# Autonics

## DUAL INDICATOR TEMPERATURE CONTROLLER
# TCN4 SERIES
## M A N U A L

C E  c ᴿᵁ us

Thank you for choosing our Autonics product.
**Please read the following safety considerations before use.**

## ■ Safety Considerations

※Please observe all safety considerations for safe and proper product operation to avoid hazards.

※Safety considerations are categorized as follows.

⚠**Warning** Failure to follow these instructions may result in serious injury or death.

⚠**Caution** Failure to follow these instructions may result in personal injury or product damage.

※The symbols used on the product and instruction manual represent the following
⚠ symbol represents caution due to special circumstances in which hazards may occur.

### ⚠ Warning

1. **Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss.** (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)
Failure to follow this instruction may result in personal injury, fire, or economic loss.
2. **The unit must be installed on a device panel before use.**
Failure to follow this instruction may result in electric shock.
3. **Do not connect, repair, or inspect the unit while connected to a power source.**
Failure to follow this instruction may result in electric shock.
4. **Check the terminal numbers before connecting the power source.**
Failure to follow this instruction may result in electric shock.
5. **Do not disassemble or modify the unit. Please contact us if necessary.**
Failure to follow this instruction may result in electric shock or fire.

### ⚠ Caution

1. **Do not use the unit outdoors.**
Failure to follow this instruction may result in shorten the life cycle of the unit, or electric shock.
2. **When connecting the power input and relay output cables, use AWG20 (0.05mm²) cables and make sure to tighten the terminal screw bolt above 0.74N·m to 0.90N·m.**
Failure to follow this instruction may result in fire due to contact failure.
3. **Use the unit within the rated specifications.**
Failure to follow this instruction may result in shorten the life cycle of the unit, or fire.
4. **Do not use loads beyond the rated switching capacity of the relay contact.**
Failure to follow this instruction may result in insulation failure, contact melt, contact failure, relay broken, or fire.
5. **Do not use water or oil-based detergent when cleaning the unit. Use dry cloth to clean the unit.**
Failure to follow this instruction may result in electric shock or fire.
6. **Do not use the unit where flammable or explosive gas, humidity, direct sunlight, radiant heat, vibration, or impact may be present.**
Failure to follow this instruction may result in fire or explosion.
7. **Keep dust and wire residue from flowing into the unit.**
Failure to follow this instruction may result in fire or product damage.
8. **Check the polarity of the measurement input contact before wiring the temperature sensor.**
Failure to follow this instruction may result in fire or explosion.
9. **For installing the unit with reinforced insulation, use the power supply unit which basic level is ensured.**

## ■ Ordering Information

| T | CN | 4 | S | - | 2 | 4 | R | - | P |
|---|----|----|----|----|----|----|----|----|----|

| Wiring method | No-mark | Bolt wiring method |
| | P | Connector plug connection method[1] |
| Control output | R | Relay contact + SSR drive output[2] |
| Power supply | 2 | 24VAC 50/60Hz, 24-48VDC |
| | 4 | 100-240VAC 50/60Hz |
| Sub output | 2 | Alarm1 + Alarm2 output |
| Size | S | DIN W48 × H48mm |
| | M | DIN W72 × H72mm |
| | H | DIN W48 × H96mm |
| | L | DIN W96 × H96mm |
| Digit | 4 | 9999 (4 digit) |
| Setting type | CN | Dual display type, set by touch switch |
| Item | T | Temperature controller |

※1: Only for TCN4S model.
※2: In case of the AC voltage model, SSR drive output method (standard ON/OFF control, cycle control, phase control) is available to select.
※The above specifications are subject to change and some models may be discontinued without notice.

