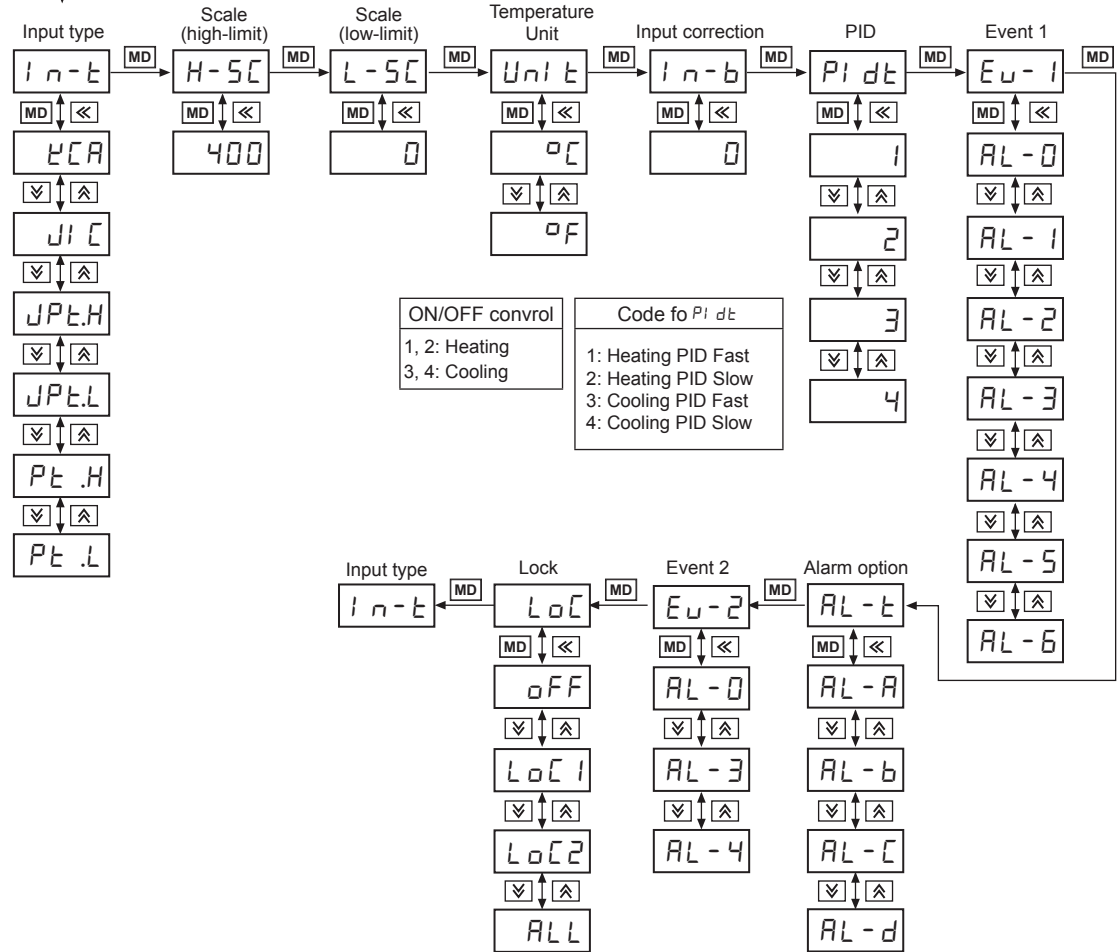2: Output operation after stop the time. (reservation function)

MD

▣ Parameter 2 group

Run mode

MD 5 sec.

※To set SV, press the ≪ key and SV of the SV display part flashes. Press the ⌃, ⌄ keys and change SV and press the MD key to save the value and SV of the SV display part flashes.
※For ON/OFF control, only P and HYS parameters are displayed.
※The value in every parameter is factory default.
※Entering parameter 2 group is not available in transmission output type(TB42-14N).
※When pressing MD key for 5 sec. at each parameter or there is no key operation for 90 sec. it returns to RUN mode.
※⌐⌐⌐ This parameter might not be displayed depending on other parameter settings.

At ←≪→ oFF ⌃⌄ on

MD MD

Select whether operates Auto-tunning or not.
After completing auto-tuning, SV returns to oFF.

P   3.0

Set proportional band.
Set range: 0.0 to 100.0%
※If P value is 0.0, it becomes ON/OFF control function.

MD

I   0

Set integral time.
Set range: 0 to 3600 sec.
※If I is 0, this function will be OFF.

MD

d   0

Set derivative time.
Set range: 0 to 3600 sec.
※If d is 0, this function will be OFF.

MD

t   20

Set cycle of control.
Set range: 1 to 120 sec.
※For SSR drive output type(TB42-14S), control cycle for factory default is 2 sec.

