Economical PID control

▣Features

NEW

- ●Realizes ideal temp. controlling with newly developed PID control algorithm and 100ms high speed sampling
- ●**Relay output and SSRP output embodied together : SSRP output makes phase control and cycle control possible.(AC power)**
- ●Dramatically increased visibility using wide display part
- ●Mounting space saving with compact design : Approx. 38% reduced size compared with existing model(depth-based)
- ●SV/PV deviation indicatable

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

▣Ordering information

T	C	4	S	–	1	4	R

Control output	N	Indicator – Without control output
	R	Relay output+SSRP output(AC power) Relay output+SSR output(AC/DC power)
Power supply	2	24-48VDC, 24VAC 50/60Hz
	4	100-240VAC 50/60Hz
Alarm output	N	No alarm output
	1	Alarm1 output
	2	Alarm1 output+Alarm2 output**(※1)**
Size	S	DIN W48×H48mm(Terminal block type)
	SP	DIN W48×H48mm(11 pin plug type)**(※2)**
	Y	DIN W72×H36mm
	M	DIN W72×H72mm
	H	DIN W48×H96mm
	W	DIN W96×H48mm
	L	DIN W96×H96mm
Digit	4	9999(4 Digit)
Setting type	C	Set by touch switch
Item	T	Temperature controller

(※1) It is unavailable for TC4SP, TC4Y.
(※2) 11 pin socket(PG-11, PS-11) for TC4SP : sold separately.

▣Specifications

Series		TC4S	TC4SP	TC4Y	TC4M	TC4H	TC4W	TC4L
Power supply	AC power	100-240VAC 50/60Hz						
	AC/DC power	24VAC 50/60Hz, 24-48VDC						
Allowable voltage range		90 to 110% of rated voltage						
Power con-sumption	AC power	Max. 5VA(100-240VAC 50/60Hz, 24VAC 50/60Hz)						
	AC/DC power	Max. 3W(24-48VDC)						
Display method		7Segment(Red), Other display(Green, Yellow, Red) LED						
Character size		W7×H15mm	W7.4×H15mm	W9.5×H20mm	W7×H14.6mm	W9.5×H20mm	W11×H22mm	
Input type	RTD	DPt100Ω(Allowable line resistance max. 5Ω per a wire)						
	TC	K(CA), J(IC), L(IC)						
Display method	RTD, TC	(PV ±0.5% or ±1℃ higher one) rdg ±1Digit**(※1)** ※TC4SP (Plug type) is (PV ±0.5% or ±2℃ higher one) rdg ±1Digit**(※2)** ☞ Based on room temperature(23℃ ±5℃)						

(※1) In case of out of room temperature range: (PV ±0.5% or ±2℃ higher one)rdg ±1 Digit
L(IC) and RTD CU50: (PV ±0.5% or ±3℃ higher one)rdg ±1 Digit
(※2) In case of out of room temperature range for TC4SP: (PV ±0.5% or ±3℃ higher one)rdg ±1 Digit
L(IC) and RTD CU50: (PV ±0.5% or ±4℃ higher one)rdg ±1 Digit

▣Specifications

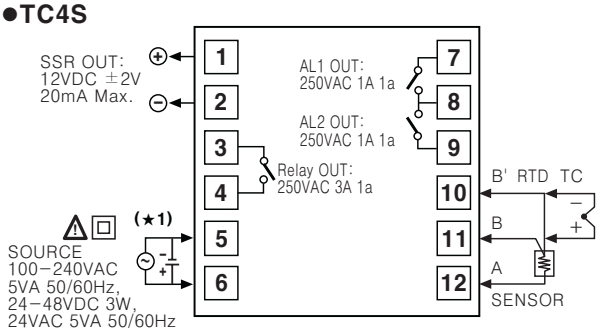
Series		TC4S	TC4SP	TC4Y	TC4M	TC4H	TC4W	TC4L
Control output	Relay	250VAC 3A 1a						
	SSR	12VDC ±2V 20mA Max.						
Sub output		AL1, AL2 relay output : 250VAC 1A 1a(※TC4SP, TC4Y have AL1 only.)						
Control method		ON/OFF and P, PI, PD, PID control						
Hysteresis		1 to 100℃/℉ [ƴƇR, ꓷIC, LIC, dPt.H, CUS.H] / 0.1 to 50.0℃/℉ [dPt.L, CUS.L]						
Proportional band		0.1 to 999.9℃/℉						
Integral time(I)		9999sec.						
Derivative time(D)		9999sec.						
Control period		0.5 to 120.0sec.						
Manual reset		0.0 to 100.0%						
Sampling period		100ms						
Dielectric strength	AC power	2000VAC 50/60Hz for 1min.(Between input terminal and power terminal)						
	AC/DC power	1000VAC 50/60Hz for 1min.(Between input terminal and power terminal)						
Vibration		0.75mm amplitude at frequency of 5 to 55Hz in each X, Y, Z directions for 2 hours						
Relay life cycle	Control output	Mechanical: Min. 5,000,000 operations, Electrical: Min. 200,000 operations (250VAC 3A resistive load)						
	Alarm output	Mechanical: Min. 5,000,000 operations, Electrical: Min. 300,000 operations (250VAC 1A resistive load)						
Insulation resistance		Min. 100MΩ (at 500VDC megger)						
Noise		Square shaped noise by noise simulator(pulse width 1㎲) ±2kV R-phase and S-phase						
Memory retention		Approx. 10 years (When using non-volatile semiconductor memory type)						
Ambient temperature		-10 to 50℃ (at non-freezing status)						
Storage temperature		-20 to 60℃ (at non-freezing status)						
Ambient humidity		35 to 85%RH						
Insulation type		(※3) ⧈						
Approval		CE cULus (Except for AC/DC power type)						
Unit weight		Approx. 97g	Approx. 84g	Approx. 127g	Approx. 127g	Approx. 118g	Approx. 118g	Approx. 172g

(※3) "⧈" Mark indicates that equipment protected throughout by double insulation or reinforced insulation.

