# Touch Switch Type Temperature Controller

## Touch Switch Type Temperature Controller

### ■Features

- 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.**
- 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.**

CE c RU US

### ■Ordering information

| T | C | 4 | S | — | 1 | 4 | R |

| | | | |
|---|---|---|---|
| Control output | | N | Indicator − Without control output |
| | | R | Relay output+SSRP output |
| Power supply | | 4 | 100−240VAC 50/60Hz |
| Alarm output | | N | No alarm output |
| | | 1 | Alarm1 output |
| (※1) | | 2 | Alarm1 output+Alarm2 output |
| | | S | DIN W48×H48mm(Terminal block type) |
| (※2) | | SP | DIN W48×H48mm(Plug type) |
| | | Y | DIN W72×H36mm |
| Size | | M | DIN W72×H72mm |
| | | H | DIN W48×H96mm |
| | | W | DIN W96×H48mm |
| | | L | DIN W96×H96mm |
| Digit | | 4 | 4Digit |
| Setting type | | C | Set by touch switch |
| Item | | T | Temperature controller |

(※1) It is unavailable for TC4SP, TC4Y.
(※2) TC4SP sockets (PG−11, PS−11) are sold separately.

### ■Specifications

| Series | | | TC4S | TC4SP | TC4Y | TC4M | TC4H | TC4W | TC4L |
|---|---|---|---|---|---|---|---|---|---|
| Power supply | | | 100−240VAC 50/60Hz | | | | | | |
| Allowable voltage range | | | 90~110% of rated voltage | | | | | | |
| Power consumption | | | Max. 5VA | | | | | | |
| 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 | | DIN Pt100Ω (Allowable line resistance max. 5Ω per a wire) | | | | | | |
| | TC | | K(CA), J(IC) | | | | | | |
| Display method | TC, RTD | (★1) (★2) | (PV ±0.5% or ±1℃ higher one) rdg ±1Digit  ※TC4SP (Plug type) is (PV ±0.5% or ±2℃ higher one) rdg ±1Digit  ☞Based on normal temperature(23℃ ±5℃) | | | | | | |
| Control output | Relay | | 250VAC 3A 1a | | | | | | |
| | SSRP | | 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 | | | | | | |

※(★1)(PV ±0.5% or ±2℃ higher one) rdg ±1Digit, except normal temperature range.
※(★2)TC4SP is (PV ±0.5% or ±3℃ higher one) rdg ±1Digit, except normal temperature range.

(A) Counter

(B) Timer

(C) Temp. controller

(D) Power controller

(E) Panel meter

(F) Tacho/ Speed/ Pulse meter

(G) Display unit

(H) Sensor controller

(I) Switching power supply

(J) Proximity sensor

(K) Photo electric sensor

(L) Pressure sensor

(M) Rotary encoder

(N) Stepping motor & Driver & Controller

(O) Graphic panel

(P) Field network device

(Q) Production stoppage models & replacement

# TC Series

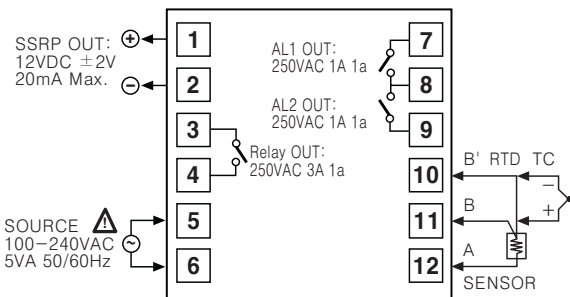## ▣ Specifications

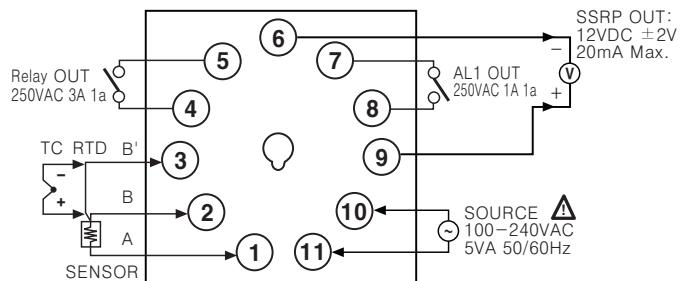| Series | TC4S | TC4SP | TC4Y | TC4M | TC4H | TC4W | TC4L |
|---|---|---|---|---|---|---|---|
| Hysteresis | 1 ~ 100℃(KCA,JIC,PT1) / 0.1 ~ 50.0℃(PT2) | | | | | | |
| Proportional band | 0.1 ~ 999.9℃ | | | | | | |
| Integral time(I) | 9999sec. | | | | | | |
| Derivative time(D) | 9999sec. | | | | | | |
| Control period | 0.5 ~ 120.0sec. | | | | | | |
| Manual reset | 0.0 ~ 100.0% | | | | | | |
| Sampling period | 100ms | | | | | | |
| Dielectric strength | 2000VAC 50/60Hz for 1min.(Between input terminal and power terminal) | | | | | | |
| Vibration | 0.75mm amplitude at frequency of 5~55Hz in each X, Y, Z directions for 2 hours | | | | | | |
| Relay life cycle — Mechanical | Mechanical : Min. 10,000,000 operations, Electrical : Min. 100,000 operations(250VAC 3A resistive load) | | | | | | |
| Relay life cycle — Electrical | Mechanical : Min. 10,000,000 operations, Electrical : Min. 300,000 operations(250VAC 1A resistive load) | | | | | | |
| Insulation resistance | Min. 100MΩ (at 500VDC mega) | | | | | | |
| Noise | Square shaped noise by noise simulator(pulse width 1μs)±2kV R−phase and S−phase | | | | | | |
| Memory retention | Approx. 10 years (When using non−volatile semiconductor memory type) | | | | | | |
| Ambient temperature | −10 ~ 50℃(at non−freezing status) | | | | | | |
| Storage temperature | −20 ~ 60℃(at non−freezing status) | | | | | | |
| Ambient humidity | 35 ~ 85%RH | | | | | | |
| Unit weight | Approx. 97g | Approx. 84g | Approx. 127g | Approx. 127g | Approx. 118g | Approx. 118g | Approx. 172g |
| Approval | CE ᴄ ⓊⓁ us | | | | | | |

## ▣ Connections

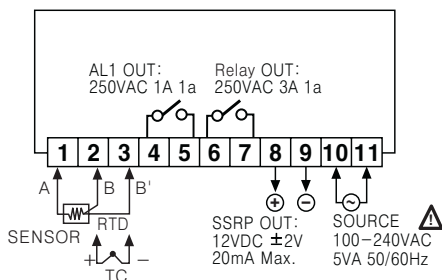※TC4 series has both Main Out and SSR Out. You may select the model as your needs.
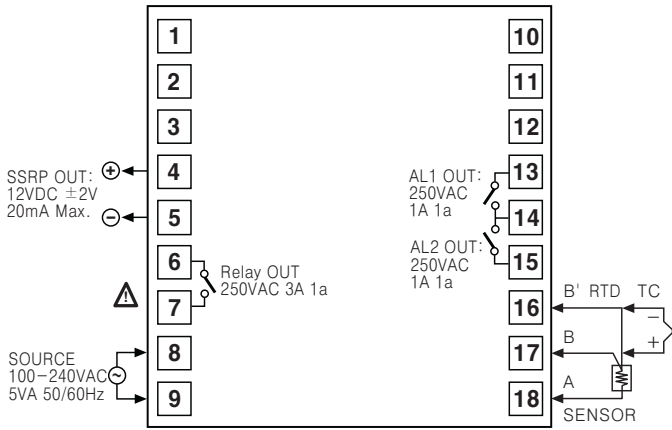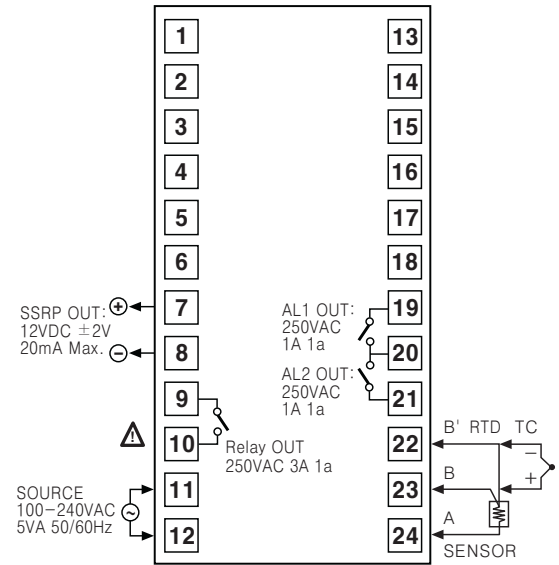
### ●TC4S