## ■ Specification

| Series | | TCN4S | TCN4M | TCN4H | TCN4L |
|---|---|---|---|---|---|
| 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. 5V(24VAC 50/60Hz), Max. 3W(24-48VDC) | | | |
| Display method | | 7 segment (PV: red, SV: green), other display part(green, red) LED method | | | |
| Character size | PV(W×H) | 7.0×15.0mm | 9.5×20.0mm | 7.0×14.6mm | 11.0×22.0mm |
| | SV(W×H) | 5.0×9.5mm | 7.5×15.0mm | 6.0×12.0mm | 7.0×14.0mm |
| Input type | RTD | DIN Pt100Ω, Cu50Ω (Allowable line resistance max.5Ω per a wire) | | | |
| | TC | K(CA), J(IC), L(IC), T(CC), R(PR), S(PR) | | | |
| Display accuracy ※1 | RTD | At room temperature(23℃ ±5℃): (PV ±0.5% or ±1℃, select the higher one) ± 1 digit | | | |
| | TC | Out of room temperature range: (PV± 0.5% or ±2℃, select the higher one)± 1digit For TCN4S-□-P, add ±1℃ by accuracy standard. | | | |
| Control output | Relay | 250VAC 3A 1a | | | |
| | SSR | 12VDC±2V 20mA Max. | | | |
| Alarm output | | AL1, AL2 Relay: 250VAC 1A 1a | | | |
| Control method | | ON/OFF control, P, PI, PD, PID control | | | |
| Hysteresis | | 1 to 100℃/℉ (0.1 to 50.0℃/℉) | | | |
| 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 | 2000VAC 50/60Hz 1min.(between input terminal and power terminal) | | | |
| | AC/DC power | 1000VAC 50/60Hz 1min.(between input terminal and power terminal) | | | |
| Vibration | | 0.75mm amplitude at frequency of 5 to 55Hz in each X, Y, Z direction for 2 hours | | | |
| Relay life cycle | Mechanical | OUT: Over 5,000,000 times, AL1/2: Over 5,000,000 times | | | |
| | Electrical | OUT: Over 200,000 times(250VAC 3A resistive load) AL1/2: Over 300,000 times(250VAC 1A resistive load) | | | |
| Insulation resistance | | Min. 100MΩ(at 500VDC megger) | | | |
| Noise | | Square-wave 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) | | | |
| Environ -ment | Ambient temp. | -10 to 50℃, Storage: -20 to 60℃ | | | |
| | Ambient humi. | 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 | | C E  c ᴿᵁ us | | | |
| Weight ※2 | | Approx. 147g (approx. 100g) | Approx. 203g (approx. 133g) | Approx. 194g (approx. 124g) | Approx. 275g (approx. 179g) |

※1: ◎ At room temperature(23℃±5℃)
- Below 200℃ of thermocouple R(PR), S(PR) is (PV ±0.5% or ±3℃, select the higher one) ±1 digit
- Over 200℃ of thermocouple R(PR), S(PR) is (PV ±0.5% or ±2℃, select the higher one) ±1 digit
- Termocouple L (IC), RTD Cu50Ω is (PV ±0.5% or ±2℃, select the higher one) ±1 digit
◎ Out of room temperature range
- Below 200℃ of thermocouple R(PR), S(PR) is (PV ±1.0% or ±6℃, select the higher one) ±1 digit
- Over 200℃ of thermocouple R(PR), S(PR) is (PV ±0.5% or ±5℃, select the higher one) ±1 digit
- Thermocouple L (IC), RTD Cu50Ω is (PV ±0.5% or ±3℃, select the higher one) ±1 digit
For TCN4S-□-P, add ±1℃ by accuracy standard.
※2: The weight includes packaging. The weight in parentheses is for unit only.
※ Environment resistance is rated at no freezing or condensation.

## ■ Unit Description
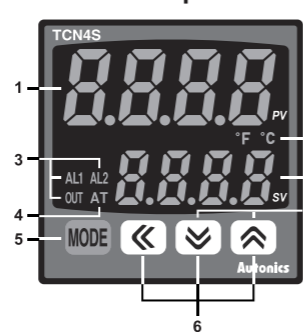


1. **Present temperature (PV) display (Red)**
1) RUN mode: Present temperature (PV) display
2) Parameter setting mode: Parameter display
2. **Set temperature (SV) display (Green)**
1) RUN mode: Set temperature (SV) display
2) Parameter setting mode
: Parameter setting value display
3. **Control/Alarm output display indicator**
1) OUT: It turns ON when the control output is ON.
During SSR drive output type in CYCLE/PHASE control, this indicator turns ON when MV is over 3.0%.
2) AL1/AL2: It turns ON when the alarm output is ON.
4. **Auto tuning indicator**
AT indicator flashes by every 1 sec during operating auto tuning.
5. **MODE key**
Used when entering into parameter groups, returning to RUN mode, moving parameter, and saving setting values.
6. **Adjustment**
Used when entering into set value change mode, digit moving and digit up/down.
7. **Digital input key**
Press ⋁ + ⋀ keys for 3 sec. to operate the set function (RUN/STOP, alarm output reset, auto tuning) in digital input key [di - t ].
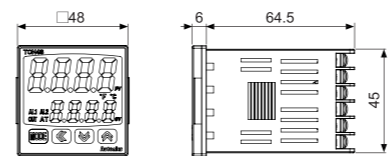8. **Temperature unit (℃/℉) indicator**
It shows current temperature unit.
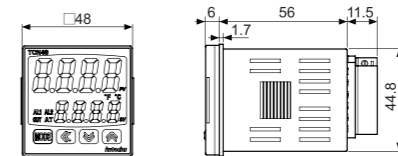
## ■ Input Sensor And Temperature Range