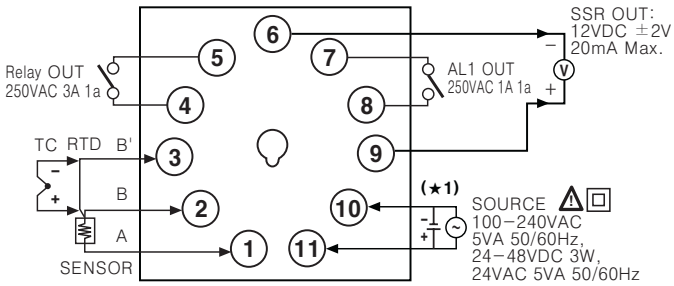
▣Connections

※TC4 series has selectable control output; Relay output, and SSRP output. AC/DC voltage type has Relay output and SSR output and it is selectable.

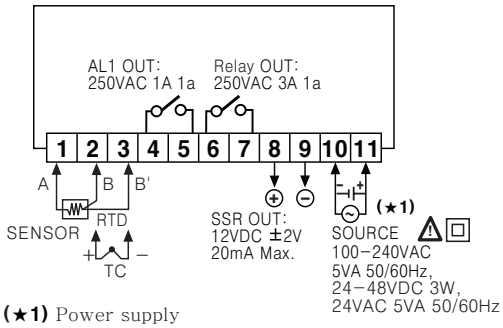
●TC4S



●TC4SP

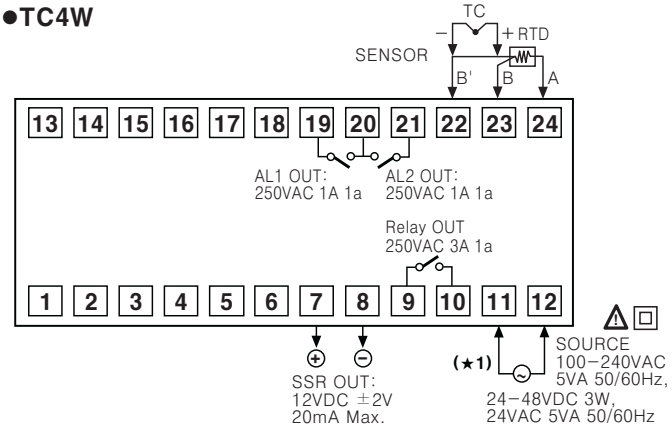


●TC4Y

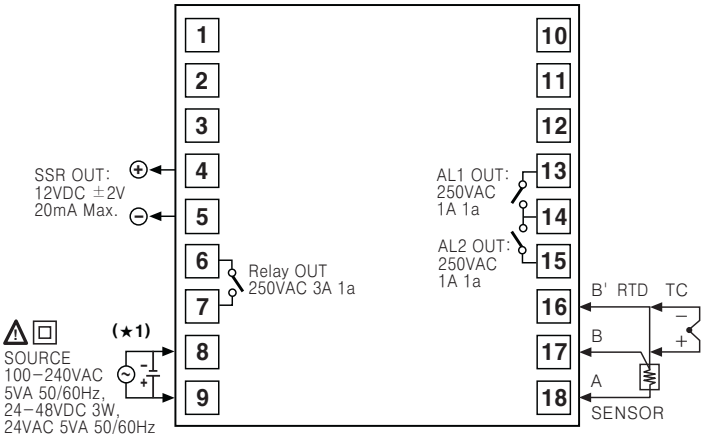


※**(★1)** Power supply
- -AC power : 100-240VAC 50/60Hz
- -Low voltage : 24-48VDC, 24VAC 50/60Hz

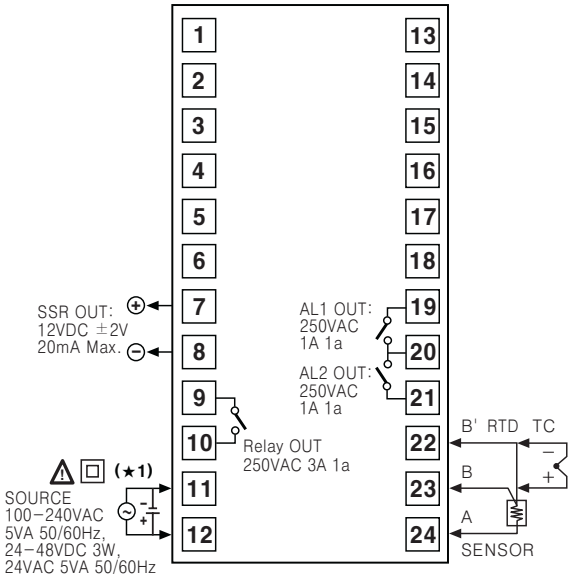
●TC4W



●TC4M



●TC4H/L

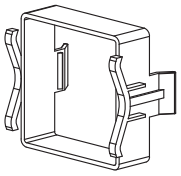


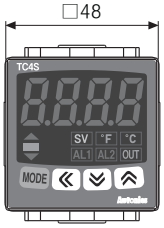
※(★1) Power supply
-AC power : 100-240VAC 50/60Hz
-AC/DC power : 24-48VDC 3W, 24VAC 50/60Hz

