TC Series

Single Display, PID Control Temperature Controller

▣ Features

- Realizes ideal temp. controlling with newly developed PID control algorithm and 100ms high speed sampling
- **Built-in relay output or SSR output selectable : Enables to phase control and cycle control with SSR drive output (SSRP function)**
- 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 "Safety Considerations" in operation manual before using.**

CE c🅤us

▣ Ordering Information

| T | C | 4 | S | — | 1 | 4 | R |

Control output	N	Indicator - Without control output
	R	Relay output + SSR drive output[※1]
Power supply	2	24VAC 50/60Hz, 24-48VDC
	4	100-240VAC 50/60Hz
Alarm output	N	No alarm output
	1	Alarm 1 output
	2	Alarm 1 output + Alarm 2 output[※2]
Size	S	DIN W48×H48mm (terminal block type)
	SP	DIN W48×H48mm (11-pin plug type)[※3]
	Y	DIN W72×H36mm
	M	DIN W72×H72mm
	H	DIN W48×H96mm
	W	DIN W96×H48mm
	L	DIN W96×H96mm
Digit	4	9999 (4-digit)
Setting type	C	Set by touch switch
Item	T	Temperature controller

※1: In case of the AC voltage model, SSR drive output method (standard ON/OFF control, cycle, control, phase control) is available to select.

※2: It is unavailable for TC4SP, TC4Y.

※3: 11-pin socket (PG-11, PS-11(N)) for TC4SP: sold separately.

▣ Specifications

Series		TC4S	TC4SP	TC4Y	TC4M	TC4W	TC4H	TC4L
Power supply	AC power	100-240VAC～ 50/60Hz						
	AC/DC power	24VAC～ 50/60Hz, 24-48VDC⎓						
Allowable voltage range		90 to 110% of rated voltage						
Power consumption	AC power	Max. 5VA (100-240VAC 50/60Hz)						
	AC/DC power	Max. 5VA (24VAC 50/60Hz), max. 3W (24-48VDC)						
Display method		7-segment (red), other display (green, yellow, red) LED						
Character size (W×H)		7.0×15.0mm		7.4×15.0mm	9.5×20.0mm	9.5×20.0mm	7.0×14.6mm	11.0×22.0mm
Input type	RTD	DPt100Ω, Cu50Ω (allowable line resistance max. 5Ω per a wire)						
	Thermocouple	K(CA), J(IC), L(IC)						
Display accuracy[※1]	RTD	• At room temperature (23℃±5℃): (PV ±0.5% or ±1℃, select the higher one) ±1-digit • Out of room temperature range: (PV ±0.5% or ±2℃, select the higher one) ±1-digit ※For TC4SP, add ±1℃ by accuracy standard.						
	Thermocouple							

※1: Thermocouple L(IC) type, RTD Cu50Ω
  • At room temperature (23℃ ±5℃): (PV ±0.5% or ±2℃, select the higher one) ±1-digit
  • Out of room temperature range: (PV ±0.5% or ±3℃, select the higher one) ±1digit
  In case of TC4SP Series, ±1℃ will be added.

Autonics

◼ Specifications

Series		TC4S	TC4SP	TC4Y	TC4M	TC4W	TC4H	TC4L
Control output	Relay	250VAC∼ 3A, 30VDC⎓ 3A, 1a						
	SSR	12VDC⎓ ±2V 20mA Max.						
Alarm output		AL1, AL2 Relay: 250VAC 1A 1a (※TC4SP, TC4Y have AL1 only.)						
Control method		ON/OFF and P, PI, PD, PID control						
Hysteresis		1 to 100℃/℉ (0.1 to 50.0℃/℉) variable						
Proportional band (P)		0.1 to 999.9℃/℉						
Integral time (I)		0 to 9999 sec						
Derivative time (D)		0 to 9999 sec						
Control period (T)		0.5 to 120.0 sec						
Manual reset		0.0 to 100.0%						
Sampling period		100ms						
Dielectric strength	AC power	2,000VAC 50/60Hz for 1 min (between input terminal and power terminal)						
	AC/DC power	1,000VAC 50/60Hz for 1 min (between input terminal and power terminal)						
Vibration		0.75mm amplitude at frequency of 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours						
Relay life cycle	Mechanical	OUT: over 5,000,000 operations, AL1/2: Over 5,000,000 operations						
	Electrical	OUT: over 200,000 operations (250VAC 3A resistive load) AL1/2: over 300,000 operations (250VAC 1A resistive load)						
Insulation resistance		Over 100MΩ (at 500VDC megger)						
Noise immunity		Square-wave noise by noise simulator (pulse width 1us) ±2kV R-phase and S-phase						
Memory retention		Approx. 10 years (when using non-volatile semiconductor memory type)						
Environment	Ambient temperature	-10 to 50℃, storage: -20 to 60℃						
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH						
Insulation type		Double insulation or reinforced insulation (mark: ▣, Dielectric strength between the measuring input part and the power part: AC power 2kV, AC/DC Power 1kV)						
Approval		CE c⚛us						
Weight※2		Approx. 141g (approx. 94g)	Approx. 123g (approx. 76g)	Approx. 174g (approx. 85g)	Approx. 204g (approx. 133g)	Approx. 194g (approx. 122g)	Approx. 194g (approx. 122g)	Approx. 254g (approx. 155g)
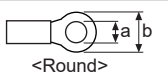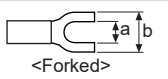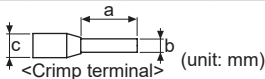
※2: The weight includes packaging. The weight in parenthesis is for unit only.
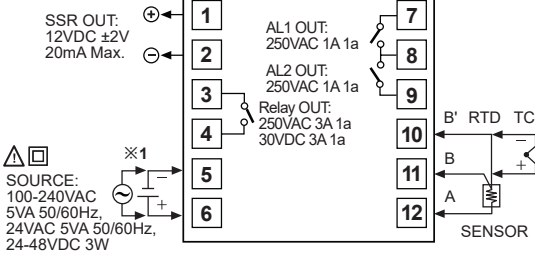※Environment resistance is rated at no freezing or condensation.