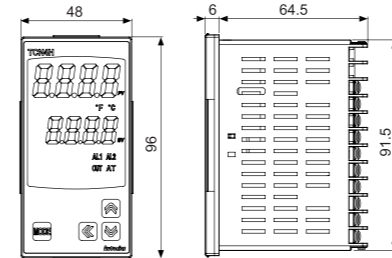| Input sensor | | Display | Temperature range(℃) | Temperature range(℉) |
|---|---|---|---|---|
| Thermocouple | K(CA) | � CA.H | -50 to 1200 | -58 to 2192 |
| | | � CA.L | -50.0 to 999.9 | -58.0 to 999.9 |
| | J(IC) | JI C.H | -30 to 800 | -22 to 1472 |
| | | JI C.L | -30.0 to 800.0 | -22.0 to 999.9 |
| | L(IC) | LI C.H | -40 to 800 | -40 to 1472 |
| | | LI C.L | -40.0 to 800.0 | -40 to 999.9 |
| | T(CC) | ⴺ CC.H | -50 to 400 | -58 to 752 |
| | | ⴺ CC.L | -50.0 to 400.0 | -58.0 to 752.0 |
| | R(PR) | r Pr | 0 to 1700 | 32 to 3092 |
| | S(PR) | SPr | 0 to 1700 | 32 to 3092 |
| RTD | DPt100Ω | dPt.H | -100 to 400 | -148 to 752 |
| | | dPt.L | -100.0 to 400.0 | -148.0 to 752.0 |
| | Cu50Ω | CU5.H | -50 to 200 | -58 to 392 |
| | | CU5.L | -50.0 to 200.0 | -58.0 to 392.0 |

## ■ Dimensions
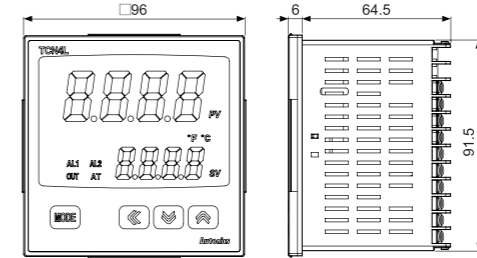(unit: mm)
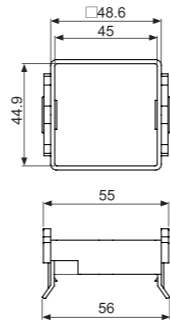
● TCN4S Series
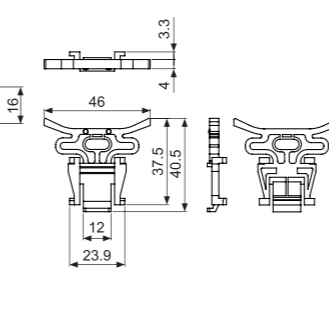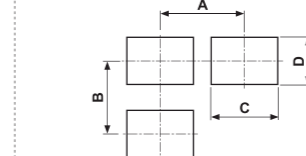● TCN4S-□-P
● TCN4M Series
● TCN4H Series
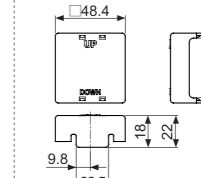● TCN4L Series
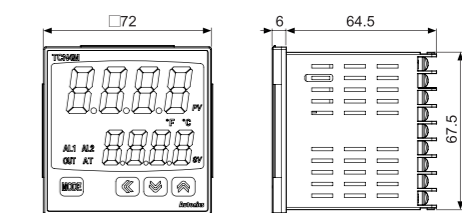


