# TD Series

## Digital switch type PID control

### ■ Features

- **Digital switch application to PID control temperature controller**
- Realizes ideal temp. controlling with newly developed PID control algorithm and 100ms high speed sampling
- Built-in 2 types main output (TD4H, TD4L)
  : Selectable relay output or SSR drive output
    current output or SSR drive output ⎱ Selectable
- Dramatically increased visibility using wide display part
- Mounting space saving with compact design
  : Approx. 38% reduced size compared with existing model(depth-based)
※ For substitute T3HS, set *AL-1* or *AL-2* as *Añ.1b* or *Añ5.b*
※ For substitute T3HA, T3MA, T3LA set *AL-1* or *AL-2* as *Añ4.A*.

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

CE cULus

### ■ Ordering information

| T | D | 4 | M | — | 1 | 4 | R |

| | | |
|---|---|---|
| | | R | Relay output + SSR drive output |
| Control output※1 TD4SP/TD4M | | S | SSR drive output |
| | | C | Current output |
| TD4H/TD4L | | R | Relay output + SSR drive output |
| | | C | Current output + SSR drive output |

Control output※1

| Power supply | 4 | 100-240VAC 50/60Hz |
|---|---|---|

| Alarm output | N | No alarm output |
|---|---|---|
| | 1 | Alarm1 output |
| | 2 | Alarm1 output+Alarm2 output |

| | SP | DIN W48×H48mm(8pin plug type)※2 |
|---|---|---|
| Size | M | DIN W72×H72mm |
| | H | DIN W48×H96mm |
| | L | DIN W96×H96mm |

| Digit | 4 | 9999(4digit) |
|---|---|---|
| Setting type | D | Set by digital switch |
| Item | T | Temperature controller |

※1. Control output types is different depending on model size.
※2. 8pin socket(PG-08, PS-08) : sold separately.

### ■ Specifications

| Series | | TD4SP | TD4M | TD4H | TD4L |
|---|---|---|---|---|---|
| Power supply | | 100-240VAC 50/60Hz | | | |
| Allowable voltage range | | 90 to 110% of rated voltage | | | |
| Power consumption | | Max. 5VA | | | |
| Display method | | 7 Segment(Red), Other display(Green, Yellow, Red LED) | | | |
| Character size | | H15×W7mm | H18×W9mm | H15×W7mm | H22×W11mm |
| Input type | RTD | DIN Pt100Ω(Allowable line resistance max. 5Ω per a wire) | | | |
| | TC | K(CA), J(IC) | | | |
| Display accuracy | RTD | (PV ±0.5% or ±1℃ higher one) rdg ±1digit※1 | | | |
| | TC | ※TD4SP(Plug type) is (PV ±0.5% or ±2℃ higher one) rdg ±1digit※2 | | | |
| Control output | Relay | 250VAC 3A 1c | 250VAC 3A 1a | Relay(250VAC 3A 1a)+SSR(24VDC ±3V 20mA Max.) | |
| | SSR | 24VDC ±3V 20mA Max. | | | |
| | Current | DC4-20mA (Load resistance Max. 600Ω) | | | |
| Alarm output | | ─ | AL1 Relay: 250VAC 1A 1a | AL1, AL2 Relay: 250VAC 1A 1a | |
| Control method | | ON/OFF and P, PI, PD, PID control | | | |
| Hysteresis | | 1 to 100℃/℉ | | | |
| Proportional band(P) | | 0.1 to 999.9℃/℉ | | | |

※1. In case of out of room temperature range: (PV ±0.5% or ±2℃ higher one)rdg ±1digit
    L(IC) and RTD Cu50: (PV ±0.5% or ±3℃ higher one)rdg ±1digit
※2. In case of out of room temperature range for TD4SP: (PV ±0.5% or ±3℃ higher one)rdg ±1digit
    L(IC) and RTD Cu50: (PV ±0.5% or ±4℃ higher one)rdg ±1digit

**Autonics**

# Digital Switch type PID Control

## ■ Specifications

| Series | TD4SP | TD4M | TD4H | TD4L |
|---|---|---|---|---|
| Integral time(I) | 9999sec. | | | |
| Derivative time(D) | 9999sec. | | | |
| Control period(T) | 0.5 to 120.0sec. | | | |
| Manual reset | 0.0 to 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 to 55Hz(for 1 min.) in each of X, Y, Z directions for 2 hours | | | |
| Relay life cycle | Control output | Mechanical : Min. 10,000,000 operations, Electrical : Min. 100,000 operations | | |
| | Alarm output | Mechanical : Min. 5,000,000 operations, Electrical : Min. 300,000 operations | | |
| Insulation resistance | Min. 100MΩ (at 500VDC megger) | | | |
| Memory retention | Square shaped noise by noise simulator(pulse width 1μs)±2kV R-phase and S-phase | | | |
| Ambient temperature | Approx. 10 years (When using non-volatile semiconductor memory type) | | | |
| Environ-ment | Ambient temperature | -10 to 50℃, storage: -20 to 60℃ | | |
| | Ambient humidity | 35 to 85%RH, storage: 35 to 85%RH | | |
| Insulation type | Double insulation or reinforced insulation (Mark: ▣, Dielectric strength between the measuring input part and the power part : 2kV) | | | |
| Approval | CE c⏚Lus | | | |
| Unit weight | Approx. 185g | | | |

※Environment resistance is rated at no freezing or condensation.