◼ Connections

※TC4 Series has selectable control output; Relay output, and SSR drive output. AC/DC power type does not have SSRP function.
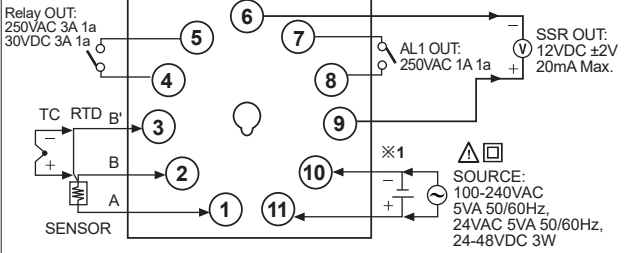※Use crimp terminals or teminals of size specified below.

	<Round>	<Forked>	<Crimp terminal> (unit: mm)		
a	Min. 3.0mm	Min. 3.0mm	Terminal number	a	b	c
b	Max. 5.8mm	Max. 5.8mm	1 to N	6	Max. 1.9	Max. 4.0

● TC4S

SSR OUT: 12VDC ±2V 20mA Max.
AL1 OUT: 250VAC 1A 1a
AL2 OUT: 250VAC 1A 1a
Relay OUT: 250VAC 3A 1a 30VDC 3A 1a
SOURCE: 100-240VAC 5VA 50/60Hz, 24VAC 5VA 50/60Hz, 24-48VDC 3W
SENSOR

● TC4SP

Relay OUT: 250VAC 3A 1a 30VDC 3A 1a
AL1 OUT: 250VAC 1A 1a
SSR OUT: 12VDC ±2V 20mA Max.
SOURCE: 100-240VAC 5VA 50/60Hz, 24VAC 5VA 50/60Hz, 24-48VDC 3W
SENSOR

● TC4Y

AL1 OUT: 250VAC 1A 1a
Relay OUT: 250VAC 3A 1a 30VDC 3A 1a
SENSOR
SSR OUT: 12VDC ±2V 20mA Max.
SOURCE: 100-240VAC 5VA 50/60Hz, 24VAC 5VA 50/60Hz, 24-48VDC 3W

● TC4W

SENSOR
AL1 OUT: 250VAC 1A 1a
AL2 OUT: 250VAC 1A 1a
Relay OUT: 250VAC 3A 1a 30VDC 3A 1a
SSR OUT: 12VDC ±2V 20mA Max.
SOURCE: 100-240VAC 5VA 50/60Hz, 24VAC 5VA 50/60Hz, 24-48VDC 3W
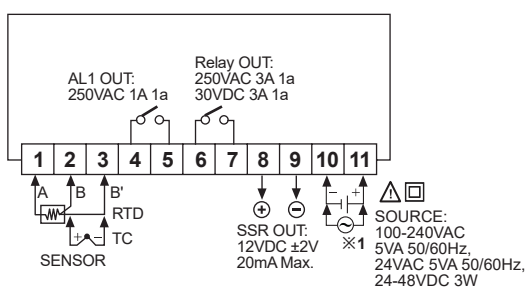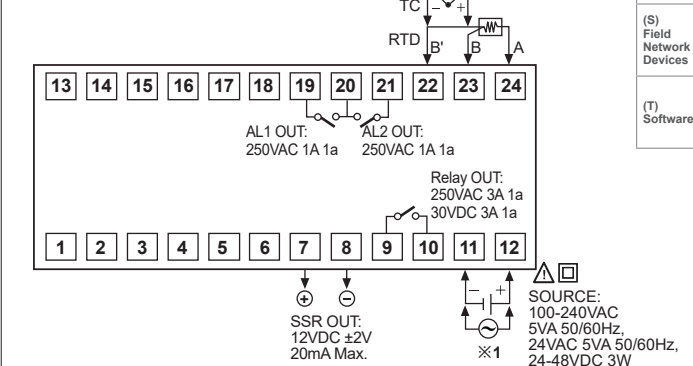
※1: AC power: 100-240VAC 5VA 50/60Hz
　　AC/DC power: 24VAC 5VA 50/60Hz, 24-48VDC 3W

(A) Photoelectric Sensors

(B) Fiber Optic Sensors

(C) Door/Area Sensors

(D) Proximity Sensors

(E) Pressure Sensors

(F) Rotary Encoders

(G) Connectors/ Connector Cables/ Sensor Distribution Boxes/Sockets

(H) Temperature Controllers

(I) SSRs / Power Controllers

(J) Counters

(K) Timers

(L) Panel Meters

(M) Tacho / Speed / Pulse Meters

(N) Display Units

(O) Sensor Controllers

(P) Switching Mode Power Supplies
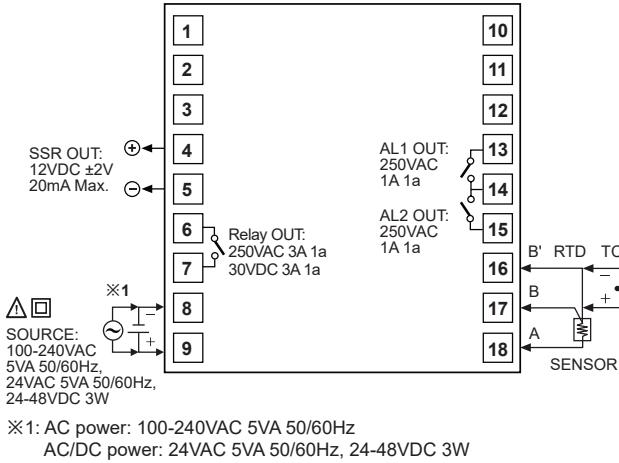
(Q) Stepper Motors & Drivers & Controllers

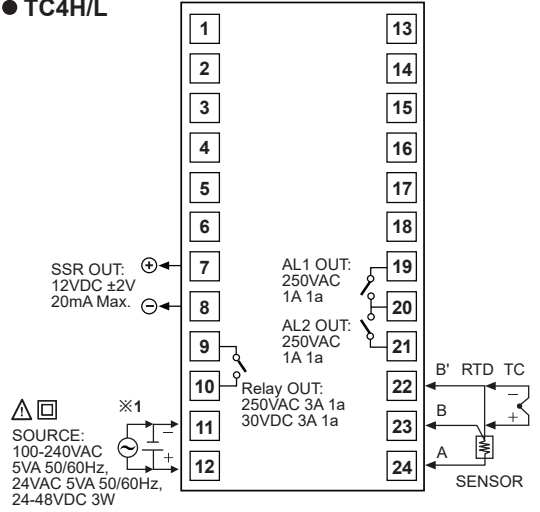(R) Graphic/ Logic Panels

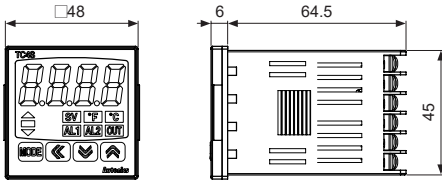(S) Field Network Devices

(T) Software

TC Series

● TC4M

SSR OUT:
12VDC ±2V
20mA Max.