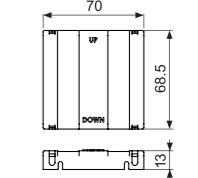● Bracket
• TCN4S Series
• TCN4M, TCN4H, TCN4L Series

● Panel cut-out

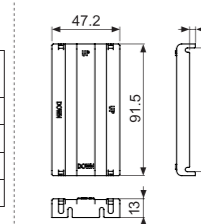| Size Series | A | B | C | D |
|---|---|---|---|---|
| TCN4S | Min. 65 | Min. 65 | 45⁺⁰·⁶ | 45⁺⁰·⁶ |
| TCN4M | Min. 90 | Min. 90 | 68⁺⁰·⁷ | 68⁺⁰·⁷ |
| TCN4H | Min. 65 | Min. 115 | 45⁺⁰·⁶ | 92⁺⁰·⁸ |
| TCN4L | Min. 115 | Min. 115 | 92⁺⁰·⁸ | 92⁺⁰·⁸ |

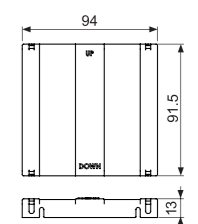● Terminal cover(sold separately)
• RSA-COVER(48×48mm)
• RMA-COVER(72×72mm)
• RHA-COVER(48×96mm)
• RLA-COVER(96×96mm)

## ■ Connections

1)TCN4S Series



SSR OUT※1
AL1 OUT 250VAC 1A 1a
AL2 OUT 250VAC 1A 1a
Relay OUT 250VAC 3A 1a
SOURCE※2

2)TCN4S-□-P

SSR OUT※1
AL1 OUT 250VAC 1A 1a
AL2 OUT 250VAC 1A 1a
Relay OUT 250VAC 3A 1a
SOURCE※2

3)TCN4M Series

SSR OUT※1
AL1 OUT 250VAC 1A 1a
AL2 OUT 250VAC 1A 1a
Relay OUT 250VAC 3A 1a
SOURCE※2

4)TCN4H/L Series

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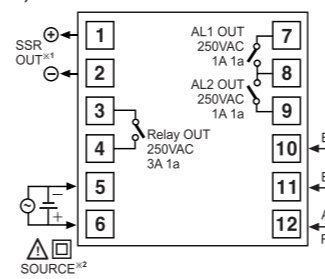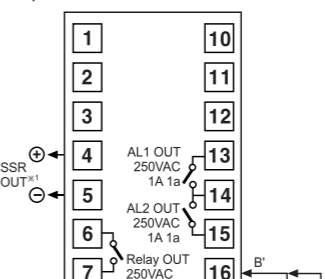
※1:12VDC±2V 20mA Max.
※2:AC voltage type: 100-240VAC 5VA 50/60Hz
AC/DC voltage type: 24VAC 5VA 50/60Hz 24-48VDC 3W

## ■ Parameter Groups

1. **All Parameter**

Run mode
Please key any among MODE, ⟪, ⋁, ⋀ → MODE 2sec. → MODE 4sec.
SV setting → Parameter 1group [PAr 1] → Parameter 2group [PAr 2]