## ■ Connections

### ●TD4SP-N4☐ (Indicator only, no alarm output model)
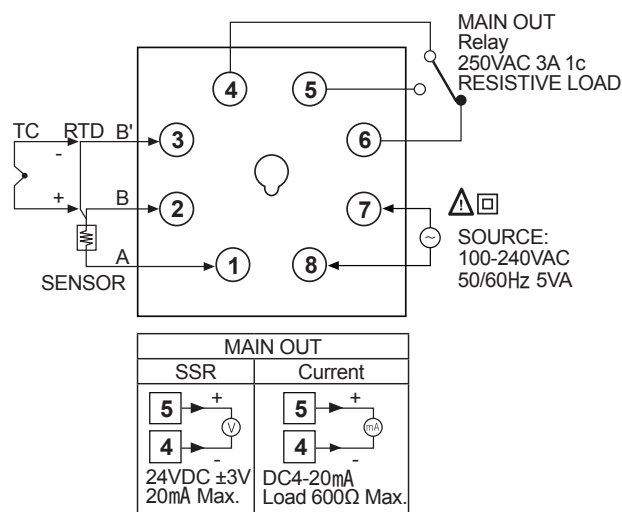


### ●TD4H/TD4L
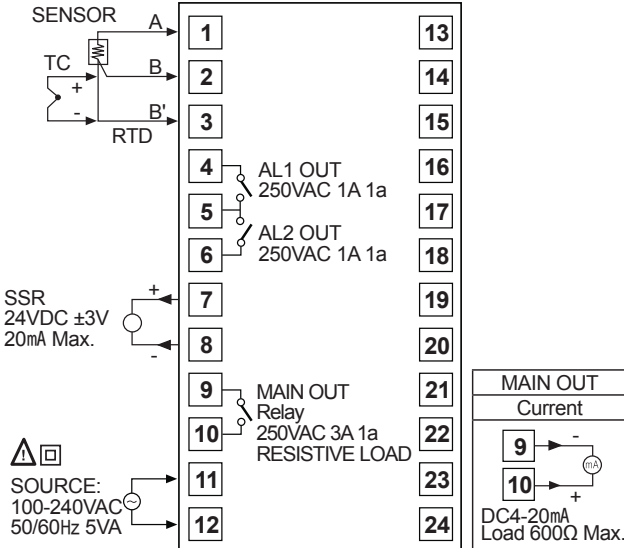


### ●TD4M
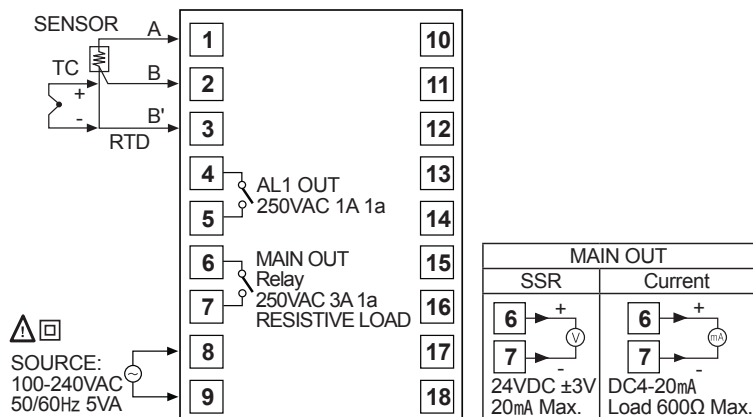
(A) Photo electric sensor
(B) Fiber optic sensor
(C) Door/Area sensor
(D) Proximity sensor
(E) Pressure sensor
(F) Rotary encoder
(G) Connector/ Socket
(H) Temp. controller
(I) SSR/ Power controller
(J) Counter
(K) Timer
(L) Panel meter
(M) Tacho/ Speed/ Pulse meter
(N) Display unit
(O) Sensor controller
(P) Switching power supply
(Q) Stepping motor& Driver&Controller
(R) Graphic/ Logic panel
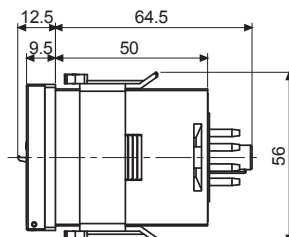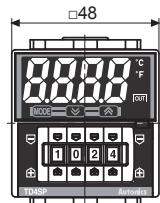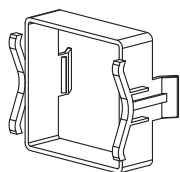(S) Field network device
(T) Software
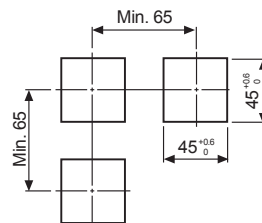(U) Other

# TD Series

## ■ Connections

### ●TD4SP
●Bracket
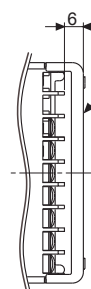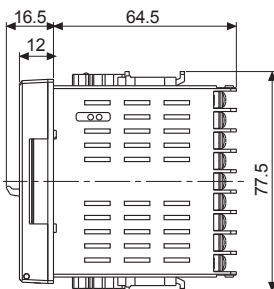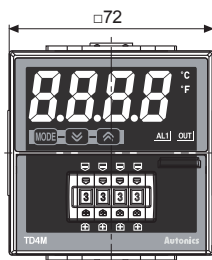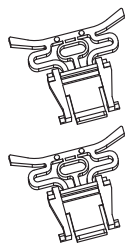
□48

12.5  64.5
9.5   50
56

●Panel cut-out

Min. 65
Min. 65
$45^{+0.6}_{0}$
$45^{+0.6}_{0}$

---

### ●TD4M
●Bracket

(unit: mm)

□72

16.5  64.5
12
77.5
6

Terminal cover

●Panel cut-out

Min. 90
Min. 90
$68^{+0.7}_{0}$
$68^{+0.7}_{0}$

---

### ●TD4H
●Bracket

(unit: mm)

48

16.5  64.5
12
101.5
96
6

Terminal cover

●Panel cut-out

Min. 65
Min. 115
$92^{+0.8}_{0}$
$45^{+0.6}_{0}$

---

### ●TD4L
●Bracket

(unit: mm)

□96

16.5  64.5
12
101.5
6

Terminal cover

●Panel cut-out

Min. 115
Min. 115
$92^{+0.8}_{0}$
$92^{+0.8}_{0}$

---
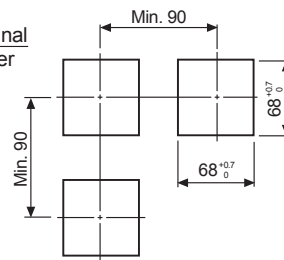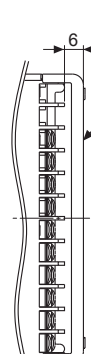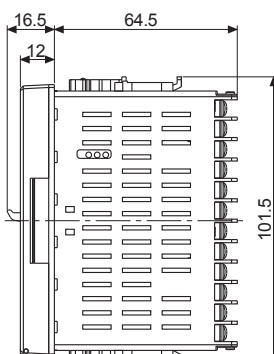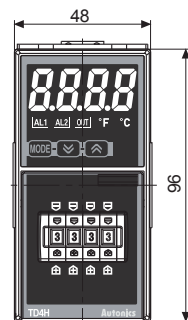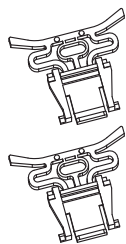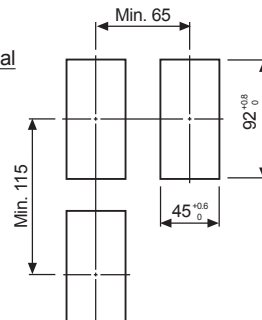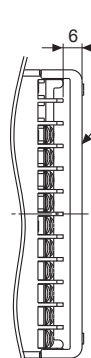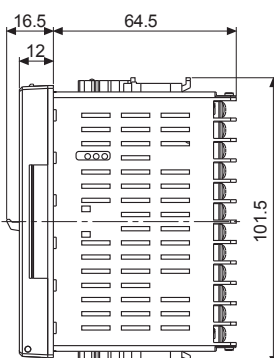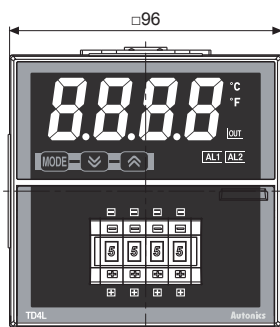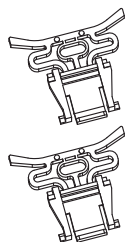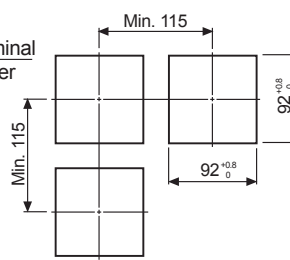
### ●Terminal cover(Sold separately)