### ●TC4SP



### ●TC4Y



### ●TC4W
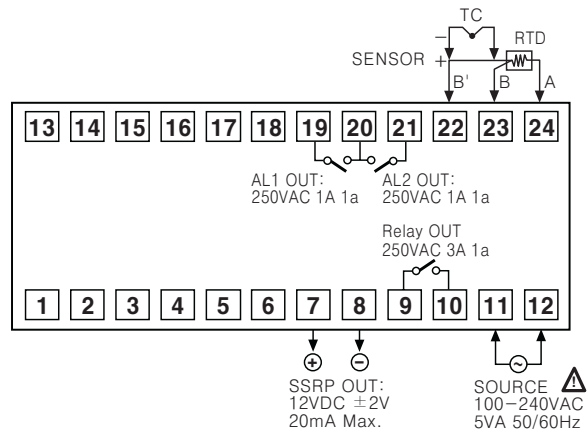
# Touch Switch Type Temperature Controller

● TC4M

1 | 10
2 | 11
3 | 12
4 | 13
5 | 14
6 | 15
7 | 16
8 | 17
9 | 18

SSRP OUT:
12VDC ±2V
20mA Max.

Relay OUT
250VAC 3A 1a

SOURCE
100−240VAC
5VA 50/60Hz

AL1 OUT:
250VAC
1A 1a

AL2 OUT:
250VAC
1A 1a

B' RTD TC

B

A

SENSOR

● TC4H/L

1 | 13
2 | 14
3 | 15
4 | 16
5 | 17
6 | 18
7 | 19
8 | 20
9 | 21
10 | 22
11 | 23
12 | 24

SSRP OUT:
12VDC ±2V
20mA Max.

Relay OUT
250VAC 3A 1a

SOURCE
100−240VAC
5VA 50/60Hz

AL1 OUT:
250VAC
1A 1a

AL2 OUT:
250VAC
1A 1a

B' RTD TC

B

A

SENSOR

## ■ Dimensions

### ● TC4S

● Bracket
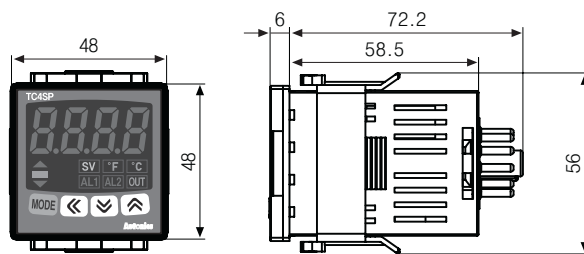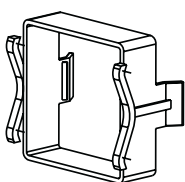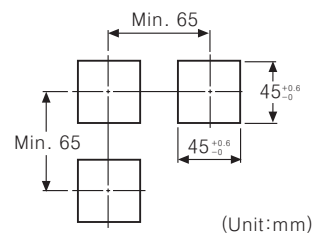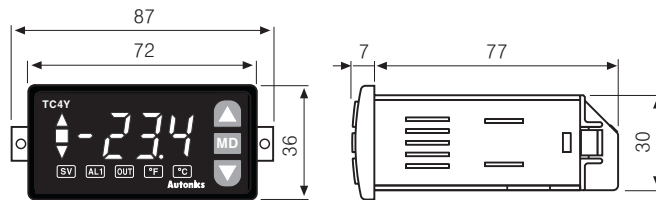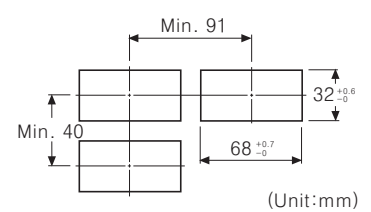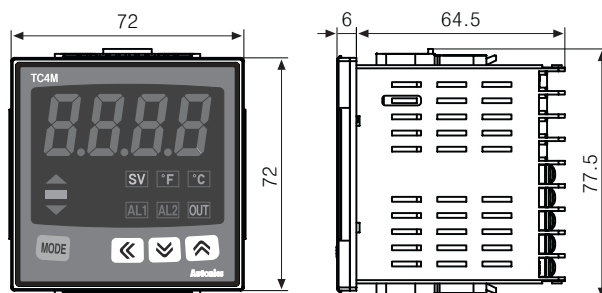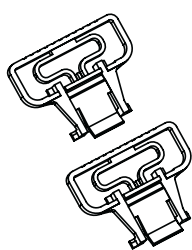
48

48

6 | 64.5

56

TC4S
SV | °F | °C
AL1 | AL2 | OUT
MODE

● Panel cut−out

Min. 65

Min. 65

$45^{+0.6}_{-0}$

$45^{+0.6}_{-0}$

(Unit:mm)

### ● TC4SP

● Bracket

48

48

6 | 72.2 | 58.5

56

TC4SP
SV | °F | °C
AL1 | AL2 | OUT
MODE

● Panel cut−out

Min. 65

Min. 65

$45^{+0.6}_{-0}$

$45^{+0.6}_{-0}$

(Unit:mm)

### ● TC4Y

87

72

36

TC4Y
SV | AL1 | OUT | °F | °C
MD
Autonics

7 | 77

30

● Panel cut−out

Min. 91

Min. 40

$32^{+0.6}_{-0}$

$68^{+0.7}_{-0}$

(Unit:mm)

### ● TC4M

● Bracket

72

72

6 | 64.5

77.5

TC4M
SV | °F | °C
AL1 | AL2 | OUT
MODE

● Panel cut−out

Min. 90

Min. 90

$68^{+0.7}_{-0}$

$68^{+0.7}_{-0}$

(Unit:mm)

# TC Series

## ●TC4H

●Bracket

48

96

6 64.5

101.5

TC4H

SV °F °C
AL1 AL2 OUT

MODE

●Panel cut-out

Min. 65

92 $^{+0.8}_{-0}$

Min. 115

45 $^{+0.6}_{-0}$

(Unit: mm)

## ●TC4W

●Bracket

96

48

6 64.5

TC4W

MODE

SV °F °C
AL1 AL2 OUT

●Panel cut-out

Min. 115

45 $^{+0.6}_{-0}$

Min. 65

92 $^{+0.8}_{-0}$

(Unit: mm)