AL1 OUT:
250VAC
1A 1a

AL2 OUT:
250VAC
1A 1a

Relay OUT:
250VAC 3A 1a
30VDC 3A 1a

⚠ ⬚   ※1

SOURCE:
100-240VAC
5VA 50/60Hz,
24VAC 5VA 50/60Hz,
24-48VDC 3W

B' RTD TC

SENSOR

※1: AC power: 100-240VAC 5VA 50/60Hz
     AC/DC power: 24VAC 5VA 50/60Hz, 24-48VDC 3W

● TC4H/L

SSR OUT:
12VDC ±2V
20mA Max.

AL1 OUT:
250VAC
1A 1a

AL2 OUT:
250VAC
1A 1a

Relay OUT:
250VAC 3A 1a
30VDC 3A 1a

⚠ ⬚   ※1

SOURCE:
100-240VAC
5VA 50/60Hz,
24VAC 5VA 50/60Hz,
24-48VDC 3W

B' RTD TC

SENSOR

◼ Dimensions

(unit: mm)

● TC4S

● TC4SP

● TC4Y

● TC4W

● TC4M

● TC4H

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Single Display, PID Control

● TC4L

□96

6　64.5

TC4L

SV °F °C
AL1 AL2 OUT

MODE

Autonics

91.5

● Panel cut-out

A

B

C

D
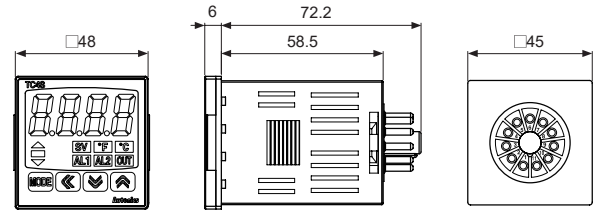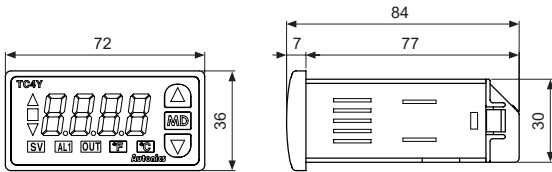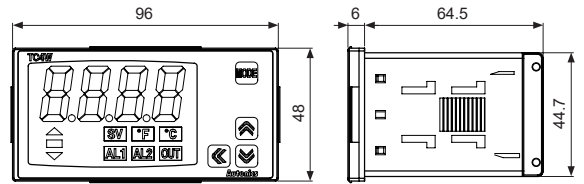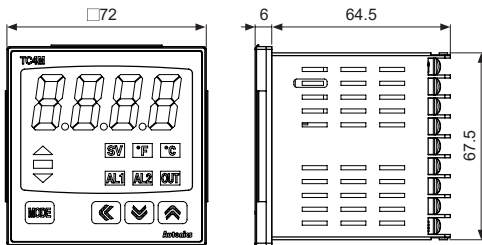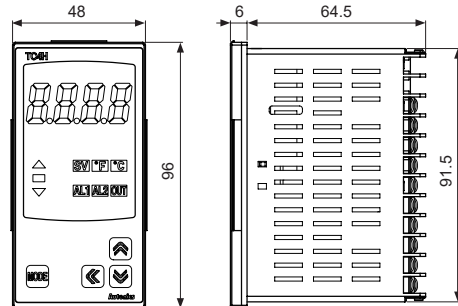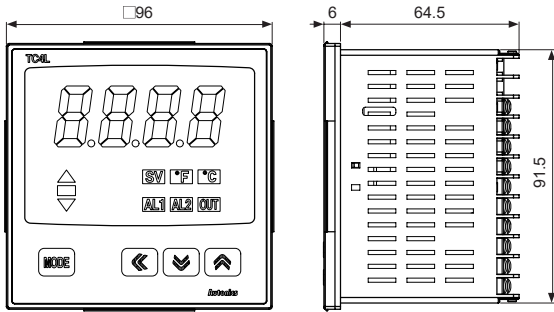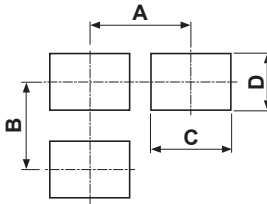
Model / Size	A	B	C	D
TC4S	Min. 65	Min. 65	$45^{+0.6}_{0}$	$45^{+0.6}_{0}$
TC4SP	Min. 65	Min. 65	$45^{+0.6}_{0}$	$45^{+0.6}_{0}$
TC4Y	Min. 91	Min. 40	$68^{+0.7}_{0}$	$31.5^{+0.5}_{0}$
TC4M	Min. 90	Min. 90	$68^{+0.7}_{0}$	$68^{+0.7}_{0}$
TC4H	Min. 65	Min. 115	$45^{+0.6}_{0}$	$92^{+0.8}_{0}$
TC4W	Min. 115	Min. 65	$92^{+0.8}_{0}$	$45^{+0.6}_{0}$
TC4L	Min. 115	Min. 115	$92^{+0.8}_{0}$	$92^{+0.8}_{0}$

● Bracket

● TC4S/TC4SP Series

□48.6

45

44.9

31

20

5

36

16

15

21

55

56

● TC4Y Series

30

12　10

60

4.4

3.5

10
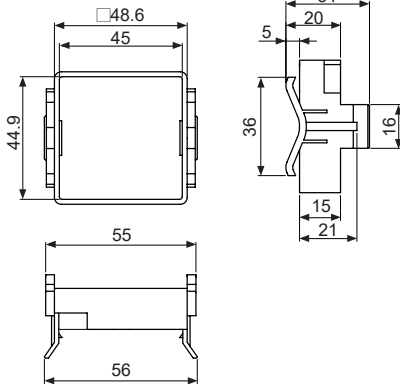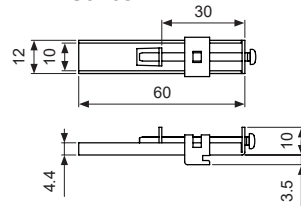
● TC4M, TC4W, TC4H, TC4L Series