(unit: mm)

●RMA-COVER(72×72mm)      ●RHA-COVER(48×96mm)      ●RLA-COVER(96×96mm)

73      68.5
47.2    13    91.5
94      13    91.5

**Autonics**

# Digital Switch type PID Control

(A)
Photo
electric
sensor

(B)
Fiber
optic
sensor

(C)
Door/Area
sensor

(D)
Proximity
sensor

(E)
Pressure
sensor

(F)
Rotary
encoder

(G)
Connector/
Socket

(H)
Temp.
controller

(I)
SSR/
Power
controller

(J)
Counter

(K)
Timer

(L)
Panel
meter

(M)
Tacho/
Speed/ Pulse
meter

(N)
Display
unit

(O)
Sensor
controller

(P)
Switching
power
supply

(Q)
Stepping
motor&
Driver&Controller

(R)
Graphic/
Logic
panel

(S)
Field
network
device

(T)
Software

(U)
Other

## ■ Product mounting

● TD4SP(48×48㎜) Series          ● Other Series



※Mount the product on the panel, fasten bracket by
pushing with tools as shown above.

## ■ 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. Temperature unit indicator**(℃/℉) : It shows current temperature unit.
**2. Auto-tuning indicator**
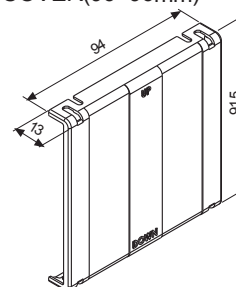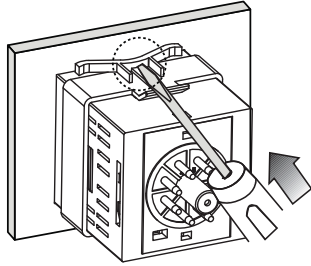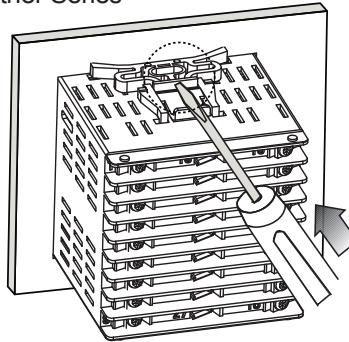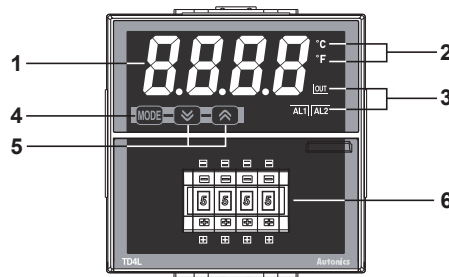Temperature unit indicator(℃ or ℉) is flashing by every 1 sec during auto tuning operation.
Se[oFF] to stop auto tuning operation, it maintains previous P, I, D setting values.
If error [Er.Su, oPEn]occurs during operation, auto tuning stops.
※Auto tuning operates continuously if error [HHHH], [LLLL] occurs. If it is satisfied with the condition, it finishes auto tuning  normally.
**3. Control/sub output indicator**
-OUT: It will light up when control output(Main Control Output) is on.
 ※For current output type, if MV is below 2%, it turns OFF. If MV is over 3%, it turns ON.
-AL1/AL2: It will light up when alarm output  Alram1, Alram2 is on.
**4. MODE Key** : Used when entering into parameter setting group, returning to RUN mode, moving parameter
and saving setting values.
**5. Adjustment** : Used when entering into set value change mode, Digit moving and Digit Up/down
Press ⊻ + ⊼ keys at the same time to move digit, to execute, or release the set function in digital
input key setting (dl - ᵸ)
**6. Digital Switch** : Set the setting temperature (SV) to be controlled.

## ■ Factory default

● Setting group 1

| Parameter | Factory default |
|-----------|-----------------|
| AL 1 | 1250 |
| AL 2 | |
| 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 | ḻCA | AL - 1 | Añ 1.A |
| Unlt | ℃ | | |
| In-b | 000 | AL - 2 | Añ2.A |
| ḻAᵤF | 000.1 | | |
| L-Su | -50 | AHYS | 00 1 |
| H-Su | 1200 | L bA.t | 0000 |
| o-Fu | HEAt | L bA.b | 002 |
| C-ᵐd | PId | dl - ḻ | StoP |
| oᵁt ※1 | rLY | Er.ᵐu | 000.0 |
| t ※2 | 020.0 | | |
| | 020.0 | LoC | oFF |

※1. Only for TD4H/TD4L.
※2. Factory default of [t] is 20.0 when [oᵁt] is [rLY], 2.0 when [oᵁt] is [SSr]. In case of current output[Cᵁᶻ], it is not displayed.

# TD Series

## ■ Flow chart for setting group

**RUN mode** ⑤

① Digital switch     ② MODE 2 sec.     ③ MODE 4 sec.

Setting SV     First setting group(*PAr 1*)     Second setting group(*PAr 2*)

MODE 3 sec.     MODE 3 sec.

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

④

| | |
|---|---|
| *AL 1* | AL1 alarm temperature (Deviation/absolute value) setting |
| *AL 2* | AL2 alarm temperature (Deviation/absolute value) setting |
| *At* | Auto tuning ON/OFF |
| *P* | Proportional band |
| *I* | Integral time setting |
| *d* | Derivative time setting |
| *rSEt* | Manual reset(Normal deviation correction) setting |
| *HYS* | Hysteresis setting |

| | |
|---|---|
| *In-t* | Input sensor |
| *Unit* | Temperature unit |
| *In-b* | Input correction |
| *mAu.F* | Input digital filter |
| *L-Su* | SV low-limit value |
| *H-Su* | SV high-limit value |
| *o-Ft* | Control output operation |
| *C-md* | Control type |
| *oUt* | Control output type (Only for TD4H/L model) |
| *SSr.m* | PID control cycle |
| *t* | AL1 alarm operation mode |
| *AL-1* | AL2 alarm operation mode |
| *AL-2* | Alarm output hysteresis |
| *LbA.t* | LBA monitoring time |
| *LbA.b* | LBA detection band |
| *dI-t* | Digital input key operation |
| *Er.mu* | Control output MV in case of input break error |
| *LoC* | Lock setting |

※Parameter marked in ⟨dotted⟩ might not be displayed depending on other parameter settings.