## ●TC4L

●Bracket

96

96

6 64.5

101.5

TC4L

SV °F °C
AL1 AL2 OUT

MODE

●Panel cut-out

Min. 115

92 $^{+0.8}_{-0}$

Min. 115

92 $^{+0.8}_{-0}$
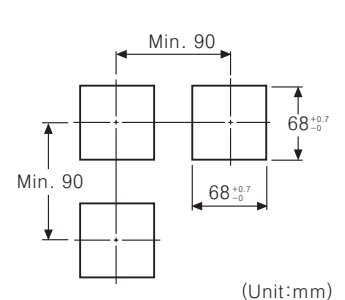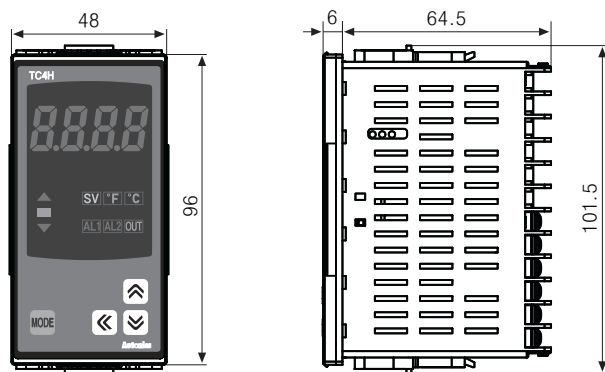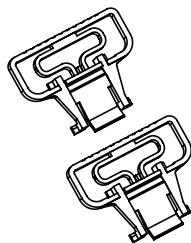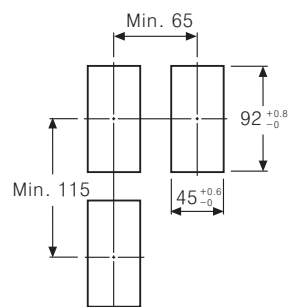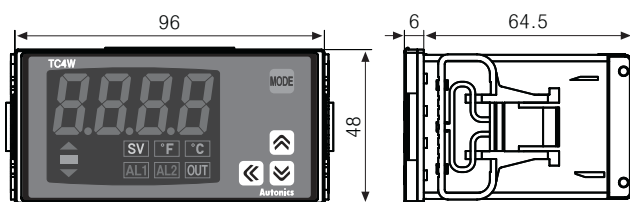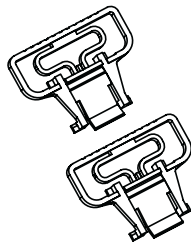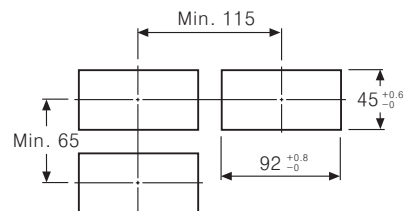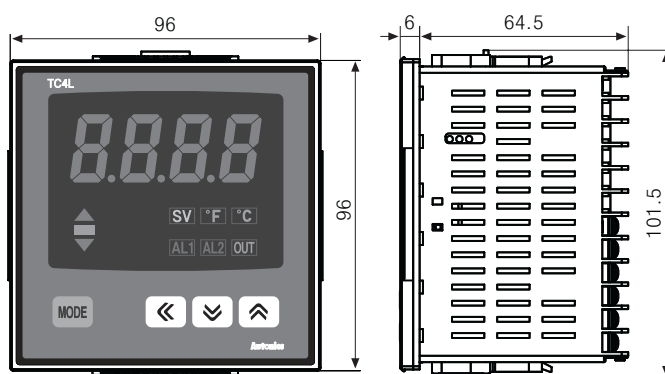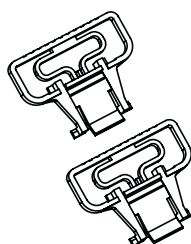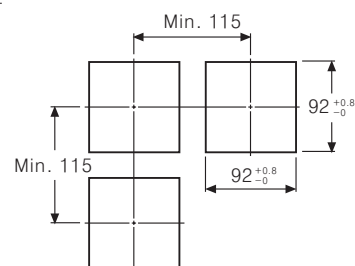
(Unit: mm)

## ▣Product mounting

●TC4S/SP(48×48mm) series
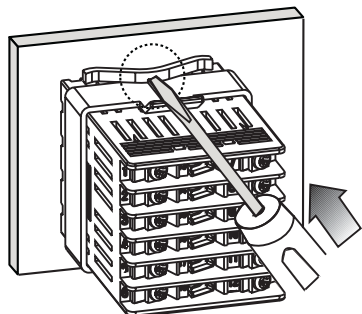
●TC4Y(72×36mm) series

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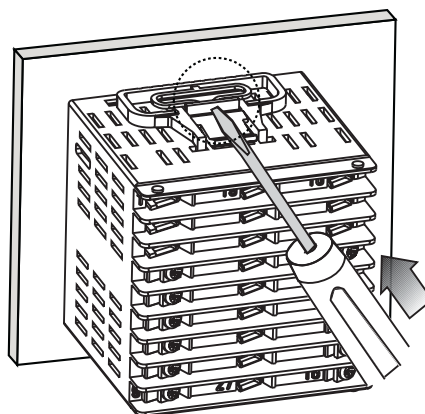
※Insert product into a panel, fasten bracket by pushing with tools as shown above.
(In case of TC4Y, fasten the bracket bolts.)

Autonics

# Touch Switch Type Temperature Controller

(A)
Counter

(B)
Timer

(C)
Temp.
controller

(D)
Power
controller

(E)
Panel
meter

(F)
Tacho/
Speed/
Pulse
meter

(G)
Display
unit

(H)
Sensor
controller

(I)
Switching
power
supply

(J)
Proximity
sensor

(K)
Photo
electric
sensor

(L)
Pressure
sensor

(M)
Rotary
encoder

(N)
Stepping
motor &
Driver &
Controller

(O)
Graphic
panel

(P)
Field
network
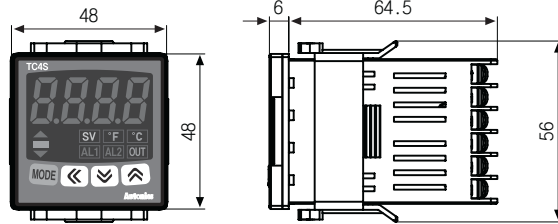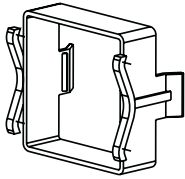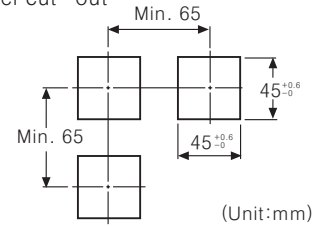device

(Q)
Production
stoppage
models &
replacement

## ■SSRP(Solid State Relay Phase Output) output function[ 55r.ō ]

- ●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 [55r.ō]; 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).