3.3

4

46

37.5

40.5

12

23.9
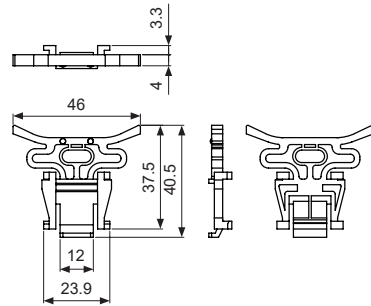
● Terminal cover (sold separately)

● RSA-COVER (48×48mm)

□48.4

UP

DOWN

41.5

18　22

9.8

22.5

● RMA-COVER (72×72mm)

70

UP

DOWN

68.5

3

64

13

● RHA-COVER (48×96mm)

47.2

UP

DOWN

91.5

4

86

13

● RLA-COVER (96×96mm)

94

UP

DOWN

91.5

3

86

13

TC Series

▣ Unit Description
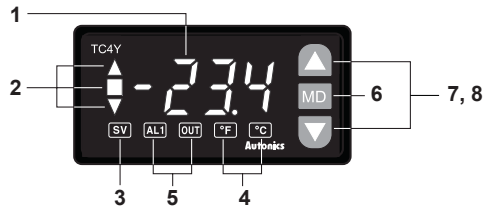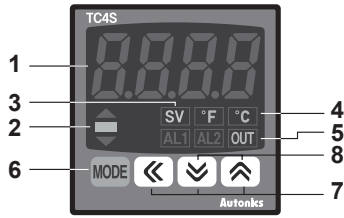
1. Present temperature (PV) display
  • RUN mode: Present temperature (PV) display.
  • Parameter setting mode: Parameter or parameter setting value display.

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

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

The deviation indicators (▲, ■, ▼) flash by every 1 sec when operating auto tuning.

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

4. Temperature unit (℃/℉) indicator
It shows current temperature unit.

5. Control/alarm output indicator
  • OUT: It will turn ON when control output (Main Control Output) is ON.
  ※In case of CYCLE/PHASE control of SSR drive output, it will turn ON when MV is over 3.0%. (only for AC voltage type)
  • AL1/AL2: It will light up when alarm output Alarm 1/ Alarm 2 are on.

6. MODE key
Used when entering into parameter 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, auto-tuning) set in inner parameter [di-Ł].
  ※Press ⌄+⌃ keys at the same time in set value operation to move digit.

▣ SV Setting
※In case of changing set temperature from 210℃ to 250℃.

① RUN mode (display a current temperature)

Press any key among MODE, ≪, ⌄, ⌃

② Set value change mode change set value by ≪, ⌄, ⌃ keys.

③ Finish the setup.

MODE

④ Check SV

MODE
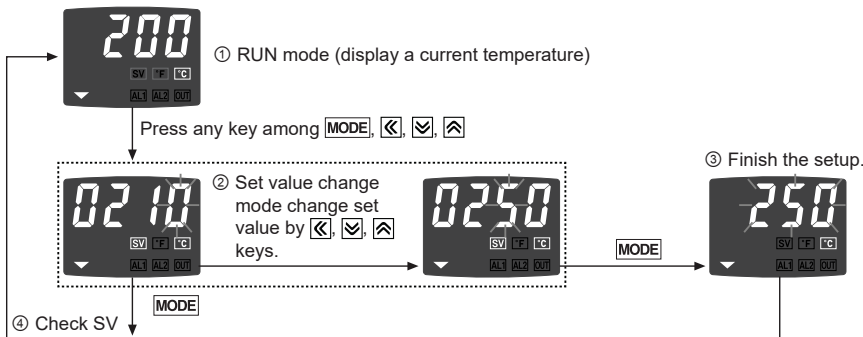
▣ Parameter Reset
Reset all parameters as factory default. Hold the front ≪+⌄+⌃ keys for 5 sec, to enter parameter reset [I ni Ł] parameter. Select 'ЧЕ5' and all parameters are reset as factory default. Select 'no' and previous settings are maintained. If setting parameter lock [LoⱠ] or processing auto-tuning, parameter reset is unavailable. (except TC4Y Series)

Single Display, PID Control

◼ Parameter Group

Run mode ⑤

① Press any key among MODE, ≪, ⋁, ⋀
SV setting

② MODE 2 sec
Parameter group 1 [PAr 1]

③ MODE 4 sec
Parameter 2group [PAr 2]

MODE
MODE 3 sec
MODE 3 sec
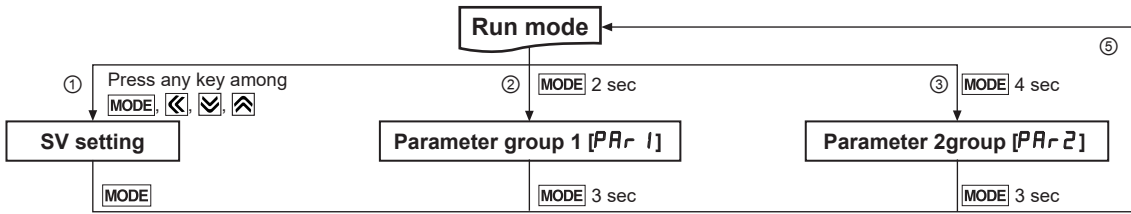
④
- AL 1 — AL1 alarm temperature
- AL 2 — AL2 alarm temperature
- At — Auto tuning
- P — Proportional band
- I — Integral time
- d — Derivative time
- rSEt — Manual reset (Normal deviation correction)
- HYS — ON/OFF control hysteresis

- In-t — Input type
- Unit — Temperature unit
- In-b — Input correction
- nAu.F — Input digital filter
- L-Su — SV low-limit value
- H-Su — SV high-limit value
- o-Ft — Control output operation
- C-nd — Control type
- oUt — Control output
- SSr.n — SSR drive output method[1]
- t — Control cycle
- AL-1 — AL1 alarm operation mode
- AL-2 — AL2 alarm operation mode
- AHYS — Alarm output hysteresis
- LbA.t — LBA monitoring time
- LbA.b — LBA detection range
- dI-Y — Digital input key
- Er.nu — Control output MV in case of input break error
- LoC — Parameter lock

※1: It is not displayed for AC/DC power model (TC4□-□2R).
※If no key entered for 30 sec, it returns to RUN mode automatically and the set value of parameter is not be saved.
※[⌐⌐⌐] This parameter might not be displayed depending on other parameter settings.
① Press any key once in RUN mode, it advances to set value setting group.
② Press MODE key over 2 sec in RUN mode, it advances to parameter group 1.
③ Press MODE key over 4 sec in RUN mode, it advances to parameter group 2.
④ First parameter will be displayed on viewer when it advances to the setting group.
⑤ Press MODE key over 3 sec in the setting group, it returns to RUN mode.
  ※Exception: Press MODE key once in SV setting group it returns to RUN mode.