①Digital switch is available to set SV, alarm value at anywhere.
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.

※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 garoup 2 → Setting group 1
•Set parameter as the above considering parameter relation of each setting group.
•Check parameter set value after change parameter of setting group 2.
•Setting group description above is for TD4H/L-24R models.

※Shaded parameters of setting group 2 may not be displayed depending on TD4 model.
※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 [*Amo_/SbA::/LbA_::*], [*AHYS*] parameter is not displayed.

## ■ Flow chart for setting group 1

MODE 3sec. → RUN mode

MODE 2sec.

*PAr 1*

Alarm1 setting value

*AL 1* — S → *1250*

MODE

Alarm2 setting value

*AL2* — S → *1250*

MODE

**S** : Press any key among ⌄, ⌃.
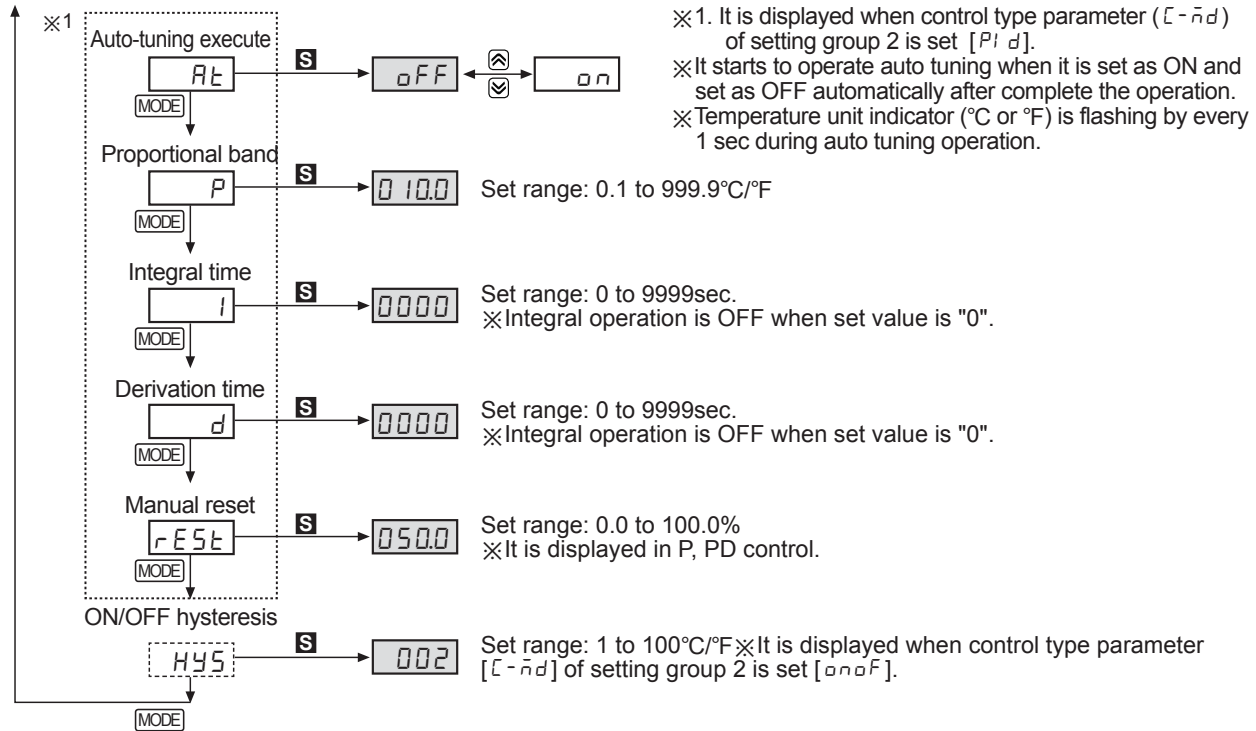※After checking/changing set value at each parameter, and press MODE key, set value flashes twice and it moves to next parameter automatically.
※After entering any parameter and press MODE key for 3sec, it returns to RUN mode.

Set range: Deviation alarm(-[F.S] to [F.S]),
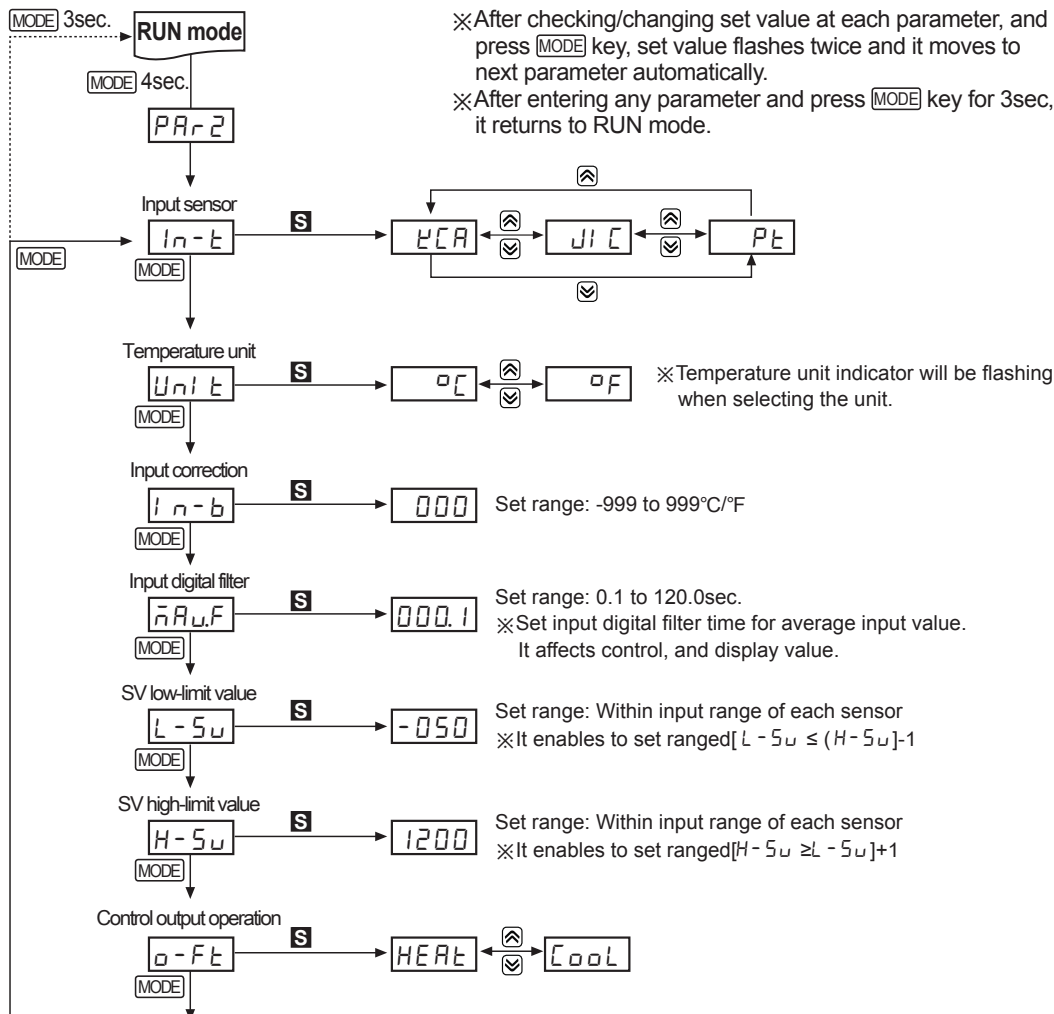          Absolute value alarm(Input range)
※In case alarm operation mode(*AL-1*, *AL-2*) is set as [*Amo_/SbA::/LbA_::*], parameter will not be displayed.