**Temp. controller**

SSRP voltage output 12VDC

**SSR module**

Load

TC4S

SV °F °C
AL1 AL2 OUT

MODE

**TC4 series**

INPUT    LOAD

**SRH1 series**

Power ~
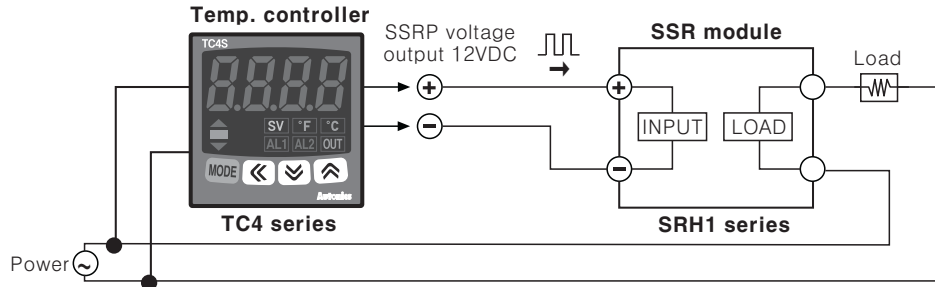
※**You can select the functions with parameter settings.**

ON/OFF output

ON    OFF    ON    OFF

Cycle output

When using Zero Cross Turn-on SSR
or Random Turn-on SSR
(2% cycle control)

50cycle                    50cycle
50%(2cycle OFF, 2cycle ON)    80%(1cycle OFF, 4cycle ON)

Phase output

When using Random Turn-on SSR for
AC half cycle phase control output

40%                    70%
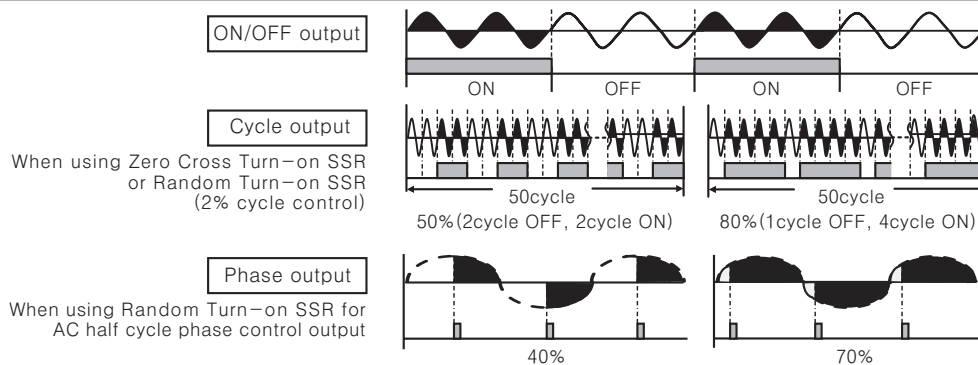
- ●Standard control mode[ 5tnd ]
  A mode to control the load in the same way as RELAY output type.(ON: output level 100%, OFF: output level 0%)
- ●Cycle control mode[ CYCL ]
  A mode to control the load by repeating output ON / OFF according to the rate of output within setting cycle
  Having improved 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

TC4S

1
3
2
6

SV °F °C
AL1 AL2 OUT

MODE

4
5
8
7

TC4Y

1
2

SV    AL1 OUT    °F °C    Autonics

6    7, 8

3    5    4
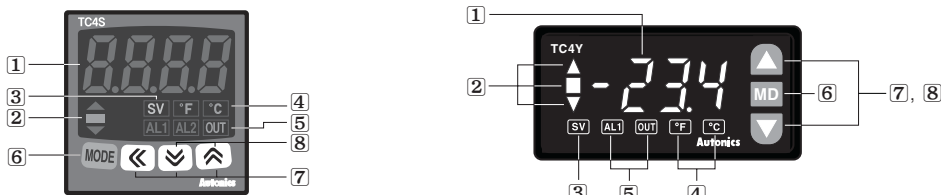
1 Temperature display
   It shows current temperature(PV) in RUN mode and parameter and set value for each setting group in parameter change mode.
2 Deviation and Auto-tuning indicator
   It shows current temperature(PV) based on set temperature(SV) by LED.
   Deviation indicators(▲, ■, ▼) are flashed 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
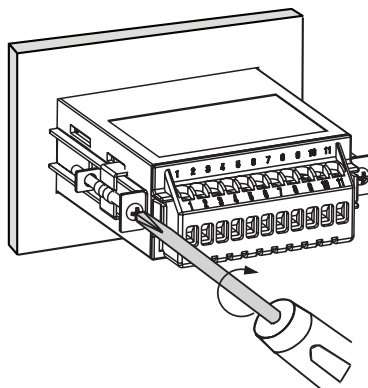   preset set value is flashed.
4 Temperature unit(℃/°F) indicator : It shows current temperature unit.
5 Control/alarm output indicator
   -OUT : It will light up when control output(Main Control Output) is on.
     ※It will light up over 3.0% of operation in CYCLE/PHASE control.
   -AL1/AL2 : It will 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 -t ].
   ※Press ⌄+⌃ keys once in set value operation to move digit.

# TC Series

## ▣ Flow chart for setting group

RUN mode ⑤

① Press any key among
MODE, ≪ , ⋁ , ⋀

② Press MODE for 2sec.

③ Press MODE for 4sec.

SV setting group

First setting group(PAr 1)

Second setting group(PAr2)

MODE

Press MODE for 3sec.

Press MODE for 3sec.
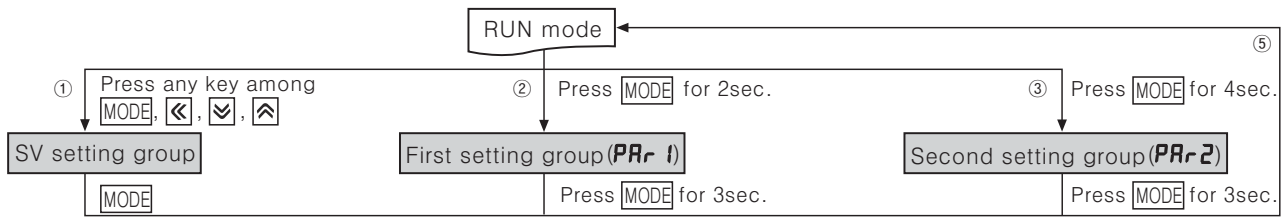
④

| | |
|---|---|
| AL 1 | Alarm1 setting value |
| AL 2 | Alarm1 setting value |
| At | Auto-tuning execute |
| P | Proportional band |
| I | Integral time |
| d | Derivation time |
| rESt | Manual reset |
| HYS | Hysteresis |

| | |
|---|---|
| In-t | Input type |
| Unit | Temperature unit |
| In-b | Input bias |
| m̄Au.F | Input digital filter |
| L-Su | SV low limit |
| H-Su | SV high limit |
| o-Ft | Control operating type |
| C-m̄d | Control method |
| oUt | Control output type |
| SSr.m̄ | SSRP output method |
| t | Control time |
| AL-1 | Alarm1 mode |
| AL-2 | Alarm2 mode |
| AHYS | Alarm hysteresis |
| LbAt | LBA monitoring time |
| LbAS | LBA detection setting value |
| LbA.b | LBA detection band |
| dI-Y | Function key operation |
| Er.m̄u | Input error MV |
| LoC | Lock |

※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 setting group of set value, it returns to RUN mode.]

※If no key touched for 30sec, it will return to RUN mode automatically and the set value of parameter will not be changed.
※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 group2 → Setting group1 → 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 group2.
  • Parameter marked in ⬚ would not be displayed by another parameter setting.
※Indicator type displays colored parameter of setting group2.
※AL2 and AL-2 parameter display is available with only "Alarm output 1 + Alarm output 2" model.
※AHYS parameter will not be displayed when AL-1 or AL-2 is set to LBA or HBA.

## ▣ Flow chart for SV setting group(※To change preset temperature 210℃ into 250℃.)

**200** ① RUN mode(display a current temperature)

Press any key among MODE, ≪ , ⋁ , ⋀ .

③ Finish the setup.

**0210** ② Set value change mode

Change set value by ≪ , ⋁ , ⋀ keys.