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

※Parameter setup

Parameter group 2 → Parameter group 1 → SV setting

- Set parameter as the above considering parameter relation of each setting group.
- Check parameter set value after change parameter of setting group 2.

※Indicator model (TC4□-N□N)displays shaded parameter (▨) of parameter group 2.
※Alarm operation mode [AL-1, AL-2] parameter of parameter group 2 is decided whether to display according by alarm output type.
※If alarm operation mode [AL-1, AL-2] of parameter group 2 is set to Anu_/SbA□/LbA., AHYS parameter is not displayed.

TC Series

▣ Parameter Group 1

Run mode

MODE 3 sec

MODE 2 sec

| PAr 1 |

AL1 alarm temperature

| AL 1 | **S** ※1 → | 1250 |

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

MODE ※2

AL2 alarm temperature

| AL 2 | **S** → | 1250 |

MODE

※3

Auto-tuning

| At | **S** → | oFF | ⟷ | on |

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

MODE

Proportional band

| P | **S** → | 0 10.0 |

Setting range: 0.1 to 999.9℃/℉

MODE

Integral time

| I | **S** → | 0000 |

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

MODE

Derivation time

| d | **S** → | 0000 |

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

MODE

Manual reset

| rESt | **S** → | 050.0 |

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

MODE

Hysteresis

| HYS | **S** → | 002 |

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

MODE

▣ Parameter Group 2

Run mode

MODE 3 sec

MODE 4 sec

| PAr2 |

Input type

| In-t | **S** ※1

| CUS.L | ⟷ | CUS.H | ⟷ | dPt.L | ⟷ | dPt.H |

| KCA | ⟷ | JIC | ⟷ | LIC |

MODE

MODE ※2 ※When changing input type SV *In-b, H-Su, L-Su, AL 1, AL2, LbAt, LbAb, AHYS* parameters are initialized.

Temperature unit

| Unit | **S** → | ℃ | ⟷ | ℉ |

※Front temperature unit indicator will flash when selecting the unit.
※When changing input type SV *In-b, H-Su, L-Su, AL 1, AL2, LbAt, LbAb, AHYS* parameters are initialized.

MODE

Input correction

| In-b | **S** → | 000 |

Setting range: -999 to 999 (*dPt.L / CUS.L* : -199.9 to 999.9)

MODE

Input digital filter

| āAuF | **S** → | 0.1 |

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

MODE

SV low-limit value

`L-5u` **S** → `-050`

MODE

Setting range: Within the rated temperature range by input sensor [`L-5u` ≤ (`H-5u`-1-digit)]
※When changing SV low-limit value, if SV<`L-5u`, SV is initialized as `L-5u`.

SV high-limit value

`H-5u` **S** → `1200`

MODE

Setting range: Within the rated temperature range by input sensor [`H-5u` ≥ (`L-5u`+1digit)]
※When changing SV high-limit value, if SV>`H-5u`, SV is initialized as `H-5u`.

※In case of changing input sensor type [`I n-t`], it changes automatically as max./min. value of the changed input sensor.

Control output operation

`o-Ft` **S** → `HEAt` ⇕ `CooL`

MODE

※When changing control output operation, `Er.ñU` is initialized.

Control type

`C-ñd` **S** → `PId` ⇕ `onoF`

MODE

※When changing control type, `Er.ñU` is initialized (control output MV is below 100%) and `dI-t` turns OFF automatically.

Control output type

`oUt` **S** → `rLY` ⇕ `55r`

MODE

※Operates only selected output between Relay or SSR.

SSR dirve output method

`55r.ñ` **S** → `5tnd` ⇕ `CYCL` ⇕ `PHA5`

MODE

※It is displayed when selecting control output [`oUt`] as `55r`. For AC/DC power type (TC4□-□2R), this parameter [`55r.ñ`] is not displayed.

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 drive output [`55r`], factory default is 2.0 sec.
※This `t` will not be displayed when SSR drive output method [`55r.ñ`] is set as `CYCL`, `PHA5`.

AL1 alarm operation

`AL-1` **S** → `Añ1.A` ⇕ `LbA.A` ◄ `Añ1.A` ⇕ `Añ1.b`

MODE

※Alarm operation   ※Alarm option

※Press Ⓚ key to convert alarm operation mode into alarm option.
※Refer to page H-82.

AL2 alarm operation

`AL-2` **S** → `Añ2.A`

MODE

※Same with the above [`AL-1`].
※When changing alarm operation AL1, AL2 alarm temperature of AL1, AL2 is initialized.

Alarm output hysteresis

`AHY5` **S** → `001`

MODE

Setting range: 1 to 100℃/℉ (`dPt.L`/`CY5.L` : 0.1 to 50.0℃)
※If AL1, AL2 alarm operation [`AL-1`, `AL-2`] is set to `Añ0.`, `5bA□`, `LbA□`, `AHY5` parameter is not displayed.

LBA monitoring time

`LbA.t` **S** → `0`

MODE

Setting range: 0 to 9999 sec (Automatically setting with Auto-tuning)
※`LbA.t` parameter is displayed when AL1, AL2 alarm operation [`AL-1`, `AL-2`] is set as `LbA□`.

LBA detection band

`LbA.b` **S** → `002`

MODE

Setting range: 0 to 999℃/℉ (`dPt.L`/`CU5`: 0.0 to 999.9℃/℉) (automatically setting with auto-tuning)
※When alarm operation mode [`AL-1`, `AL-2`] is set as loop break alarm (LBA) [`LbA□`], and `LbA.t` parameter does not set as 0, `LbA.b` parameter is displayed.

Digital input key

`dI-t` **S** → `oFF` ⇕ `5toP` ⇕ `AL.rE` ⇕ `At`

MODE

Press ⓥ + ⓐ keys for 3 sec and it executes the set function. For more information, refer to ■ Functions ' ◎Digital input key'.

※`AL.rE` is not displayed for not alarm output model.
※`At` is not displayed when control type parameter [`C-ñd`] is set `onoF`.