**Autonics**

# Digital Switch type PID Control

※1 Auto-tuning execute

`At`  S  `oFF` ⇕ `on`

MODE

※1. It is displayed when control type parameter (`C-ñd`) of setting group 2 is set [`PI d`].
※It starts to operate auto tuning when it is set as ON and set as OFF automatically after complete the operation.
※Temperature unit indicator (°C or °F) is flashing by every 1 sec during auto tuning operation.

Proportional band

`P`  S  `0 10.0`  Set range: 0.1 to 999.9°C/°F

MODE

Integral time

`I`  S  `0000`  Set range: 0 to 9999sec.
※Integral operation is OFF when set value is "0".

MODE

Derivation time

`d`  S  `0000`  Set range: 0 to 9999sec.
※Integral operation is OFF when set value is "0".

MODE

Manual reset

`rESt`  S  `050.0`  Set range: 0.0 to 100.0%
※It is displayed in P, PD control.

MODE

ON/OFF hysteresis

`HYS`  S  `002`  Set range: 1 to 100°C/°F ※It is displayed when control type parameter [`C-ñd`] of setting group 2 is set [`onoF`].

MODE

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## ■ Flow chart for setting group 2

MODE 3sec. → **RUN mode**

MODE 4sec.

`PAr2`

※After checking/changing set value at each parameter, and press MODE key, set value flashes twice and it moves to next parameter automatically.
※After entering any parameter and press MODE key for 3sec, it returns to RUN mode.

Input sensor

MODE  `In-t`  S  `HCA` ⇄ `JIC` ⇄ `Pt`

MODE

Temperature unit

`Unit`  S  `°C` ⇕ `°F`  ※Temperature unit indicator will be flashing when selecting the unit.

MODE

Input correction

`In-b`  S  `000`  Set range: -999 to 999°C/°F

MODE

Input digital filter

`ñAuF`  S  `000.1`  Set range: 0.1 to 120.0sec.
※Set input digital filter time for average input value. It affects control, and display value.

MODE

SV low-limit value

`L-Su`  S  `-050`  Set range: Within input range of each sensor
※It enables to set ranged[ `L-Su` ≤ ( `H-Su` )-1

MODE

SV high-limit value

`H-Su`  S  `1200`  Set range: Within input range of each sensor
※It enables to set ranged[ `H-Su` ≥ `L-Su` ]+1

MODE

Control output operation

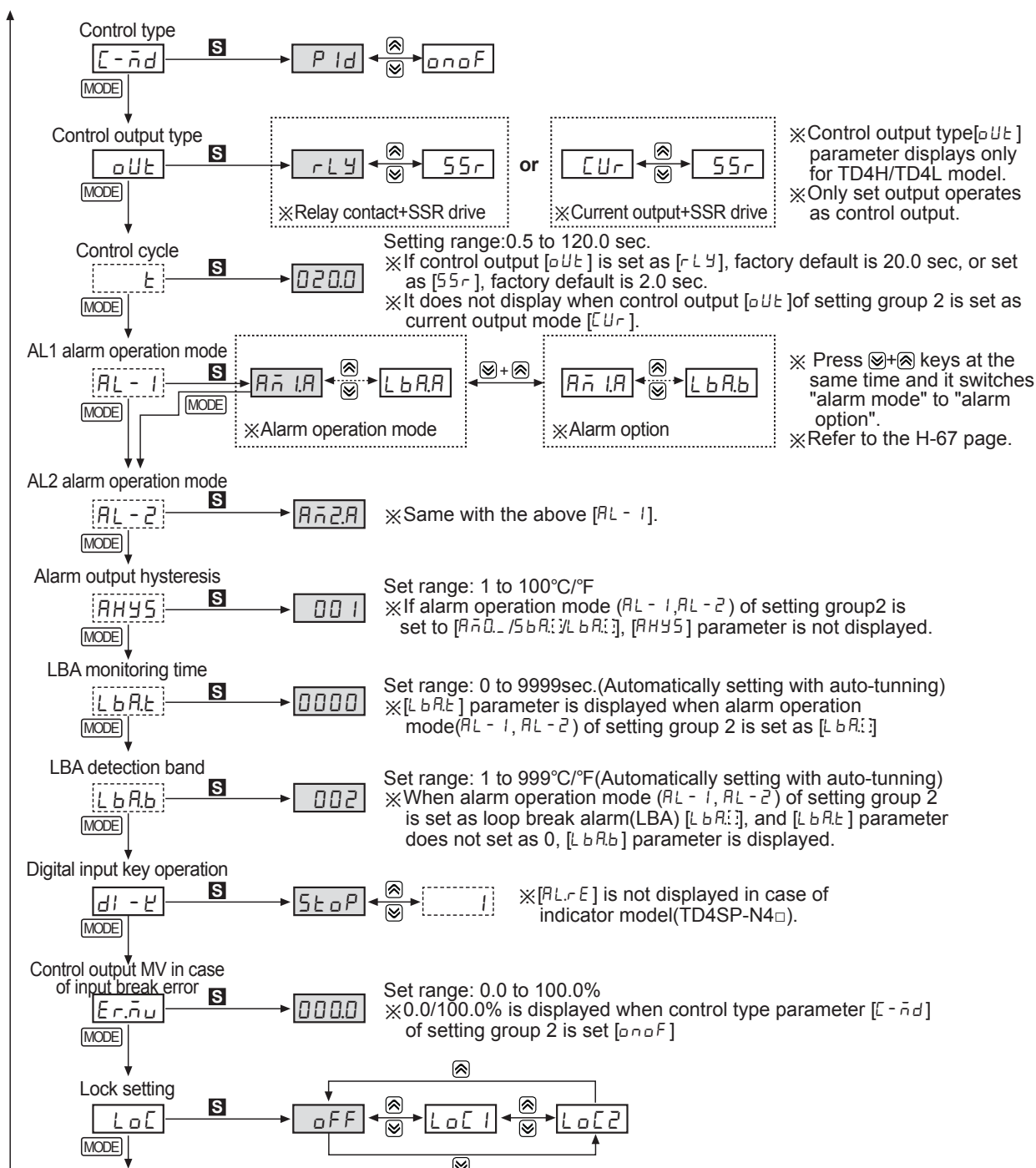`o-Ft`  S  `HEAt` ⇕ `CooL`

MODE

---

(A) Photo electric sensor
(B) Fiber optic sensor
(C) Door/Area sensor
(D) Proximity sensor
(E) Pressure sensor
(F) Rotary encoder
(G) Connector/ Socket
(H) Temp. controller
(I) SSR/ Power controller
(J) Counter
(K) Timer
(L) Panel meter
(M) Tacho/ Speed/ Pulse meter
(N) Display unit
(O) Sensor controller
(P) Switching power supply
(Q) Stepping motor& Driver&Controller
(R) Graphic/ Logic panel
(S) Field network device
(T) Software
(U) Other