**0250**

MODE

**250**

④ To check a SV   MODE
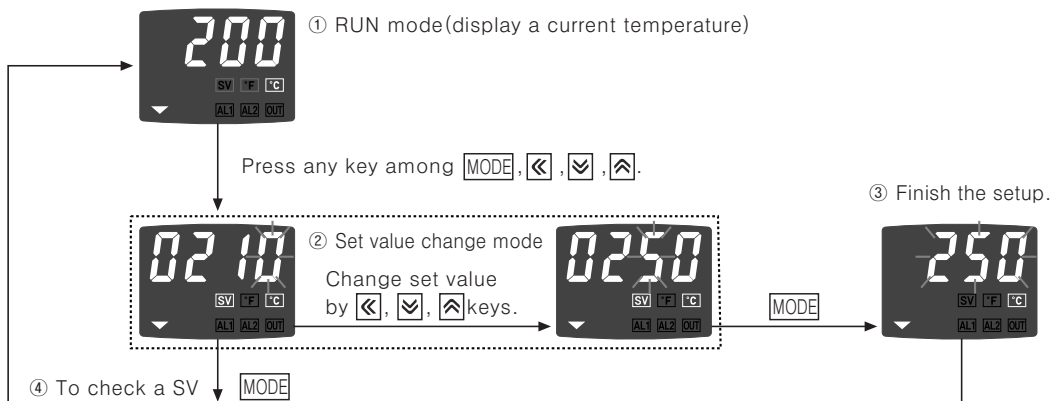
# Touch Switch Type Temperature Controller

## ▣ Flow chart for first setting group

(A)
Counter

(B)
Timer

(C)
Temp.
controller

(D)
Power
controller

(E)
Panel
meter

(F)
Tacho/
Speed/
Pulse
meter

(G)
Display
unit

(H)
Sensor
controller

(I)
Switching
power
supply

(J)
Proximity
sensor

(K)
Photo
electric
sensor

(L)
Pressure
sensor

(M)
Rotary
encoder

(N)
Stepping
motor &
Driver &
Controller

(O)
Graphic
panel

(P)
Field
network
device

(Q)
Production
stoppage
models &
replacement

Press MODE for 3sec.

**Run mode**

`PRr 1` Press MODE for 2sec.

MODE

※ **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.

Alarm1 setting value
MODE `RL 1` **S** → `1250`
MODE

Setting range : Deviation alarm(−[F.S]~[F.S], Absolute value alarm(Input range)
※In case alarm operation mode (RL-1) is set to [ Rñ0_/SbR. ://LbR_ ], no parameters will be displayed.

Alarm2 setting value
`RL2` **S** → `1250`
MODE

Setting range : Deviation alarm(−[F.S]~[F.S], Absolute value alarm(Input range)
※In case alarm operation mode (RL-2) is set to [ Rñ0_/SbR. ://LbR_ ], no parameters will be displayed.

Auto−tuning execute
`Rt` **S** → `oFF` ⇄ `on`
MODE

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

Proportional band
`P` **S** → `0 10.0`
MODE

Setting range : **0.1 ~ 999.9℃**

Integral time
`I` **S** → `0000`
MODE

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

Derivation time
`d` **S** → `0000`
MODE

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

※It will be displayed only if control method parameter(C-ñd) is set as [ Pl d ].

Manual reset
`rESt` **S** → `050.0`
MODE

Setting range : **0.0 ~ 100.0%**
※It will be displayed in P/PD control and not in ON/OFF and PI/PID control.

Hysteresis
`HYS` **S** → `002`
MODE

Setting range : **1 ~ 100℃ [0.1~50.0℃]**
※It will be displayed in ON/OFF control.

## ▣ Flow chart for second setting group

Press MODE for 3sec.

**Run mode**

`PRr2` Press MODE for 4sec.

MODE

※ **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.

Input type
MODE `In-t` **S** → `kCR` ⇄ `JIC` ⇄ `Pt 1` ⇄ `Pt2`
MODE

Temperature unit
`Unlt` **S** → `°C` ⇄ `°F`
MODE

※Front temperature unit indicator will be flickering when selecting the unit.

Input bias
`In-b` **S** → `000`
MODE

Setting range：**−999 ~ 999℃ [※Pt2 : −199.9 ~ 999.9℃]**

Input digital filter
`ñRuF` **S** → `0.1`
MODE

Setting range：**0.1 ~ 120.0sec.**

# TC Series

※ **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.

**SV low limit**

`L-Su` → **S** → `-050`

Setting range : Within using range of each sensor(KCA sensor)
※ It enables to set ranged [ `L-Su` ≤ `H-Su` ] −1

**SV high limit**

`H-Su` → **S** → `1200`

Setting range : Within using range of each sensor(KCA sensor)
※ It enables to set ranged [ `H-Su` ≥ `L-Su` ] +1

**Control operating type**

`o-Ft` → **S** → `HEAt` ⇄ `CooL`

**Control method**

`C-md` → **S** → `PId` ⇄ `onoF`

**Control output type**

`oUt` → **S** → `rLY` ⇄ `SSr`

※ Preset output will be operated as control output.

**SSRP output method**

`SSrm` → **S** → `Stnd` ⇄ `CYCL` ⇄ `PHAS`

※ It will be displayed when selecting [ `oUt` ] as [ `SSr` ].

**Control time**

`t` → **S** → `020.0`

Setting range : **0.5 ~ 120.0sec.**
※ In case of [ `rLY` ] output mode default value is 20.0 sec.(2.0sec in case of [ `SSr` ] mode)
※ It will not be displayed when [ `SSrm` ] is set as [ `CYCL/PHAS` ].

**Alarm1 mode**

`AL-1` → **S** → `Am1.A` ⇄ `LbA_` ← ⟨⟨ ← `Am1.A` ⇄ `Am1.d`

※ Select alarm operation mode | ※ Select alarm option

※ Press ⟨⟨ key to convert alarm operation mode into alarm option.

**Alarm2 mode**

`AL-2` → **S** → `Am2.A`

※ Same with the above [ `AL-1` ].

**Alarm hysteresis**

`AHYS` → **S** → `001`

Setting range : **1 ~ 999℃ [0.1 ~ 50.0℃]**
※ `AHYS` parameter will not be displayed when set value is set as [ `Amd_/SbA.::/LbA_` ].

**LBA monitoring time**

`LbAt` → **S** → `0`

Setting range : **0 ~ 9999sec.**
※ [ `LbAt` ] parameter will be displayed when alarm operation mode( `AL-1`, `AL-2` ) is set as [ `LbA_` ].

**LBA detection setting value**

`LbAS` → **S** → `008`

Setting range : **1 ~ 999℃**
※ When setting [ `AL-1`, `AL-2` ] to [ `LbA_` ] and [ `LbAt` ] setting value is 0, [ `LbAS` ] parameter is not displayed.

**LBA detection band**

`LbAb` → **S** → `003`

Setting range : **1 ~ 999℃**
※ [ `LbAb` ] parameter will be displayed when alarm operation mode( `AL-1`, `AL-2` ) is set as [ `LbA_` ] and [ `LbAt` ] is not 0.

**Function key operation**

`dI-Y` → **S** → `StoP` ⇄ `ALrE`

※ [ `ALrE` ] will not be displayed in case of no alarm output models.

**Input error MV**

`Er.mu` → **S** → `000.0`

Setting range : **0.0 ~ 100.0%**
※ 0.0/100.0% will be displayed in ON/OFF control.