Control output MV in case of input break error

`Er.ñU` **S** → `000.0`

MODE

Setting range: 0.0 to 100.0%
※0.0/100.0% is displayed when control type parameter [`C-ñd`] is set `onoF`.
※When changing PID control to ON/OFF control, if MV is below 100.0%, it is initialized as 0.0%.

Parameter lock

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

MODE

※For indicator model (TC4□-N□N), only `oFF`, `LoC1` are available.

TC Series

▣ Input Sensor and Temperature Range [In-t]

Input sensor		Display	Input range (℃)	Input range (℉)
Thermocouple	K(CA)	ႦႠႤ	-50 to 1200	-58 to 2192
	J(IC)	ႿႨႠ	-30 to 500	-22 to 932
	L(IC)	ԼႨႠ	-40 to 800	-40 to 1472
RTD	DPt100Ω	ძჶႠ.Ⴖ	-100 to 400	-148 to 752
		ძჶႠ.Ⴑ	-100.0 to 400.0	-148.0 to 752.0
	Cu50Ω	ႠႮႭ.Ⴖ	-50 to 200	-58 to 392
		ႠႮႭ.Ⴑ	-50.0 to 200.0	-58.0 to 392.0

▣ Factory Default

● SV setting

Parameter	Factory default
–	0

● Parameter group 1

Parameter	Factory default
AL 1	1250
AL 2	
At	oFF
P	010.0
I	0000
d	
rESt	050.0
HYS	002

● Parameter group 2

Parameter	Factory default	Parameter	Factory default
In-t	ႦႠႤ	t	020.0
Unit	℃	AL-1	Am1.A
In-b	0000		
mAuF	000.1	AL-2	Am2.A
L-Su	-050	AHYS	0001
H-Su	1200	LbAt	0000
o-Ft	HEAt	LbA.b	002
C-md	PId	dI-P	StoP
oUt	rLY	Er.mu	000.0
SSr.m	Stnd	LoC	oFF

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

▣ Mounting

● TC4S/SP (48×48mm) Series
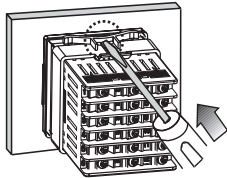
● TC4Y (72×36mm) Series
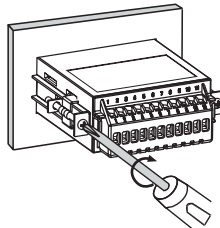
● Other Series
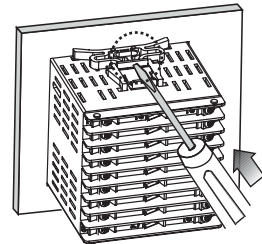
※Mount the product on the panel, fasten bracket by pushing with tools as shown above.
(In case of TC4Y, fasten bolts for bracket.)

■ Functions

◎ Alarm [*AL - 1 / AL - 2*]

Aл 1.A

Alarm operation — Alarm option
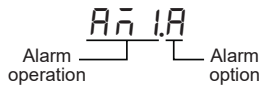
Set both alarm operation and alarm option by combining.
Each alarm operates individually in two alarm output models.
When the current temperature is out of alarm range, alarm clears automatically. If alarm option is alarm latch or alarm latch and standby sequence 1/2, press digital input key(⊠+⊠ 3 sec, digital input key[*dI - E*] of Parameter group 2 set as *AL.rE*), or turn OFF the power and turn ON to clear alarm.

● Alarm operation

Mode	Name	Alarm operation	Description
Aл0._	—	—	No alarm output
Aл 1.	Deviation high-limit alarm	OFF ←H↑ ON / OFF ←H↑ ON △SV 100℃ ▲PV 110℃ / △PV 90℃ ▲SV 100℃ High deviation: Set as 10℃ High deviation: Set as -10℃	If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.
Aл2.	Deviation low-limit alarm	ON↑H← OFF / ON↑H↓ OFF △PV 90℃ ▲SV 100℃ / ▲SV 100℃ △PV 110℃ Lower deviation: Set as 10℃ Lower deviation: Set as -10℃	If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON.
Aл3.	Deviation high/low-limit alarm	ON↑H OFF ←H↑ ON △PV 90℃ ▲SV 100℃ △PV 110℃ High/Lower deviation: Set as 10℃	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON.
Aл4.	Deviation high/low-limit reserve alarm	ON↑H OFF ←H↑ ON △PV 90℃ ▲SV 100℃ △PV 110℃ High/Lower deviation: Set as 10℃	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be OFF.
Aл5.	Absolute value high limit alarm	OFF ↓H↑ ON / OFF ←H↑ ON △PV 90℃ ▲SV 100℃ / ▲SV 100℃ △PV 110℃ Absolute-value Alarm: Set as 90℃ Absolute-value Alarm: Set as 110℃	If PV is higher than the absolute value, the output will be ON.
Aл6.	Absolute value low limit alarm	ON↑H← OFF / ON↑H↓ OFF △PV 90℃ ▲SV 100℃ / ▲SV 100℃ △PV 110℃ Absolute-value Alarm: Set as 90℃ Absolute-value Alarm: Set as 110℃	If PV is lower than the absolute value, the output will be ON.
5bA.	Sensor break Alarm	—	It will be ON when it detects sensor disconnection.
LbA.	Loop break Alarm	—	It will be ON when it detects loop break.

※ H: Alarm output hysteresis [*AHY5*]

● Alarm option

Mode	Name	Description
Aл.A	Standard alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
Aл.b	Alarm latch	If it is an alarm condition, alarm output is ON and maintains ON status. (Alarm output HOLD)
Aл.C	Standby sequence 1	First alarm condition is ignored and from second alarm condition, standard alarm operates. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, standard alarm operates.
Aл.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 ignored and from the second alarm condition, alarm latch operates.
Aл.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.
Aл.F	Alarm latch and standby sequence 2	Basic operation is same as alarm latch and standby sequence 1. 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 [*5bA.A*], or alarm latch [*5bA.b*].