MD

rESt   0.0

This mode is for compensating deviation, which occurs when proportional control is used.
Set range: 0.0 to 100.0%

MD

HYS   2

This mode is for setting hysteresis when it is used ON/OFF control.
Set range: 1 to 100℃(0.1 to 100.0℃)

MD

TB42 Series

■ Parameter 3 group

※To set SV, press the ⌘ key and SV of the SV display part flashes. Press the ⌃, ⌄ keys and change SV and press the MD key to save the value and SV of the SV display part flashes.
※The value in every parameter is factory default.
※Entering parameter 2 group is not available in transmission output type(TB42-14N).
※When pressing MD key for 5 sec. at each parameter or there is no key operation for 90 sec. it returns to RUN mode.

ON/OFF convrol	Code for PI dt
1, 2: Heating	1: Heating PID Fast
3, 4: Cooling	2: Heating PID Slow
	3: Cooling PID Fast
	4: Cooling PID Slow

In-t	ⴸCA	Select one input sensor among 6 types.
H-SC	400	Set high-limit of temperature(20mA output value for transmission output). Set range: Within the rated range
L-SC	0	Set low-limit of temperature(4mA output value for transmission output). Set range: Within the rated range
Unit	°C	Set the unit of temperature between ℃ or ℉.
In-b	0	Set the correction value for error from input sensor. Set range: -50 to 50℃(-50.0 to 50.0℃).
PI dt	1	Select PID control type among 4 kinds.
Eu-1	AL-1	Select Alarm output function of Event 1 among 7 kinds.
AL-t	LA-A	Select Alarm output option function among 4 kinds.
Eu-2	AL-4	Select Alarm output function of Event 2 among 3 kinds.
LoC	oFF	Set whether it is locked or not of setting value among 4 kinds.

▣ Alarm

◎ Alarm operation

Mode	Name	Alarm operation	Description
AL - 0	—	—	No alarm output
AL - 1	Deviation high-limit alarm	OFF — H↑ ON SV 100℃ PV 110℃ High deviation: Set as 10℃	If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.
AL - 2	Deviation low-limit alarm	ON H↓ OFF PV 90℃ SV 100℃ Low deviation: Set as 10℃	If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AL - 3	Deviation high/low-limit alarm	ON↑H↓ OFF ↓H↑ ON PV 90℃ SV 100℃ PV 110℃ High/Low deviation: Set as 10℃	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AL - 4	Deviation high/low-limit reserve alarm	OFF↓H↑ ON ↑H↓ OFF PV 90℃ SV 100℃ PV 110℃ High/Low deviation: Set as 10℃	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be OFF.
AL - 5	Absolute value high limit alarm	OFF↓H↑ ON OFF ↓H↑ ON PV 90℃ SV 100℃ SV 100℃ PV 110℃ Absolute-value Alarm: Set as 90℃ Absolute-value Alarm: Set as 110℃	If PV is higher than the absolute value, the output will be ON.
AL - 6	Absolute value low limit alarm	ON↑H↓ OFF ON↑H↓ OFF PV 90℃ SV 100℃ SV 100℃ PV 110℃ Absolute-value Alarm: Set as 90℃ Absolute-value Alarm: Set as 110℃	If PV is lower than the absolute value, the output will be ON.

※ **H**: means fixed 2℃ as interval between ON and OFF when alarm output is operating.

◎ Alarm option

Mode	Name	Description
AL - A	Standard alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
AL - b	Alarm latch	If it is an alarm condition, alarm output is ON and maintains ON status.
AL - C	Standby sequence	First alarm condition is ignored and from second alarm condition, standard alarm operates. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, standard alarm operates.
AL - d	Alarm latch and standby sequence	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, alarm latch operates.

TB42 Series

▣ Functions

◎ Event

This function can execute as main control output and sub function.

● Event 1 output

Event 1 output is relay contact and contact capacity is 250VAC 0.5A 1a. Event 1 output is alarm output and there are 7 modes including deviation and absolute alarm. The operation of Event 1 output is displayed on LED 2 at front.

● Event 2 output

There is no terminals for Event 2 output but front LED 3 lamp displays the input range as O.K monitor.

Event 2 output operates as O.K monitor by setting Event 2 [Eu-2] as AL-3 or AL-4 in Parameter 3 group and set the deviation temperature at Eu-2 in Parameter 1 group.

< Example of O.K monitor >

Alarm operation AL-3	ON	b	OFF	b	ON
		△ PV	△ SV	△ PV	
O.K monitor LED (LED 3)	OFF		ON		OFF
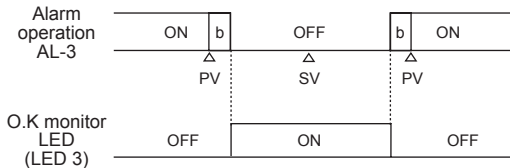
◎ Auto-tunning [At]

PID Auto-tunning function is automatically to measure thermal characteristics and response of the control object and then execute its value under high response & stability after calculating the time constant of PID required to control optimum temperature.

When AT function is started, LED3 will flash and when LED3 is OFF this operation will stop.

(Note) For ON/OFF control, AT function does not operate.