**Lock**

`LoC` → **S** → `oFF` ⇄ `LoC1` ⇄ `LoC2` ⇄ `LoC3`

**Autonics**

# Touch Switch Type Temperature Controller

**(A) Counter**

**(B) Timer**

**(C) Temp. controller**

**(D) Power controller**

**(E) Panel meter**

**(F) Tacho/ Speed/ Pulse meter**

**(G) Display unit**

**(H) Sensor controller**

**(I) Switching power supply**

**(J) Proximity sensor**

**(K) Photo electric sensor**

**(L) Pressure sensor**

**(M) Rotary encoder**

**(N) Stepping motor & Driver & Controller**

**(O) Graphic panel**

**(P) Field network device**

**(Q) Production stoppage models & replacement**

## ▣ Factory default

### ● First setting group

| Mode | Setting value | Mode | Setting value | Mode | Setting value | Mode | Setting value |
|------|------|------|------|------|------|------|------|
| *AL 1* | *1250* | *At* | *oFF* | *I* | *0* | *rESt* | *50.0* |
| *AL2* | *1250* | *P* | *10.0* | *d* | *0* | *HYS* | *2* |

### ● Second setting group

| Mode | Setting value | Mode | Setting value | Mode | Setting value | Mode | Setting value | Mode | Setting value |
|------|------|------|------|------|------|------|------|------|------|
| *In-t* | *KCA* | *L-Su* | *-50* | *oUt* | *rLY* | *AL-2* | *An2A* | *LbAb* | *3* |
| *Unit* | *°C* | *H-Su* | *1200* | *SSrñ* | *Stnd* | *AHYS* | *1* | *dI-t* | *StoP* |
| *In-b* | *0* | *o-Ft* | *HEAt* | *t* | *20.0* | *LbAt* | *0* | *Er.ñu* | *0.0* |
| *ñAuF* | *0.1* | *C-ñd* | *PId* | *AL-1* | *Añ1A* | *LbAS* | *8* | *LoC* | *oFF* |

## ▣ 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 ~ 1200℃ | −58 ~ 2192°F |
| | J(IC) | *JIC* | −30 ~ 500℃ | −22 ~ 932°F |
| RTD | DIN rated Pt 1 | *Pt1* | −100 ~ 400℃ | −148 ~ 752°F |
| | DIN rated Pt 2 | *Pt2* | −100.0 ~ 400.0℃ | −148.0 ~ 752.0°F |

## ▣ Function

See C−25 page for TC / TD common features.

### ◎ SV / PV deviation display function

A function to display SV / PV deviation on front lamp
● When PV is higher than SV over +2℃(+2.0℃), ▲(RED) lamp is ON. (PV > SV + 2.0℃)
● When PV / SV deviation is ±2℃(±2.0℃), ■(GREEN) lamp is ON.(SV + 2.0℃ ≥ PV ≥ SV − 2.0℃)
● When PV is lower than SV over −2℃(−2.0℃), ▼ (RED) lamp is ON.(PV < SV − 2.0℃)

### ◎ Control output type selection[ *oUt* ]

● A function to select control output type; Relay output( *rLY* ), SSRP voltage output( *SSr* ).
※ In case of selecting SSRP voltage output, SSRP output method( *SSrñ* ) selection parameter is displayed.

### ◎ Lock setting[ *LoC* ]

● It locks set value and parameter change of the group.
● It enables to check parameter set value of locked setting group.

| Display | Description |
|------|------|
| *oFF* | Lock off |
| *LoC1* | Lock setting group 2 |
| *LoC2* | Lock setting group 1, 2 |
| *LoC3* | Lock setting group 1, 2, SV setting group |

※ *oFF* , *LoC1* 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
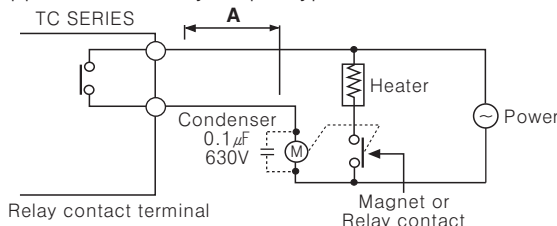


Keep power relay as far away as possible from temperature controller. If wires length of **A** is short, electromotive force occurred from a coil of magnet switch & power relay may flow in power line of the unit, it may cause malfunction. If wires length of **A** is short, please connect a mylar condenser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

● Application of SSRP output method
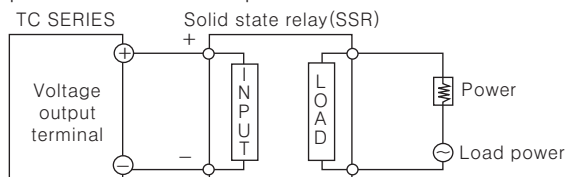


※ SSR should be selected by the capacity of load, otherwise, it may short−circuit and result in a fire. Indirect heated should be used with SSR for efficient working.
※ Please use a cooling plate or it may cause the capability deterioration, breakdown of SSR for a long usage.
※ Refer to C−12 page for phase / cycle control connections.

# TC/TD Common Features

## ■Alarm output operation mode[ AL-1 / AL-2 ]

| Mode | Alarm output operation | | Description(The initial value of AL1/AL2 is KCA.) |
|---|---|---|---|
| AmO_ | | | ■No alarm output. |
| Am1 | OFF ⟶H⟶ ON<br>△ SV100℃  ▲ PV110℃<br>Alarm temperature(Deviation temperature) : Set as 10℃. | OFF H⟶ ON<br>△ PV90℃  ▲ SV100℃<br>Alarm temperature(Deviation temperature) : Set as −10℃. | ■Deviation high−limit alarm<br>If deviation between PV and SV is occurring higher than set value of deviation temperature, the output will be ON. The deviation temperature is set in AL1/AL2.(Default of AL1, AL2 : 1250) |
| Am2 | ON ⟶H⟶ OFF<br>△ PV90℃  ▲ SV100℃<br>Alarm temperature(Deviation temperature) : Set as 10℃. | ON H⟶ OFF<br>▲ SV100℃  △ PV110℃<br>Alarm temperature(Deviation temperature) : Set as −10℃. | ■Deviation low−limit alarm<br>If deviation between PV and SV is occurring lower than set value of deviation temperature, the output will be ON. The deviation temperature is set in AL1/AL2.(Default of AL1, AL2 : 1250) |
| Am3 | ON ⟶H⟶ OFF ⟶H⟶ ON<br>△ PV90℃  ▲ SV100℃  △ PV110℃<br>Alarm temperature(Deviation temperature) : Set as 10℃. | | ■Deviation high/low−limit alarm<br>If deviation between PV and SV is occurring higher or lower than set value of deviation temperature, the output will be ON. The deviation temperature is set in AL1/AL2.<br>※It is ON if AL value<0(Default of AL1, AL2:1250) |
| Am4 | OFF ⟶H⟶ ON ⟶H⟶ OFF<br>△ PV90℃  ▲ SV100℃  △ PV110℃<br>Alarm temperature(Deviation temperature) : Set as 10℃. | | ■Deviation high/low−limit reverse alarm<br>If deviation between PV and SV is occurring higher or lower than set value of deviation temperature, the output will be OFF. The deviation temperature is set in AL1/AL2.<br>※It is OFF if AL value<0(Default of AL1, AL2:0) |
| Am5 | OFF ⟶H⟶ ON<br>△ PV90℃  ▲ SV100℃<br>Alarm temperature(Absolute value) : Set as 90℃. | OFF H⟶ ON<br>▲ SV100℃  △ PV110℃<br>Alarm temperature(Absolute value) : Set as 110℃. | ■Absolute value high−limit alarm<br>If PV is equal to or higher than the absolute value of alarm temperature, the output will be ON. The absolute temperature is set in AL1/AL2.(Default of AL1, AL2 : 1200) |
| Am6 | ON ⟶H⟶ OFF<br>△ PV90℃  ▲ SV100℃<br>Alarm temperature(Deviation temperature) : Set as 90℃. | ON H⟶ OFF<br>▲ SV100℃  △ PV110℃<br>Alarm temperature(Deviation temperature) : Set as 110℃. | ■Absolute value low−limit alarm<br>If PV is equal to or lower than the absolute value of alarm temperature, the output will be ON. The absolute temperature is set in AL1/AL2.(Default of AL1, AL2 : −50) |
| SbA | It will be ON when it detects sensor disconnection. | | ■Sensor Break Alarm |
| LbA_ | It will be ON when it detects loop break. | | ■Loop Break Alarm |