# TD Series

**Control type**

[C-n̄d] —S→ [P Id] ⇕ [onoF]

[MODE]

**Control output type**

[oUt] —S→ [rLY] ⇕ [SSr] **or** [CUr] ⇕ [SSr]

[MODE]

※Relay contact+SSR drive    ※Current output+SSR drive

※Control output type[oUt] parameter displays only for TD4H/TD4L model.
※Only set output operates as control output.

**Control cycle**

[t] —S→ [020.0]

[MODE]

Setting range:0.5 to 120.0 sec.
※If control output [oUt] is set as [rLY], factory default is 20.0 sec, or set as [SSr], factory default is 2.0 sec.
※It does not display when control output [oUt]of setting group 2 is set as current output mode [CUr].

**AL1 alarm operation mode**

[AL-1] —S→ [An̄1.A] ⇕ [LbA.A]    [⇕+⌃] [An̄1.A] ⇕ [LbA.b]

[MODE]  [MODE]

※Alarm operation mode    ※Alarm option

※ Press ⇕+⌃ keys at the same time and it switches "alarm mode" to "alarm option".
※Refer to the H-67 page.

**AL2 alarm operation mode**

[AL-2] —S→ [An̄2.A]  ※Same with the above [AL-1].

[MODE]

**Alarm output hysteresis**

[AHYS] —S→ [001]

[MODE]

Set range: 1 to 100℃/°F
※If alarm operation mode (AL-1,AL-2) of setting group2 is set to [An̄0_/SbA.i/LbA.i], [AHYS] parameter is not displayed.

**LBA monitoring time**

[LbA.t] —S→ [0000]

[MODE]

Set range: 0 to 9999sec.(Automatically setting with auto-tunning)
※[LbA.t] parameter is displayed when alarm operation mode(AL-1,AL-2) of setting group 2 is set as [LbA.i]

**LBA detection band**

[LbA.b] —S→ [002]

[MODE]

Set range: 1 to 999℃/°F(Automatically setting with auto-tunning)
※When alarm operation mode (AL-1,AL-2) of setting group 2 is set as loop break alarm(LBA) [LbA.i], and [LbA.t] parameter does not set as 0, [LbA.b] parameter is displayed.

**Digital input key operation**

[dI-t] —S→ [StoP] ⇕ [1]

[MODE]

※[AL.rE] is not displayed in case of indicator model(TD4SP-N4□).

**Control output MV in case of input break error**

[Er.n̄u] —S→ [000.0]

[MODE]

Set range: 0.0 to 100.0%
※0.0/100.0% is displayed when control type parameter [C-n̄d] of setting group 2 is set [onoF]

**Lock setting**

[LoC] —S→ [oFF] ⇕ [LoC1] ⇕ [LoC2]

[MODE]

---

## ■ Input type and range[ In-t ]

(Factory default : [UCA])

| Input type | | Display | Input range(℃) | Input range(°F) |
|---|---|---|---|---|
| ThermoCouple | K(CA) | UCA | -50 to 1200℃ | -58 to 2192°F |
| | J(IC) | JIC | -30 to 500℃ | -22 to 932°F |
| Platinum resistance thermometer(RTD) | DPt100Ω | Pt | -100 to 400℃ | -148 to 752°F |

**Autonics**

# Digital Switch type PID Control

## ■ Functions

Refer to the H-66 to 69 page for TC / TD common features.

### ◎ Control output type selection [oUt] (※Available with only TD4H/L model)

● In case of relay output type model, relay output (rLY) and SSR drive output (SSr) supported. In case of current output type model, current output (CUr)(DC4-20mA) and SSR output (SSr)supported.
● A function to select control output type.

### ◎ 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 |
| LoC1 | Lock setting group 2 |
| LoC2 | Lock setting group 1, 2 |

### ◎ Error

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

| Display | Description |
|---------|-------------|
| Er.Su | Setting error (When SV is out of SV range) |
| 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. |

● When error causes are removed after error occurs, the error is cleared and it operates normally.

## ◎ Output connections

For more information about output, refer to the H-151 page

### ● Application of relay output type
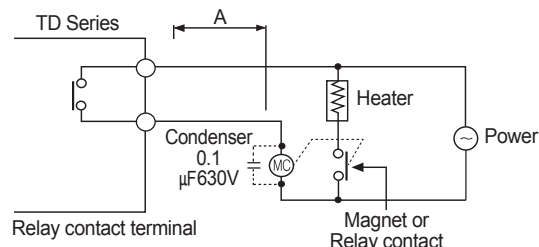


Keep power relay as far away as possible from temperature controller. If wires length of **A** is short, electromotive force occurred from a coil of magnet switch & power relay may flow in power line of the unit, it may cause malfunction. If wires length of **A** is short, please connect a mylar condenser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

### ● Application of SSR output type
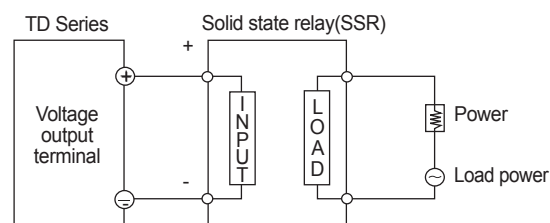


※SSR should be selected by the capacity of load, otherwise, it may short-circuit and result in a fire. Indirect heated should be used with SSR for efficient working.
※Heat sink integrated SSR must be used. Unless it may cause 70 to 80% of performance degrades or it may cause SSR failure in case of long term use.

### ● Application of current output(DC4-20mA)
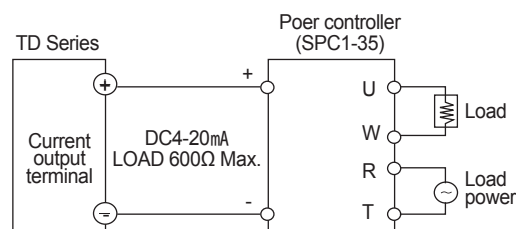


※It is important to select SCR unit after checking the capacity of the load.
※If the capacity is exceeded, it may cause a fire.