◎ 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 b A.b] during LBA monitoring time [L b A.t], or when control output MV is 0% (100% for cooling control) and PV is not decreased below than LBA detection band [L b A.b] during LBA monitoring time [L b A.t], alarm output turns ON.
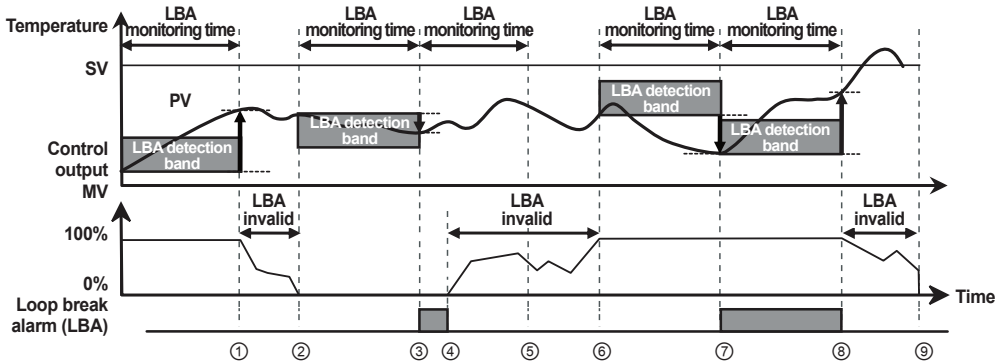

Start control to ①	When control output MV is 0% and PV is not decreased below than LBA detection band [L b A.b] during LBA monitoring time [L b A.t]
① to ②	The status of changing control output MV (LBA monitoring time is reset.)
② to ③	When control output MV is 0% and PV is not decreased below than LBA detection band [L b A.b] during LBA monitoring time [L b A.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 b A.b] during LBA monitoring time [L b A.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 b A.b] during LBA monitoring time [L b A.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 b A.b] and LBA monitoring time are automatically set based on auto tuning value. When AL1, AL2 alarm operation [AL - 1, AL - 2] is set as loop break alarm (LBA) [L b A.□], LBA detection band [L b A.b] and LBA monitoring time [L b A.t] parameter is displayed.

◎ SSR drive output function (SSRP function) [55r.m]

● SSRP function is selectable one of standard ON/OFF control, cycle control, phase control by utilizing standard SSR drive output.
● Realizing high accuracy and cost effective temperature control as linear output(cycle control and phase control).
● Select one of standard ON/OFF control [5t.nd], cycle control [CYCL] , phase control [PHA5] at [55r.m] parameter of Parameter group 2. For cycle control, connect zero cross turn-on SSR or random turn-on SSR. For phase control, connect random turn-on SSR.
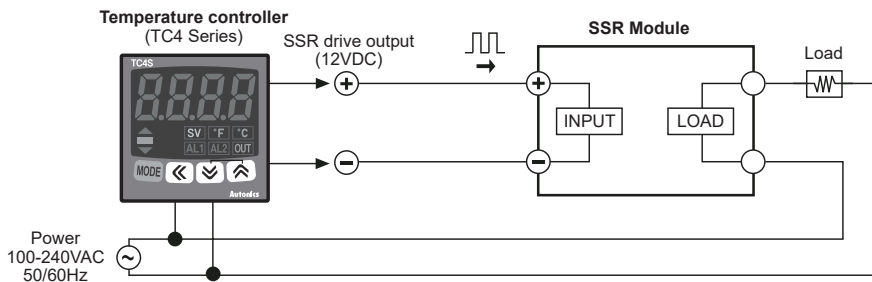
※When selecting cycle or phase control mode, **the power supply for load and temperature controller must be the same.**

※In case of selecting cycle [CYCL] or phase [PHA5] control mode for PID control, control cycle [t] is not allowed to set.
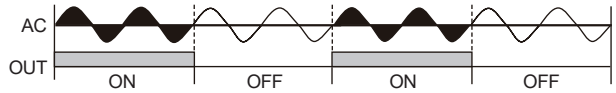
※For AC/DC power model (TC4□-□2R), this parameter [55r.m] is not displayed and it is available only standard control by relay or SSR.

Autonics

● Standard ON/OFF control mode [5ᵗnd]

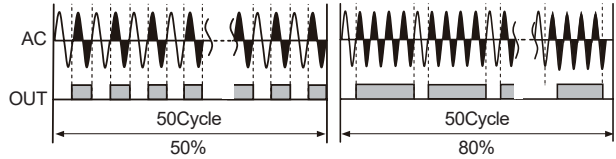A mode to control the load in the same way as Relay output type.
(ON: output level 100%, OFF: output level 0%)

● Cycle control [CYCL]

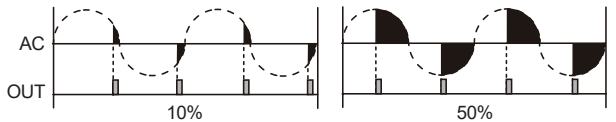A mode to control the load by repeating output ON / OFF according to the rate of output within setting cycle.
Having improved ON / OFF noise feature by Zero Cross type.

● Phase control [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.

◎ Auto tuning [At]

● When setting Aᵗ parameter to on, front temperature unit display (℃ or ℉) indicator will be flickering during Auto tuning. After completing auto tuning, temperature unit display indicator 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 [C - ňd] is set to onoF , no parameters are displayed.

● Finish auto tuning when [oPEn] error occurs during the operation.
※In case of [oPEn] error, auto tuning operation is not applicable.

◎ Input correction [I n - b]

Controller itself does not have errors but there may be error by external input temperature sensor.

E.g.)If actual temperature is 80℃ but controller displays 78℃, set input correction value [I n - b] as 002 and controller displays 80℃.

※As the result of input correction, if current temperature value (PV) is over each temperature range of input sensor, it displays HHHH or LLLL .

◎ Input digital filter [ňAᵤF]

If current temperature (PV) is fluctuating repeatedly by rapid change of input signal, it reflects to MV and stale control is impossible. Therefore, digital filter function stabilizes current temperature value.

●For example, set input digital filter value as 0.4 sec, and it applies digital filter to input values during 0.4 sec and displays this values. Current temperature may be different by actual input value.
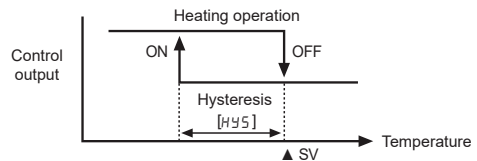
◎ Control method selection [C-ňd]

It is selectable PID, ON/OFF control.

● In case of ON/OFF [onoF] mode, Hysteresis [HYS] parameter is displayed.

● In case of PID [PI d] mode, Proportional band [P], Integral time [I], and Derivative time [ᵗ] parameters are displayed.