※Alarm output hysteresis[ AHYS ]
  • Above alarm output operation mode, "H" is alarm output histeresis which displays alarm output's on/off interval. User settable.
  • When setting alarm operation(AL-1/AL-2) mode as [ AmO_ ], [ SbA ], [ LbA_ ], parameter will not be displayed.
  • Setting Range KCA, JIC, PT:1~100(Default : 1)

## ■Optional alarm output selection

| Display | Alam mode | Description |
|---|---|---|
| A | General alarm | When PV reaches alarm temp.(deviation), Aux output will be ON. |
| b | Latch | When PV reaches alarm temp.(deviation), Aux output will be ON and retained. |
| c | Standby | When PV reaches alarm temp.(deviation) for the second time, Aux output will be ON.(No output will be on for initial operation.) |
| d | Latch & Standby | Latch and Standby mode applied together. |

## ■Function

### ◎Auto tuning[ At ]

●When setting [ At ] parameter to [ on ], front temperature unit display(℃ or °F) lamp will be flickering during Auto tuning. After completing auto tuning, temperature unit display lamp returns to normal operation and [ At ] parameter automatically becomes [ on → oFF ].

●Set as [ oFF ] to stop auto tuning.
 ※It keeps previous P, I, D set values.

●If SV is changed during auto tuning mode, auto tuning is stopped.

●PID time constants figured out thru auto tuning function can be changed.

●If control method is set to [ onoF ], no parameters are displayed.
 Finish auto tuning when [ oPEn ] error or [ Er.5u ] error (for TD series) occurs during the operation.

※In case of [ oPEn ] error or [ Er.5u ] error (for TD series), auto tuning operation is not applicable.

## ◎Control method selection[ $\mathcal{L}$-$\bar{n}$d ]
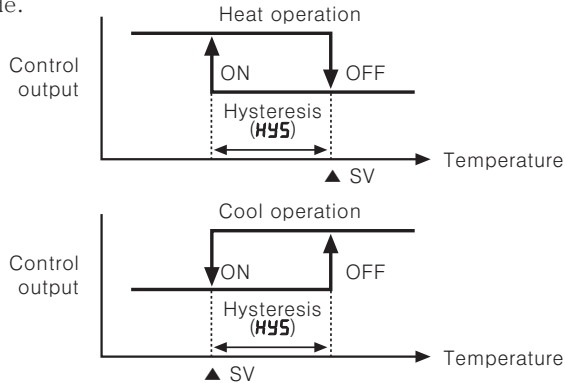
It is selectable PID, ON/OFF control.
- In case of ON / OFF( $onoF$ ) mode, Hysteresis( $H5$ ) parameter is displayed.
- In case of PID( $P d$ ) mode, Proportional band( $P$ ), Reset time( $I$ ) and Rate time( $E$ ) parameters are displayed.

## ◎Hysteresis[ $H5$ ]

Set control output ON / OFF interval in ON / OFF control mode.



- If Hysteresis is too narrow, hunting(Oscillation, Chattering)could occur due to external noise.
- In case of ON / OFF control mode, even if PV reaches stable status, there still occurs hunting. It could be due to Hysteresis( $H5$ ) SV, load's response characteristics or sensor's location. In order to reduce hunting to a minimum, it is required to take into following factors consideration when designing temp. controlling; proper Hysteresis( $H5$ ), heater's capacity, thermal characteristics, sensor's response and location.

## ◎Manual reset function[ $rE5E$ ]

When selecting P / PD control mode, there exists certain temperature difference even after PV reaches stable status since heater's rising and falling time is inconsistent due to thermal characteristics of control objects, such as heat capacity, heater capacity. This temperature difference is called OFFSET and manual reset function is to set / correct OFFSET.
- How to set
  - When PV and SV are equal, reset value is 50.0%.
  - When PV ≤ SV, reset value > 50.0%
  - When PV ≥ SV, reset value < 50.0%
- Reset( $rE5E$ ) setting depending on control results
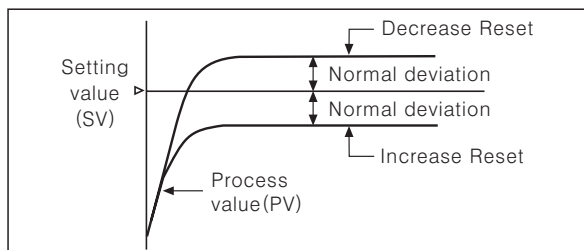


※Manual reset function is applicable only to P / PID control mode.

## ◎Temperature Unit Selection Function[ $Un E$ ]

- A function to select display temperature unit
- Front unit display lamp will be ON when converting temperature unit

## ◎Cool / Heat function[ $o$-$FE$ ]

There are two temperature controlling applications, one is heating and the other is cooling.
- Heating: When PV is lower than SV, control output will be ON to supply power to the load (heater) and vice versa.
- Cooling: When PV is higher than SV, control output will be ON to supply power to the load (cooler) and vice versa.
- In case of ON / OFF control, or P control mode, Control output for Cooling / Heating is opposite to each other.
- In case of PID mode, PID time constants for Cooling / Heating are different from each other since PID time constants are determined depending on each control object.
- Cool−function( $CooL$ ) and heat−function( $HEAE$ ) must be set correctly according to the application, if set as opposite function, it may cause a fire.
(If set cool−function( $CooL$ ) at heater, even if temperature is getting high, it will be maintained ON and it may cause a fire.)
- Avoid changing heat−function to cool−function or cool−function to heat−function on the unit is operating.
- It is impossible to operate both function at once in this unit. Therefore, only one function should be selected only.

## ◎FUNCTION key operation[ $d E$ ]

Press front keys ▼ + ▲ at the same time for 3 sec to have previously set operation in parameter performed. You can choose between control output stop and alarm output off.
It enables to stop control output without power off in RUN mode.[ $5EoP$ ]

## ◎Control output RUN / STOP

It is allowed for users to select RUN / STOP mode in RUN mode.
- When it is required to stop control output temporarily (e.g., during maintenance work), use "STOP" command to stop control output.(Auxiliary output is normally provided as setting values.)
- In case of STOP mode, [ $5EoP$ ] parameter and PV value is flickering in turn on display part.
- When power is off in "STOP" mode, "STOP" mode will be kept after Power is supplied again.(In order to return to normal control operation, make "STOP" mode OFF using front keys.)
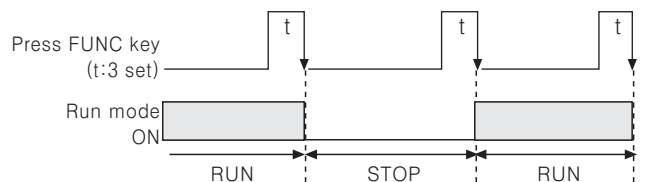


## ◎Alarm Reset

A function to reset or initialize alarm output by force while alarm output is ON. (Applicable only to Latch and Latch / Standby mode)

(A)
Counter

(B)
Timer

(C)
Temp.
controller

(D)
Power
controller

(E)
Panel
meter

(F)
Tacho/
Speed/
Pulse
meter

(G)
Display
unit

(H)
Sensor
controller

(I)
Switching
power
supply

(J)
Proximity
sensor

(K)
Photo
electric
sensor

(L)
Pressure
sensor

(M)
Rotary
encoder

(N)
Stepping
motor &
Driver &
Controller

(O)
Graphic
panel

(P)
Field
network
device

(Q)
Production
stoppage
models &
replacement

# TC/TD Common Features

## ◎Loop break alarm(LBA)[ LbR_ ]

When control deviation (SV−PV) is smaller than LBA detection band during LBA monitoring time, it is considered control loop break and LBA output will be ON.