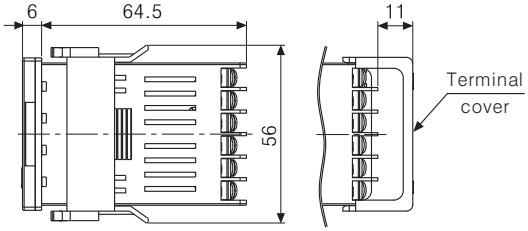
▣Dimensions

●TC4S

●Bracket







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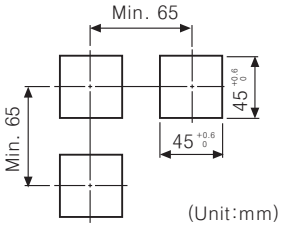
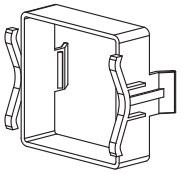
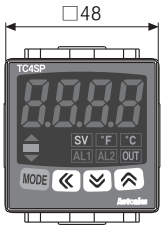


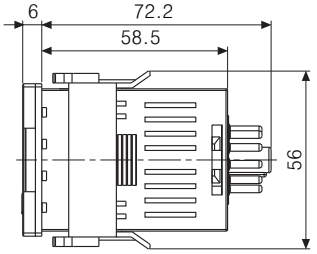
(Unit:mm)

●TC4SP

●Bracket







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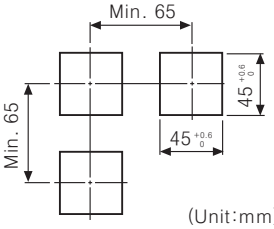
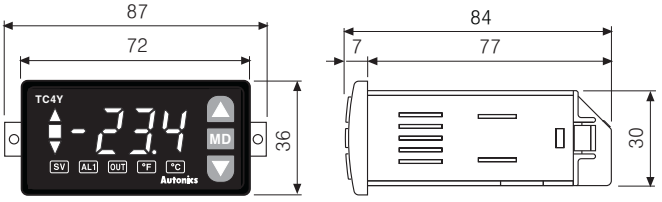


(Unit:mm)

●TC4Y



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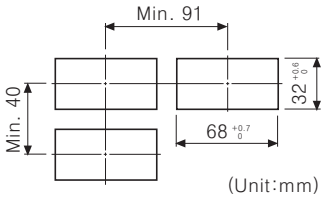

(Unit:mm)

●TC4M

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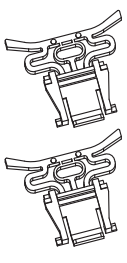

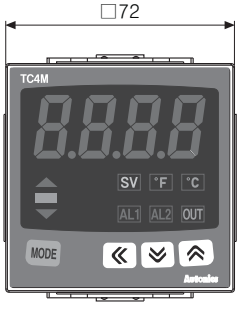

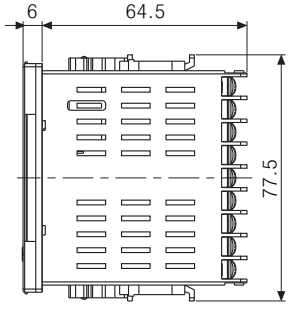

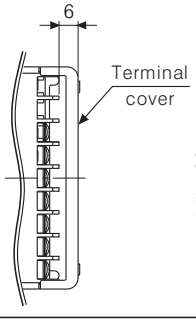

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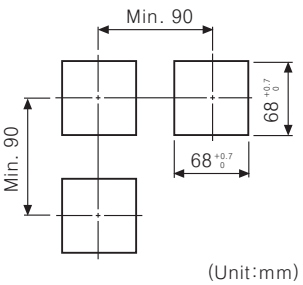
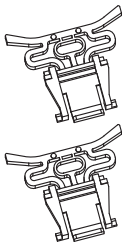
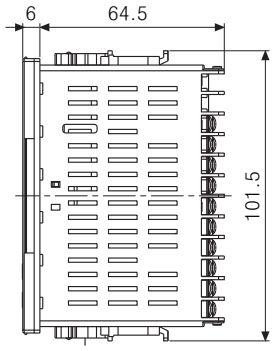


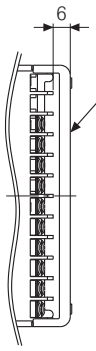
(Unit:mm)

●TC4H

●Bracket







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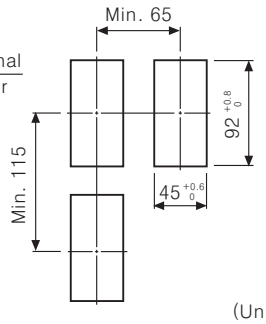
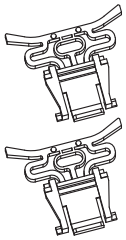
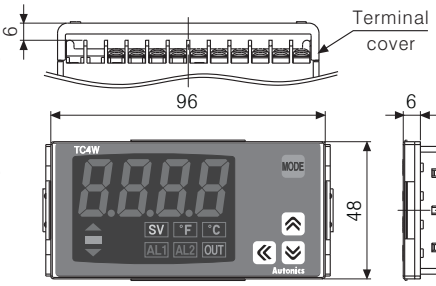