(A) Photo electric sensor
(B) Fiber optic sensor
(C) Door/Area sensor
(D) Proximity sensor
(E) Pressure sensor
(F) Rotary encoder
(G) Connector/ Socket
(H) Temp. controller
(I) SSR/ Power controller
(J) Counter
(K) Timer
(L) Panel meter
(M) Tacho/ Speed/ Pulse meter
(N) Display unit
(O) Sensor controller
(P) Switching power supply
(Q) Stepping motor& Driver&Controller
(R) Graphic/ Logic panel
(S) Field network device
(T) Software
(U) Other

# TC/TD Common Features

## ■ Alarm[AL-1/AL-2]

Aᴬᵐ1.A

Alarm mode ──┘ └── Alarm option
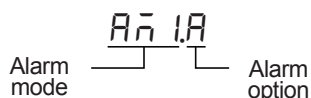
There are two alarms which operate individually. You can set combined alarm operation and alarm option.
Use digital input key (set as(ALrE)or turn OFF power and re-start this unit to release alarm operation.

### ◎ Alarm mode

| Mode | Name | Alarm operation | | Description |
|---|---|---|---|---|
| Aᴬᵐ1_ | - | - | | No alarm output |
| Aᴬᵐ1 | Deviation high-limit alarm | OFF ─── H↑ ON    SV100℃  PV110℃  Alarm temperature(Deviation): 10℃ | OFF↓H↑ ON    PV90℃  SV100℃  Alarm temperature(Deviation): -10℃ | If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON. |
| Aᴬᵐ2 | Deviation low-limit alarm | ON ↑H↓ OFF    PV90℃  SV100℃  Alarm temperature(Deviation): 10℃ | ON ↑H↓ OFF    SV100℃  PV110℃  Alarm temperature(Deviation): -10℃ | If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON. |
| Aᴬᵐ3 | Deviation high/low-limit alarm | ON ↑H↓ OFF ─── ↓H↑ ON    PV90℃  SV100℃  PV110℃  Alarm temperature(Deviation): 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. |
| Aᴬᵐ4 | Deviation high/low-limit reverse alarm | OFF ↓H↑ ON ─── ↑H↓ OFF    PV90℃  SV100℃  PV110℃  Alarm temperature(Deviation): 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. |
| Aᴬᵐ5 | Absolute value high limit alarm | OFF↓H↑ ON    PV90℃  SV100℃  Alarm temperature(Absolute): 90℃ | OFF ↓H↑ ON    SV100℃  PV110℃  Alarm temperature(Absolute): 110℃ | If PV is equal to or higher than the absolute value of alarm temperature, the output will be ON. |
| Aᴬᵐ6 | Absolute value low limit alarm | ON ↑H↓ OFF    PV90℃  SV100℃  Alarm temperature(Absolute): 90℃ | ON ↑H↓OFF    SV100℃  PV110℃  Alarm temperature(Absolute): 110℃ | If PV is equal to or lower than the absolute value of alarm temperature, the output will be ON. |
| SbA | Sensor break alarm | It will be ON when it detects sensor disconnection. | | It will be ON when it detects sensor disconnection. |
| LbA | Loop break alarm | It will be ON when it detects loop break. | | It will be ON when it detects loop break. |

### ◎ Alarm option

| Option | Name | Description |
|---|---|---|
| Aᴬᵐ A | Standard alarm | If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF. |
| Aᴬᵐ b | Alarm latch | If it is an alarm condition, alarm output is ON and maintains ON status.(Alarm output HOLD) |
| Aᴬᵐ C | Standby sequence 1 | First alarm condition is ignored and from second alarm condition, standard alarm operates. |
| Aᴬᵐ d | Alarm latch and standby sequence 1 | 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 gnored and from the second alarm condition, alarm latch operates. |
| Aᴬᵐ E | Standby sequence 2 | First alarm condition is ignored and from second alarm condition, standard alarm operates. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, standard alarm operates. |
| Aᴬᵐ F | Alarm latch and standby sequence 2 | Basic operation is same as alarm latch and standby sequence1. It operates not only by power ON/OFF, but also alarm setting value, or alarm option changing. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, alarm latch operates. |

※Condition of re-applied standby sequence for standby sequence 1, alarm latch and standby sequence 1: Power ON
Condition of re-applied standby sequence for standby sequence 2, alarm latch and standby sequence 2: Power ON, changing set temperature, alarm temperature [AL-1], [AL-2] or alarm operation [AL-1], [AL-2], switching STOP mode to RUN mode.

### ◎ Sensor break alarm

The function that alarm output will be ON when sensor is not connected or when sensor's disconnection is detected during temperature controlling. You can check whether the sensor is connected with buzzer or other units using alarm output contact.
•It is selectable between standard alarm (SbA.A) or alarm latch (SbA.b).

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## ◎ Loop break alarm(LBA)

It checks control loop and outputs alarm by temperature change of the subject.
For heating control(cooling control), when control output MV is 100%(0% for cooling control) and PV is not increased over than LBA detection band[L bA.b]During LBA monitoring time [L bA.t]or when control output MV is 0%(100% for cooling control) and PV is not decreased below than LBA detection band [L bA.b] during LBA monitoring time [L bA.t]Alarm output turns ON.
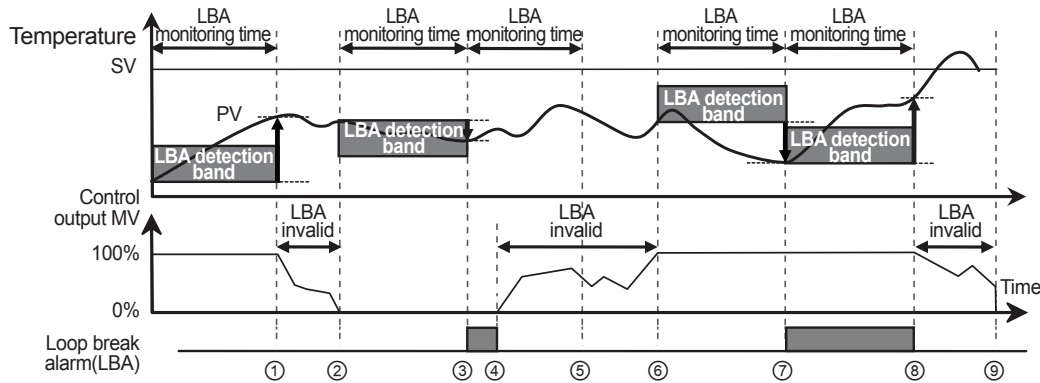


| Start control to ① | When control output MV is 100%, PV is increased over than LBA detection band [L bA.b]during LBA monitoring time[L bA.t] |
|---|---|
| ① to ② | The status of changing control output MV (LBA monitoring time is reset.) |
| ② to ③ | When control output MV is 0% and PV is not decreased below than LBA detection band [L bA.b] during LBA monitoring time [L bA.t], loop break alarm (LBA) turns ON after LBA monitoring time. |
| ③ to ④ | Control output MV is 0% and loop break alarm (LBA) turns and maintains ON. |
| ④ to ⑥ | The status of changing control output MV (LBA monitoring time is reset.) |
| ⑥ to ⑦ | When control output MV is 100% and PV is not increased over than LBA detection band [L bA.b]during LBA monitoring time [L bA.t], loop break alarm (LBA) turns ON after LBA monitoring time. |
| ⑦ to ⑧ | When control output MV is 100% and PV is increased over than LBA detection band [L bA.b]during LBA monitoring time [L bA.t], loop break alarm (LBA) turns OFF after LBA monitoring time. |
| ⑧ to ⑨ | The status of changing control output MV (LBA monitoring time is reset.) |