● Auto tuning is not applicable while LBA mode.

● When alarm reset mode is applied, the starting point of LBA monitoring will be initialized.

※ When selecting alarm output mode(RL- 1, RL-2), or LBA mode(LbR. _), related parameters(LbRt, LbR.5, LbR.b) are displayed.
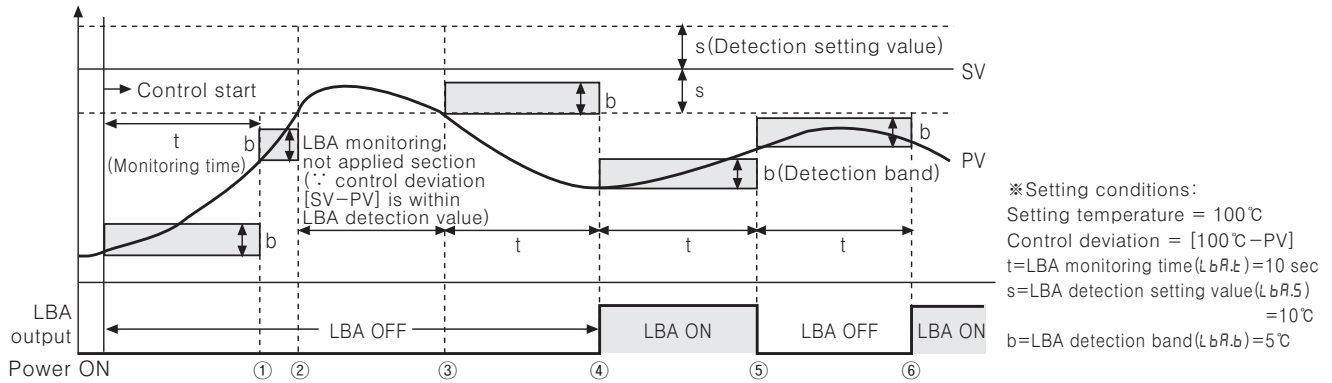


Control start ~ ①: LBA output OFF. As soon as power is supplied, control deviation [SV−PV] increases over LBA detection width (5℃) within LBA monitoring time (10sec).

②~③: LBA monitoring not applied section − PV is within LBA detection setting value (90<PV<100℃)

③~⑥: LBA monitoring applied section (LBA monitoring time: 10sec) − PV is out of LBA detection setting value (90℃<PV).

②: LBA monitoring stopped. PV reaches LBA detection range within LBA monitoring time (10sec).

④: LBA output ON. Control deviation [SV−PV] decreases over LBA detection band (5℃) at ③~④ section.

⑤: LBA output OFF. Control deviation [SV−PV] increases over LBA detection badn (5℃) at ④~⑤ section.

⑥: LBA output ON. Control deviation [SV−PV] is within LBA detection band (5℃) at ⑤~⑥ section.

## ◎Sensor break alarm(SBA)[ 5bR ]

A function to make alarm output ON when sensor line is cut or open. It is possible to check sensor break using relay contacts for alarm output or buzzers.

● Set alarm mode parameter(RL- 1, RL-2) "5bR."

● 5bRR / 5bRb selectable

● Reset alarm output or power off the unit to make alarm output OFF.

## ◎Input bias[ I n-b ]

Input correction is to correct deviation occurred from temperature sensor such as thermocouples, RTD etc.

● If you check the deviation of every temperature sensor precisely, it can measure temperature accurately.

● Use this mode after measuring deviation occurred from temperature sensor exactly.

Because if measured deviation value is not corrected, displayed temperature may be too high or too low.

● When you set the Input revise value, you may need to record it, because it will be useful when performing maintenance.

## ◎Input digital filter[ ñRuF ]

A function to filter input signals for more stable PV display in order to provide stable control output. If noise occurs on input signals or PV value keeps changing, it gets difficult to perform high accuracy control since PV has a direct effect on output level.

## ◎SV High/Low limit[ L-5u / H-5u ]

● It sets SV high/low limit Limit range of using temperature within temperature range for each sensor, user can set/change set temperature(SV) within SV high limit [H-5u] ~SV low limit[L-5u]. (※ L-5u > H-5u cannot be set.)

● When changing input specification(I n-t), SV high limit(H-5u) and SV low limit(L-5u) of using temperature will be initialized as max./min. value of sensor temperature range automatically.

## ◎Input error MV(oPEn)[ Er.ñu ]

● It sets control output when sensor input disconnection error is occurred enabling to set as ON/OFF and operation set by user.

● It executes control output by set operations regardless of ON/OFF and PID control operations.

## ▣Proper usage

### ◎Simple "error" diagnosis

● In case, the load (Heater etc) is not operated, please check operation of the out lamp located in front panel of the unit. If lamp does not operate, please check the parameter of all programmed mode. If lamp is operating, please check the output (Relay, Driving voltage of SSR) after separating output line from the unit.

● When it displays "oPEn" during operation.
This is a warning that external sensor is cut off.
Please turn off power and check the state of sensor.
If sensor is not cut off, disconnect sensor line from terminal block and +, − together. When you turn on power it can check room temperature.
If this unit cannot indicate room temperature, this unit itself is faulty. Please remove this unit from equipment and service or replace.
(When the input mode is thermocouple, it is available to indicate room temperature.)

● In case of indicating "Error" in display
This Error message is indicated in case of damaging inner chip program data by outer strong noise.
In this case, please send the unit to our after service center after removing the unit from system.
Noise protection is designed in this unit, but it does not stand up strong noise continuously.
If bigger noise than specified(Max. 2kV) flows in the unit, it can be damaged.

## ◎Caution for using

● Please use the terminal(M3.5, Max. 7.2mm) when connecting the AC power source.

● "⚠" mark indicated on the diagram of this unit means caution−refer to accompanying documents.

● In case of cleaning the unit, please keep as following Cautions;
①Clean dust with a dry tissue.
②Be sure to use alcohol to clean the unit, do not use acid, chromic acid, solvent, etc.
③Be sure to clean the unit after turning off the power and then turn on the power after passing 30minute after cleaning.

● If this unit is used in a manner not to be specified by the manufacture, it can be injury to a person or damage to property.

● Be sure that metal dust and wire−dregs do not flow in the unit, because of malfunction damage of the unit or the cause of a fire.

● Service life for the relay of the unit is indicated in this manual, life cycle is different according to the load capacity and switching times, therfore please use the unit after checking the load capacity and switching times.

● Connect wires correctly after checking polarity of terminals.

● Do not use this unit as following place.
①A place where dust, corrosive gas, oil, moisture are occurred.
②A place where there are high humidity or freezing place.
③A place where sunshine, radiant heat is occurred.
④A place where vibration, shock is occurred.

● If the equipment is used in a manner not specified by the manufacture the protection provided by the equipment may be impaired.

● Please install power switch or circuit−breaker in order to cut power supply off.

● A switch or circuit−breaker meeting the relevant requirements of IEC947−1 and IEC947−3 shall be included in equipment when the temperature controller.

● The switch or circuit−breaker should be installed near by users.

● Installation environment
①It shall be used indoor
②Altitude Max. 2000m
③Pollution Degree 2
④Installation CategoryⅡ.

● This SSRP of this controller are insulate from internal power.

● Do not connect power line to sensor connecting part. The inner circuit may be damaged.