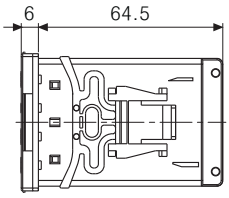
(Unit:mm)

●TC4W

●Bracket







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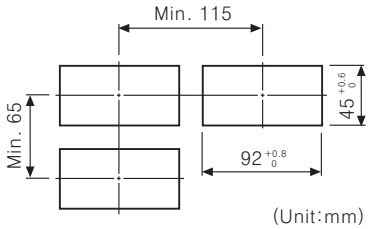
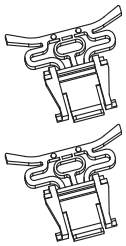
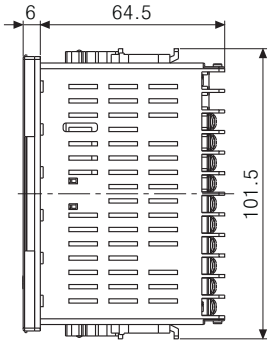


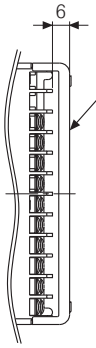
(Unit:mm)

●TC4L

●Bracket







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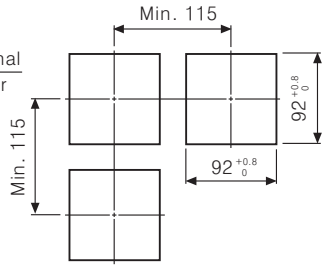
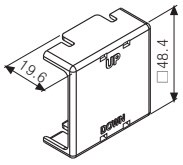


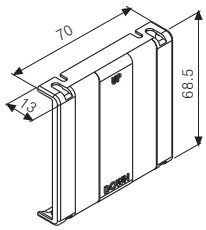
(Unit:mm)

●Terminal cover(Sold separately)

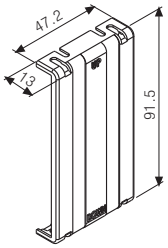
●RSA-Cover
(48×48mm size)



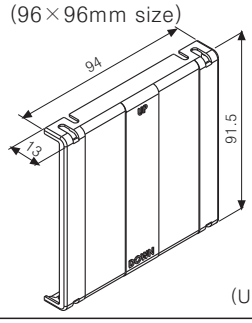
●RMA-Cover
(72×72mm size)



●RHA-Cover
(48×96mm, 96×48mm size)



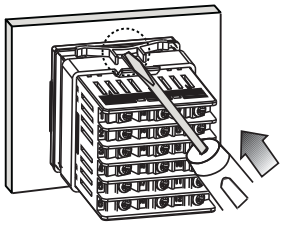
●RLA-Cover
(96×96mm size)



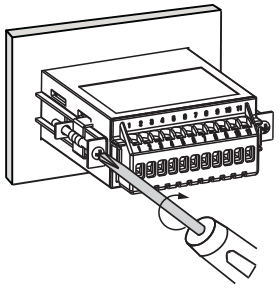
(Unit:mm)

▣Product mounting

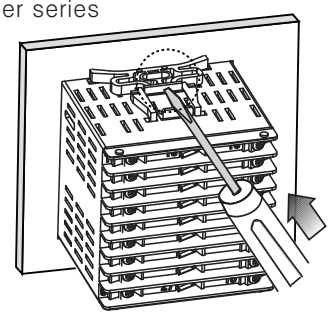
●TC4S/SP(48×48mm) series



●TC4Y(72×36mm) series



●Other series

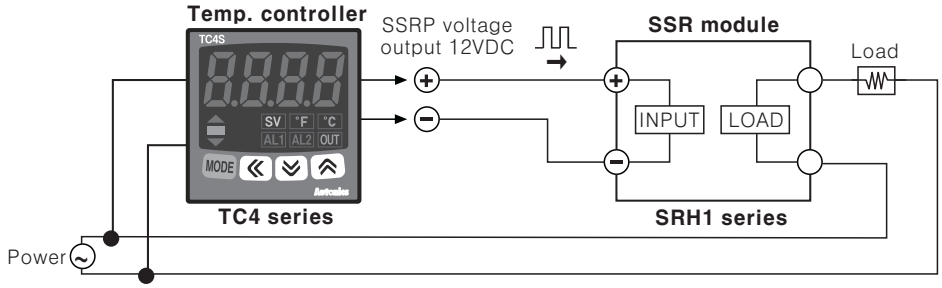


※Insert product into a panel, fasten bracket by pushing with tools as shown above.
(In case of TC4Y, fasten bolts for bracket.)

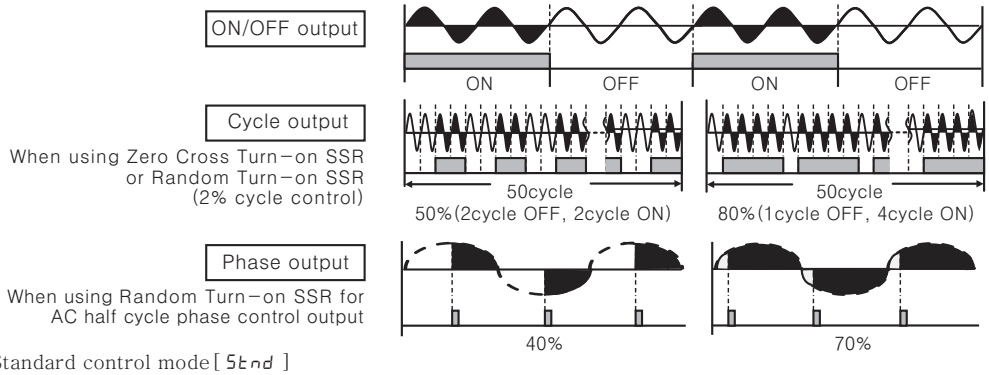
▣SSRP(Solid State Relay Phase Output) output function[SSr.n]