◎ Dual PID function

One is that PV is reached at SV with fast response speed, but a little of overshoot occurs, the other is that PV is reached at SV with slow response speed, but overshoot will be minimized.

● PID Fast

This mode is applied at the machines or systems which requite stop fast response speed, and allowable a little overshoot which requite.

● PID Slow

This mode is applied at the machine which overshoot must not occur, because the fire can be and allowable low response time.

◎ Error

If error occurs while the controller is operating, it will be displayed as follow.

● LLLL flashes
when measured input temperature is lower than input range of the sensor.

● HHHH flashes
when measured input temperature is higher than input range of the sensor.

● oPEn flashes
when the input sensor is not connected or its wire is cut.

◎ Transmission output (PV)

This function is to transmit the current value(PV) to external equipment such as PC or recorder etc. the output is DC 4-20mA and cannot be used with control output at the same time.

It will output 20mA, when PV reaches to the temperature in H-SC and output 4mA, when PV reaches to the temperature in L-SC.

Min. resolutions are 16,000 divisions available. (TB42-14N)

◎ Manual reset [rESt]

Proportional control has an offset because rising time is not the same as falling time, even if the unit operates normally. This function is to correct offset.

◎ Lock

Setting value cannot be changed by unauthorized person. There are 4 types of lock mode in this unit.

● oFF : Unlocks for all parameters
● LoC1 : Locks parameter 2, 3 groups
● LoC2 : Locks parameter groups except C-Su parameter
● ALL : Locks all parameters

◎ Timer [StSP]

There is no output terminal in this function, it controls main output by setting of Timer function.

● Timer operation

- When StSP parameter is set as 0.
  No timer function. t-Su parameter is not displayed.

- When StSP parameter is set as 1.
  This unit controls temperature for the set time of t-Su.

Ex)When t-Su is set as 5.0, this unit controls temperature for 5 hours and completes to control.

- When StSP parameter is set as 2.
  This unit controls temperature after the set time of t-Su.

Ex)When t-Su is set as 5.0, this unit controls temperature after 5 hours.

● To stop timer function, enter StSP parameter and set 0.

● During timer function, the set time at t-Su is displayed on the SV display part in RUN mode. If not using the timer function, it displays SV.

Board Type

## ■ Proper usage

◎ Front part

Front part is able to customized for user's application.

The length of connector cable connected the front part and control part is basically 300mm and also 100mm.

◎ Output

This unit has main output terminals and sub output terminals.

Main output terminals is for relay, SSR, current, transmission output and sub output terminals are fixed for Event 1 output.

Be sure that output terminals are as below.
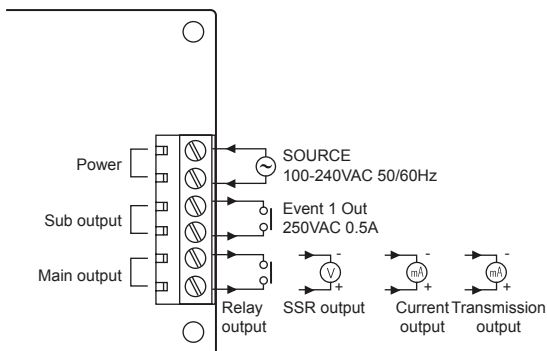
※Relay output: 1a contact output. Contact capacity is 250VAC 3A.

※SSR drive output: It outputs Max. 12VDC ±3V 30mA max. voltage to drive SSR. For using SSR drive voltage to other applications, use this within the rated current.

※Current output: It outputs DC4-20mA within the hysteresis.

※Transmission output: It outputs DC4-20mA within the set range at $H-5C$ and $L-5C$ parameters. (resolutions: 16,000 divisions)

◎ When changing the sensor type

Be sure that when changing the sensor type during operation, the set SV is cleared.

◎ Caution for when mounting on Panel

This unit does not have an additional external case but has only a PCB. When mounting this unit on panel, maintain insulation between iron plates. If dust, oil, or water is enter to inside of panel, inner may be short.

Be sure that interval between terminals is narrow to wire cables. The cable (20P) connected control PCB and front PCB is sensitive signal line.

Be careful when wiring this cable not to enter noise or affect to high voltage line.

◎ Caution for using

● The connection wire of this unit should be separated from the power line and high voltage line in order to prevent from inductive noise.
● Please install power switch or circuit-breaker in order to cut power supply off.
● The switch or circuit-breaker should be installed near by users.
● This unit is designed for temperature controlling only. Do not apply this unit as a voltage meter or a current meter.
● In case of using RTD sensor, 3-wire type must be used. If you need to extend the line, 3-wires must be used with the same thickness as the line. It might cause temperature difference if the resistance of line is different.
● In case of making power line and input signal line close, line filter for noise protection should be installed at power line and input signal line should be shielded.
● Keep away from the high frequency instruments.(High frequency welding machine & sewing machine, big capacitive SCR controller)
● Installation environment
  • It shall be used indoor.
  • Altitude Max. 2000m.
  • Pollution Degree 2
  • Installation Category II.