◎ Hysteresis [HYS]

● 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 [HYS] 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 [HYS], heater's capacity, thermal characteristics, sensor's response and location.

◎ Temperature unit selection [Uniᵗ]

● A function to select display temperature unit

● Unit display indicator will be ON when converting temperature unit.

TC Series

◎ Manual reset [ʳE5ʈ]

When selecting P/PD control mode, certain temperature difference exists even after PV reaches stable status because heater's rising and falling time is inconsistent due to thermal characteristics of controlled objects, such as heat capacity, heater capacity. This temperature difference is called offset and manual reset [ʳE5ʈ] function is to set/correct offset.

● When PV and SV are equal, reset value is 50.0%. After control is stable, PV is lower than SV, reset value is over 50.0% or PV is higher than SV, reset value is below 50.0%.

● Manual reset [ʳE5ʈ] by control result
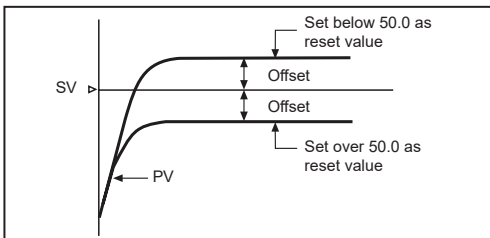
※Manual reset function is applicable only to P / PD control mode.

◎ Control output MV when input sensor line is broken [ErɱU]

The function to set control output MV in case of open error. Users are able to set by ON/OFF setting or MV setting. It executes control output by set MV regardless of ON/OFF or PID control output.

◎ Digital input key (⌄ + ⌃ 3 sec) [dɪ - ʈ]

Parameter		Operation
OFF	oFF	It does not use digital input key function.
RUN/STOP	5ʈoP	Pauses control output. Auxiliary output (except loop break alarm, sensor break alarm)except Control output operates as setting. Hold the digital input keys for 3 sec to restart.
Clear alarm	ALrE	Clears alarm output by force. (only when alarm option is alarm latch, or alarm latch and standby sequence 1/2 .) This function is applied when present value is out of alarm operation range but alarm output is ON. Alarm operates normally right after clearing alarm.
Auto-tuning	Aʈ	Starts/Stops auto-tuning. This function is same as auto-tuning[Aʈ] of parameter group 1. (You can start auto-tuning [Aʈ] of parameter group 1 and stop it by digital input key.) ※This parameter Aʈ appears only when control method [C-ɱd] Parameter group 2 is set as Pɪd. When control method [C-ɱd] Parameter group 2 is set as onoF, this parameter is changed as oFF.

◎ Parameter lock [LoC]

A function to prevent changing SV and parameters of each setting group. Parameter setting values are still possible to check when parameter lock is set.

Display	Description
oFF	Lock off
LoC1	Lock parameter group 2
LoC2	Lock parameter group 1, 2
LoC3	Lock parameter group 1, 2, SV setting

※ oFF, LoC1 are available only for indicator (TC4□-N□N).

◎ Cool / Heat function [o-Fʈ]

Generally there are two ways to control temperature, one (Heat-function) is to heat when PV is getting down (Heater). The other (Cool-function) is to cool when PV is getting higher (Freezer).

These functions are operating oppositely when it is ON/OFF control or proportional control. But in this case PID time constant will be different due to PID time constant will be decided according to control system when it is PID control.

● Cool-function [CooL] and heat-function [HEAʈ] 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, it will be maintained ON and it may cause a fire.)

● Avoid changing heat-function to cool-function or cool-function to heat-function when the unit is operating.

● It is impossible to operate both function at once in this unit. Therefore, only one function should be selected only.

◎ SV High/Low limit [H-5U / L-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] to SV low limit [L-5U]. (※ L-5U > H-5U cannot be set.)

● When changing input type [ɪn-ʈ], 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.

◎ Error

| Display	Description	Troubleshooting
oPEn	Flashes if input sensor is disconnected or sensor is not connected.	Check input sensor state.
HHHH	Flashes if measured sensor input is higher than temperature range.	When input is within the rated temperature range, this display disappears.
LLLL	Flashes if measured sensor input is lower than temperature range.	

Autonics

Single Display, PID Control

◎ Output connections

Refer to page H-170 for output.

● Application of relay output type
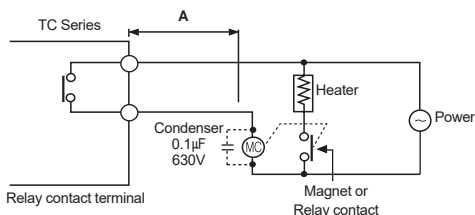
Keep **A** length as long as possible when wiring the temperature controller and the load. If wire length of **A** is short, counter electromotive force which occurs from a coil of magnet switch & power relay may flow in power line of the unit, and it may cause malfunction.

If wire length of **A** is short, please connect mylar condensers 104 (630V) on the both ends of "Ⓜ" (magnet coil) to protect electromotive force.

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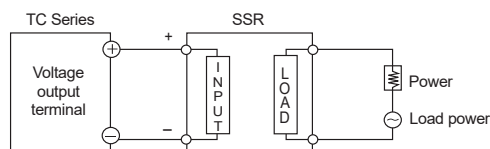
※SSR should be selected by the capacity of load, otherwise, it may short-circuit and result in a fire. Indirect heated should be used with SSR for efficient working.

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

※Refer to page H-70 for phase/cycle control connections.

■ Proper Usage

◎ Simple "error" diagnosis

● When the load (Heater etc) is not operated

Please check operation of the OUT indicator located in front panel of the unit.

If the OUT indicator does not operate, please check the parameter of all programmed mode.
If indicator 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.)

◎ Cautions during use

● Follow instructions in 'Cautions during use'. Otherwise, It may cause unexpected accidents.
● Check the polarity of the terminals before wiring the temperature sensor.
For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
● Keep away from high voltage lines or power lines to prevent inductive noise.
In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
Do not use near the equipment which generates strong magnetic force or high frequency noise.
● Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
● Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.
● When changing the input sensor, turn off the power first before changing.
After changing the input sensor, modify the value of the corresponding parameter.
● 24VAC, 24-48VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
● Make a required space around the unit for radiation of heat.
For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
● Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
● Do not wire to terminals which are not used.
● This unit may be used in the following environments.
①Indoors
　(in the environment condition rated in 'Specifications')
②Altitude max. 2,000m
③Pollution degree 2
④Installation category II

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