※When executing auto-tuning, LBA detection band [L bA.b]and LBA monitoring time are automatically set based on auto tuning value.
When alarm operation mode [AL - 1, AL - 2]is set as loop break alarm(LBA) [L bA.], LBA detection band [L bA.b]and LBA monitoring time [L bA.t]parameter is displayed.

## ■ Function

### ◎ Auto tuning [At ]

●When setting [At ] parameter to [on], front temperature unit display(℃ or ℉) 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 through 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.Su] error (for TD series) occurs during the operation.
※In case of [oPEn] error or [Er.Su] error (for TD series), auto tuning operation is not applicable.

### ◎ Input correction [In-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 [nAu.F ]

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.

(A) Photo electric sensor
(B) Fiber optic sensor
(C) Door/Area sensor
(D) Proximity sensor
(E) Pressure sensor
(F) Rotary encoder
(G) Connector/ Socket
(H) Temp. controller
(I) SSR/ Power controller
(J) Counter
(K) Timer
(L) Panel meter
(M) Tacho/ Speed/ Pulse meter
(N) Display unit
(O) Sensor controller
(P) Switching power supply
(Q) Stepping motor& Driver&Controller
(R) Graphic/ Logic panel
(S) Field network device
(T) Software
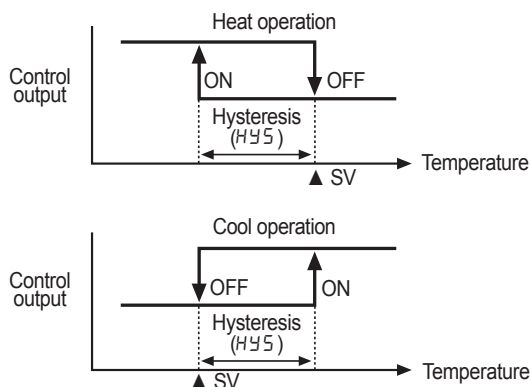(U) Other

# TC/TD Common Features

◎ **Control method selection [** $C$ - $\bar{m}d$ **]**

It is selectable PID, ON/OFF control.
- In case of ON / OFF [ $\mathit{onoF}$ ] mode, Hysteresis [ $HY5$ ] parameter is displayed.
- In case of PID [ $PI\,d$ ]mode, Proportional band [ $P$ ], Reset time [ $I$ ], and Rate time [ $E$ ] parameters are displayed.

◎ **Hysteresis[** $HY5$ **]**

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 ( $HY5$ ) 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 ( $HY5$ ), 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
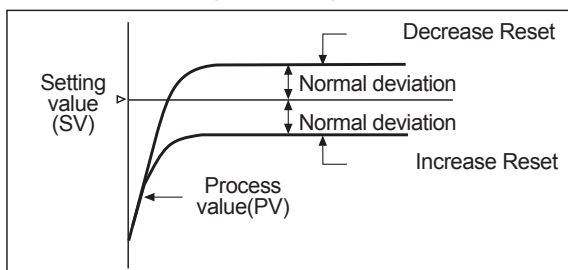


※Manual reset function is applicable only to P / PD control mode.

◎ **Temperature unit [** $Uni\,E$ **]**

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

◎ **Cool / Heat function [** $\mathit{o}$ - $FE$ **]**

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[** $dI$ - $E$ **]**

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 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 flashing 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.)
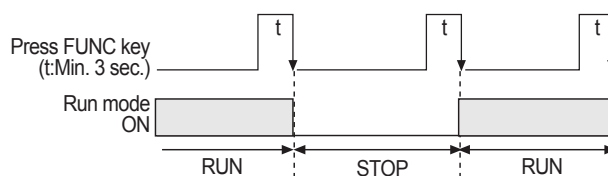


◎ **Alarm Reset**

A function to reset or initialize alarm output by force while alarm output is ON. Applicable only to Alarm latch( $A\bar{m}\square d$ ) and Alarm latch and stanby sequence ( $A\bar{m}\square d$ )mode.
- If PV value is within alarm output range, this function is not available.

## ◎ SV High/Low limit[L-Su/H-Su]

●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-Su] ~SV low limit [L-Su].

(※L-Su > H-Su cannot be set.)

●When changing input type [In-t], SV high limit [H-Su] and SV low limit [L-Su] of using temperature will be initialized as max./min. value of sensor temperature range automatically.

## ◎ Input error MV [oPEn][Er.Su]

●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

●**Please check operation of the OUT lamp located** in front panel of the unit. If the OUT lamp does not operate, please check the parameter of all programmed mode. If lamp is operating, please check the output(Relay, SSR drive voltage) after separating output line from the unit.

●**When it displays "oPEn" during operation**

This is a warning that external sensor is open. Please turn off the power and check the wire state of the sensor.

If sensor is not open disconnect sensor line from the unit and short the input +, - terminal.

Turn on the power of the unit and check the controller displays room temperature.

If this unit cannot display room temperature, this unit is broken. Please remove this unit and contact our service center.

(When the input mode is thermocouple, it is available to display room temperature.)

●**In case of display "Error"**

This Error message is displayed in case of damaging inner memory chip for data by outer strong noise.

In this case, please send the unit to our 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, Max. 5.8mm) 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.

| |
|---|
| (A) Photo electric sensor |
| (B) Fiber optic sensor |
| (C) Door/Area sensor |
| (D) Proximity sensor |
| (E) Pressure sensor |
| (F) Rotary encoder |
| (G) Connector/ Socket |
| (H. Temp. controller |
| (I) SSR/ Power controller |
| (J) Counter |
| (K) Timer |
| (L) Panel meter |
| (M) Tacho/ Speed/ Pulse meter |
| (N) Display unit |
| (O) Sensor controller |
| (P) Switching power supply |
| (Q) Stepping motor& Driver&Controller |
| (R) Graphic/ Logic panel |
| (S) Field network device |
| (T) Software |
| (U) Other |