※AC/DC power type supports ON/OFF output only when selecting control output [SSr].
(Not support to select SSRP output method function. [SSr.n])

- SSRP is a user selectable output type which phase control and cycle control are added to standard SSR drive output.
- Standard SSR output is still available by internal parameter setting [SSr.n]; in addition, "cycle control" with connecting Zero cross turn-on type SSR or Random turn-on type SSR and "phase control" with connecting Random turn-on type SSR are also available.
- **Realizing high accuracy and cost effective temperature control with both current output (4-20mA) and linear output(cycle control and phase control).**



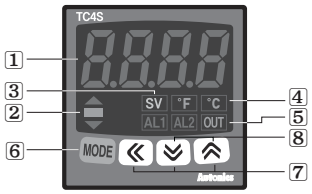
※You can select the functions with parameter settings.

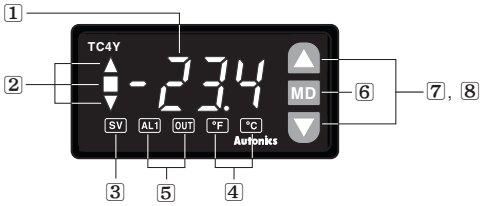


- Standard control mode[Stnd]
  A mode to control the load in the same way as RELAY output type.(ON: output level 100%, OFF: output level 0%)
- Cycle control mode[CYCL]
  A mode to control the load by repeating output ON / OFF according to the rate of output within setting cycle
  Having improved ON / OFF noise feature(ZERO CROSS type)
- Phase control mode[PHAS]
  A mode to control the load by controlling the phase within AC half cycle.
  Serial control is available
  RANDOM Turn-on type SSR must be used for this mode.

※When selecting phase or cycle control mode, the power supply for load and temperature controller must be the same.
※In case of selecting PID control type and phase / cycle control output modes, control cycle (t) is not allowed to set.

▣Parts description





1 Temperature display
It shows current temperature(PV) in RUN mode and parameter and set value for each setting group in parameter change mode.

2 Deviation indicator, Auto-tuning indicator
-It shows current temperature(PV) deviation based on set temperature(SV) by LED.

No	PV deviation temp.	Deviation display
1	Over 2℃	▲ lamp on
2	Below ±2℃	■ lamp on
3	Under -2℃	▼ lamp on

-Deviation indicator(▲, ■, ▼) is flashed by every 1sec when operating auto tuning.

3 Set temperature(SV) indicator
Press any front key once to check or change current set temperature(SV), set temperature(SV) indicator is on and preset set value is flashed.

4 Temperature unit(℃/°F) indicator:It shows current temperature unit.

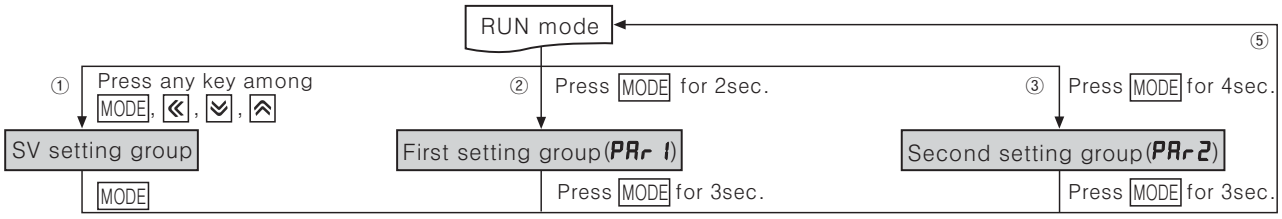
5 Control/alarm output indicator
-OUT : It will light up when control output(Main Control Output) is on.
※In case of CYCLE/PHASE control, it will light up when MV is over 3.0%.(Except for AC/DC power type)
-AL1/AL2 : It will light up when alarm output AL1/AL2 are on.

6 MODE Key : Used when entering into parameter setting group, returning to RUN mode, moving parameter and saving setting values.

7 Adjustment : Used when entering into set value change mode, Digit moving and Digit Up/down.

8 FUNCTION key : Press (▼)+(▲) keys for 3 sec. to operate function(RUN/STOP, alarm output cancel) set in inner parameter[dI -U].
※Press (▼)+(▲) keys once in set value operation to move digit.

▣Flow chart for setting group



④

AL 1	Alarm1 setting value
AL2	Alarm1 setting value
At	Auto-tuning execute
P	Proportional band
I	Integral time
d	Derivation time
rESt	Manual reset
HYS	Hysteresis

In-t	Input sensor
Unit	Temperature unit
In-b	Input correction
inAuF	Input digital filter
L-Su	SV low-limit value
H-Su	SV high-limit value
o-Ft	Control output operation
C-nd	Control type
oUt	Control output type
SSrn	SSRP output method **(※1)**
t	Control cycle
AL-1	AL1 alarm operation mode
AL-2	AL2 alarm operation mode
AHYS	Alarm output hysteresis
LbAt	LBA monitoring time
LbAb	LBA detection range
dI-Y	Digital key operation
Er.nu	Control output MV in case of input break error
LoC	Lock setting

(※1): It is not displayed for AC/DC power type.

※If no key touched for 30sec., it will return to RUN mode automatically and the set value of parameter will not be changed.

※Parameter marked in ⬚ might not be displayed depending on other parameter settings.

①Press any key once in RUN mode, it advances to set value setting group.
②Press MODE key over 2sec. in RUN mode, it advances to setting group 1.
③Press MODE key over 4sec. in RUN mode, it advances to setting group 2.
④First parameter will be displayed on viewer when it advances to the setting group.
⑤Press MODE key over 3sec. in the setting group, it returns to RUN mode.
[※Exception : Press MODE key once in SV setting group it returns to RUN mode.]

※Press MODE key again within a sec after return to RUN mode by press MODE key over 3sec., it advances to the first parameter of previous setting group.

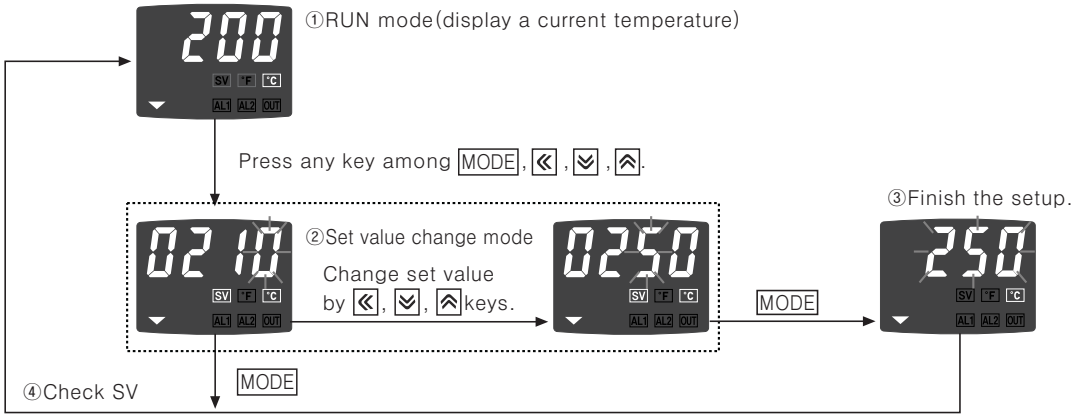
※Parameter setup
Setting group 2 → Setting group 1 → Setting group of set value
- Set parameter as the above considering parameter relation of each setting group.
- Check parameter set value after change parameter of setting group 2.

※Indicator type displays shaded parameter of setting group 2.

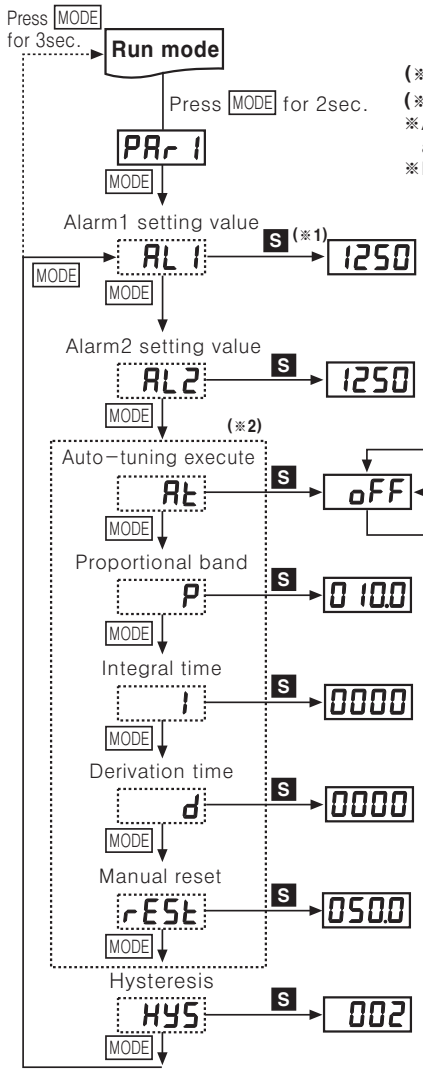
※Alarm operation mode (AL-1, AL-2) of setting group2 is decided whether to display according by alarm output type.

※If alarm operation mode (AL-1, AL-2) of setting group2 is set to [AnO_ / SbA.⬚ / LbA_], [AHYS]parameter is not displayed.

▣Flow chart for SV setting group (※In case of changing set temperature from 210℃ to 250℃.)



▣Flow chart for setting group 1



(※1) S : Press any key among ≪, ≫, ≫.
(※2) It is displayed when control type parameter [C-nd] of setting group 2 is set [PId].
※After checking or changing setting value in each parameter, press MODE key to save and move to next parameter setting.
※Press MODE key for 3 sec. to return RUN mode at any parameter.

Setting range : Deviation alarm(−[F.S] to [F.S], Absolute value alarm (temperature range)
※In case alarm operation mode (AL-1, AL-2) of setting group 2 is set to [AnQ_/SbA□/LbA□], no parameters is displayed.

※It starts to operate auto−tuning when it is ON and set as OFF automatically after finish the operation.
※**Deviation indicator(▲, ■, ▼)** will be flashing(cycle:1 sec.) during auto tuning function.

Setting range : **0.1 to 999.9℃/℉**

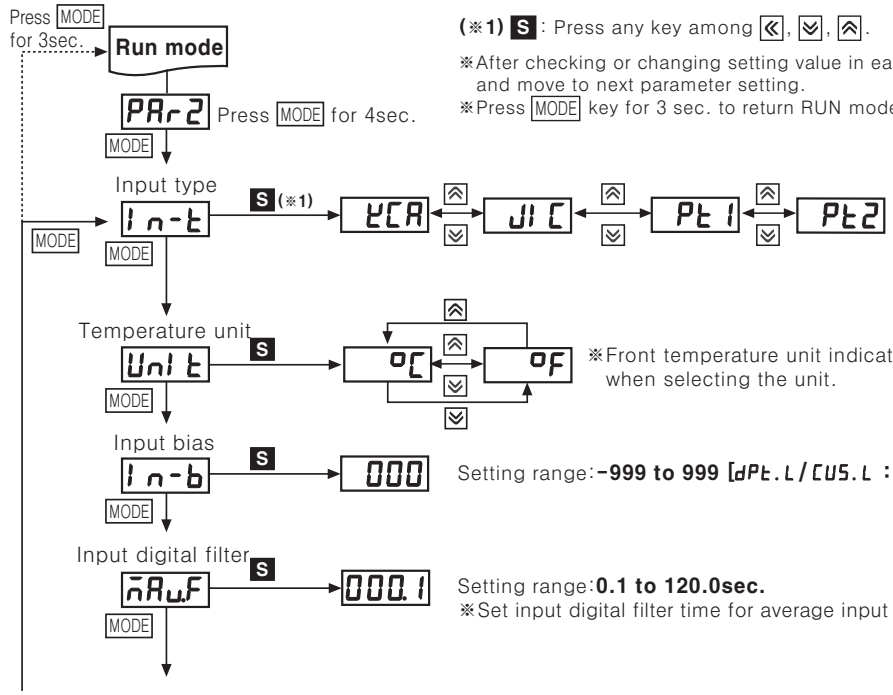
Setting range : **0 to 9999sec.**
※Integral operation will be OFF when set value is "0".

Setting range : **0 to 9999sec.**
※Derivative operation will be OFF when set value is "0".

Setting range : **0.0 to 100.0%**
※It is displayed in P/PD control.

Setting range : **1 to 100℃/℉ [0.1 to 50.0℃/℉]**
※It is displayed when control type parameter (C-nd) of setting group 2 is set [onoF].

▣Flow chart for setting group 2



(※1) S : Press any key among ≪, ≫, ≫.
※After checking or changing setting value in each parameter, press MODE key to save and move to next parameter setting.
※Press MODE key for 3 sec. to return RUN mode at any parameter.

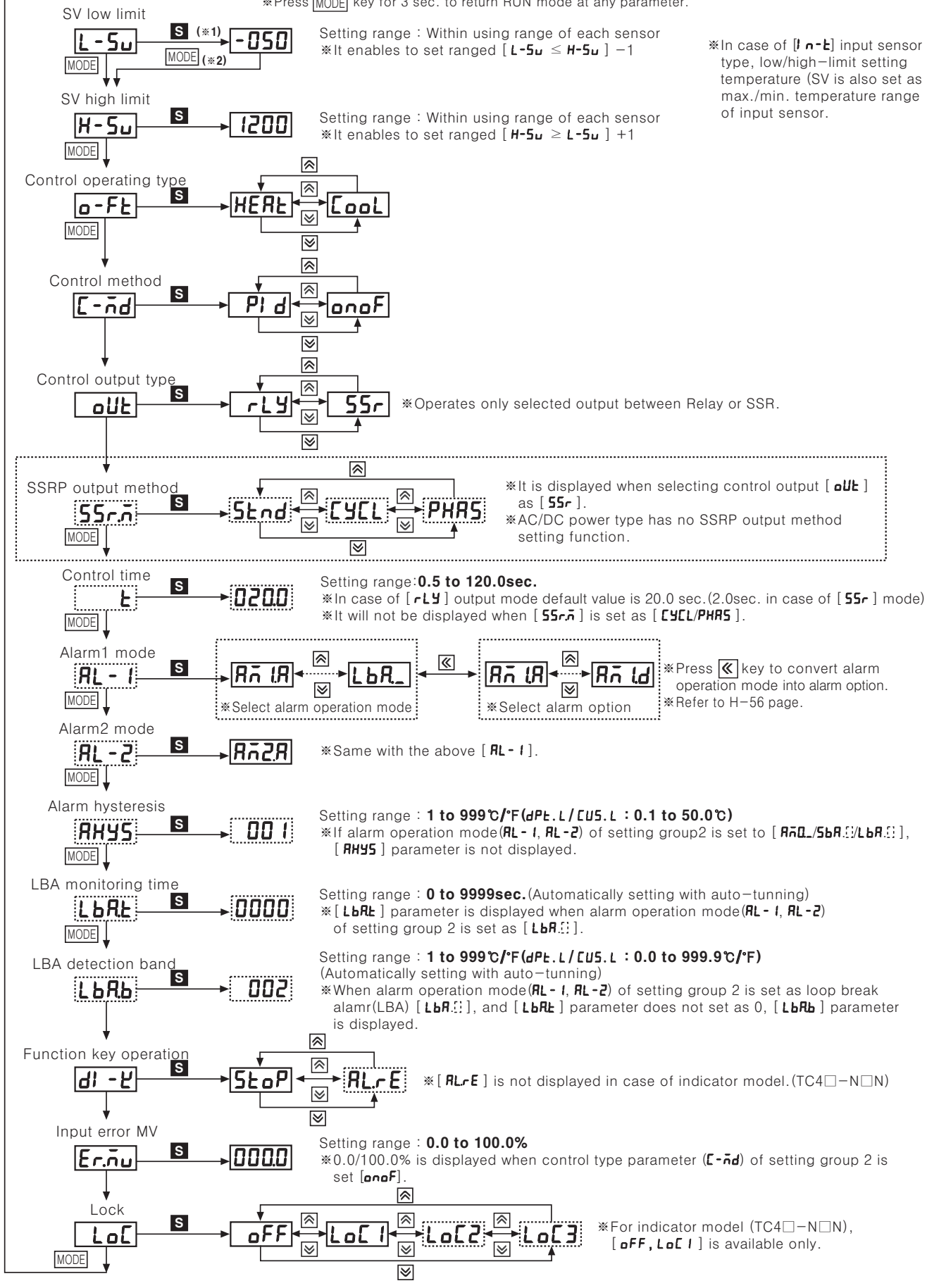
※Front temperature unit indicator will flash when selecting the unit.

Setting range:**-999 to 999 [dPt.L/CUS.L : -199.9 to 999.9]**

Setting range:**0.1 to 120.0sec.**
※Set input digital filter time for average input value affected control, and display value.

(※1) S : Press any key among ≪, ≫, ≫.

(※2) After checking or changing setting value in each parameter, press MODE key to save setting value. Saved setting value will flash twice and then moves to next parameter setting automatically.
※Press MODE key for 3 sec. to return RUN mode at any parameter.



▣Factory default

●SV setting group

Parameter	Factory default
-	0

●Setting group 1

Parameter	Factory default
AL 1	1250
AL2	
At	oFF
P	0 10.0
I	0000
d	
rESt	050.0
HYS	002

●Setting group 2

Parameter	Factory default	Parameter	Factory default
In-t	KCA	t	020.0
Unit	°C	AL-1	An 1A
In-b	0000	AL-2	An2A
nAuF	000.1	AHYS	000 1
L-Su	-050	LbAt	0000
H-Su	1200	LbAS	008
o-Ft	HEAt	LbAb	002
C-nd	PId	dI-t	StoP
oUt	rLY	Er.nu	000.0
SSr.n	Stnd	LoC	oFF

※AC/DC power type has no SSRP output method setting function and supports only ON/OFF output when selecting [SSr] in control output setting function [oUt].

▣Input sensor and range[In-t]

●Select proper input sensor type by user application.

Input sensor		Display	Input range (℃)	Input range (°F)
Thermocouple	K(CA)	KCA	−50 to 1200	−58 to 2192
	J(IC)	JI C	−30 to 500	−22 to 932
	L(IC)	LI C	−40 to 800	−40 to 1472
RTD	DPt00Ω	Pt 1	−100 to 400	−148 to 752
		Pt2	−100.0 to 400.0	−148.0 to 752.0
	CU50Ω	CUS.H	−50 to 200	−58 to 392
		CUS.L	−50.0 to 200.0	−58.0 to 392.0

▣Functions

See H−56 to 59 page for TC / TD common features.

◎Lock setting[LoC]

●A function to prevent changing SV and parameters of each setting group.

●Parameter setting values are still possible to check while Lock mode is ON.

Display	Description
oFF	Lock off
LoC 1	Lock setting group 2
LoC2	Lock setting group 1, 2
LoC3	Lock setting group 1, 2, SV setting group

※[oFF], [LoC 1] are available only for indicator(TC4 □−N□N).

◎Error

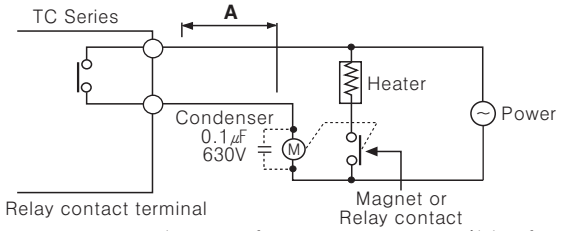
●Error mark will flash(every 1sec.) in PV viewer when error is occurred during the control operation.

Display	Description
oPEn	If input sensor is disconnected or sensor is not connected.
HHHH	If measured sensor input is higher than temperature range.
LLLL	If measured sensor input is lower than temperature range.

●It will operate normally, if input sensor is connected or returned to normal range under error oPEn / HHHH / LLLL status.

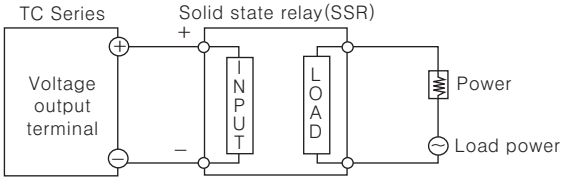
◎Output connections

●Application of relay output type



Keep power relay as far away as possible from temperature controller. If wires length of **A** is short, electromotive force occurred from a coil of magnet switch & power relay may flow in power line of the unit, it may cause malfunction. If wires length of **A** is short, please connect a mylar condenser 104(630V) across coil of the power relay "Ⓜ" to protect electromotive force.

●Application of SSRP output method



※SSR should be selected by the capacity of load, otherwise, it may short−circuit and result in a fire. Indirect heated should be used with SSR for efficient working.

※Please use a cooling plate or it may cause the capability deterioration, breakdown of SSR for a long usage.

※Refer to H−43 page for phase / cycle control connections.