Parameter 1group:
AL1 alarm termerature [AL1]
AL2 alarm termerature [AL2]
Auto tuning [At]
Proportional band [P]
Integral time [I]
Derivative time [d]
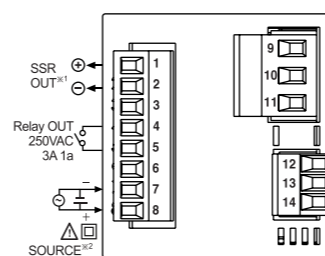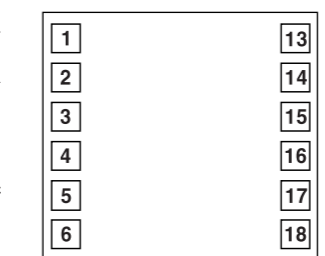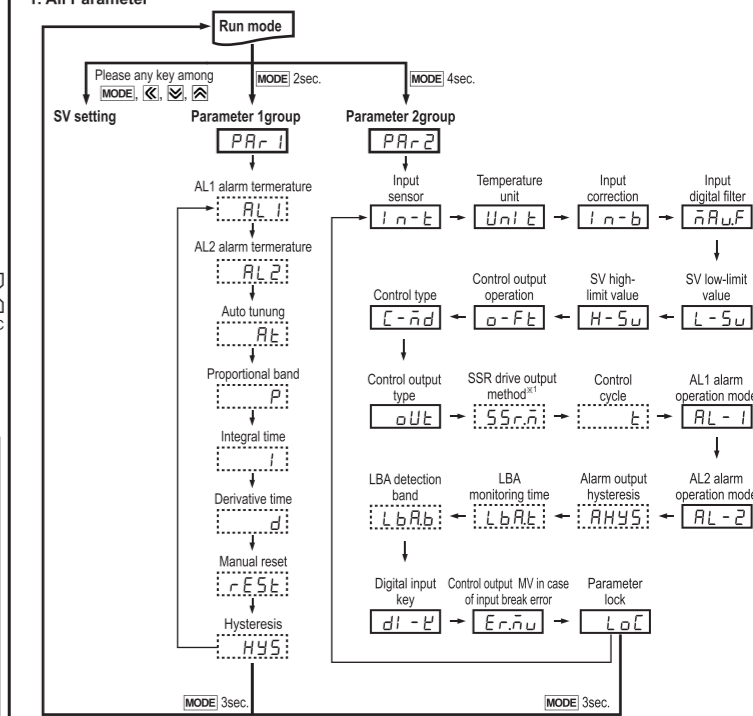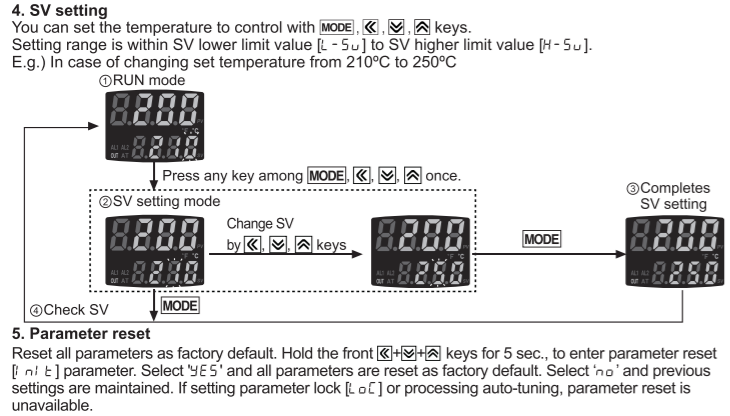Manual reset [rESt]
Hysteresis [HYS]

Parameter 2group:
Input sensor [In-t] → Temperature unit [Unit] → Input correction [In-b] → Input digital filter [dAuF]
Control type [C-nd] → Control output operation [o-Ft] → SV high-limit value [H-Su] → SV low-limit value [L-Su]
Control output type [oUt] → SSR drive output method [SSrn] → Control cycle [t] → AL1 alarm operation mode [AL-1]
LBA detection band [LbAb] → LBA monitoring time [LbAt] → Alarm output hysteresis [AHYS] → AL2 alarm operation mode [AL-2]
Digital input key [di-t] → Control output MV in case of input break error [Er.nu] → Parameter lock [LoC]

MODE 3sec.

※ Press MODE key over 3 sec in any parameter group, it saves the set value and returns to RUN mode.
(Exception: Press MODE key once in SV setting group, it returns to RUN mode).
※ If no key entered for 30 sec., it returns to RUN mode automatically and the set value of parameter is not be saved.
※ Press MODE key again within 1 sec. after returning to RUN mode, it advances the first parameter of previous parameter group.
※ Press MODE key to move next parameter.
※ Parameter marked in □ might not be displayed depending on other parameter settings.
※ Set parameter as 'Parameter 2 group → Parameter 1 group → Setting group of set value' order considering parameter relation of each setting group.
※1: It is not displayed for AC/DC power model (TCN4□-22R).

## 2. Parameter 2group

MODE key: Moves parameter and saves the set, ◁ key: Moves digit, ∨ or ∧ key: Changes the set

| Parameter | Display | Description |
|---|---|---|
| Input sensor | In-t | Setting range: Refer to 'Input sensor and temperature range'.<br>※ If changing input sensor, SV, In-b, H-Su, L-Su, AL1, AL2, LbAt, LbAb, AHYS parameter values are initialized. |
| Temperature unit | Unit | ºC ↔ ºF<br>※ If changing temperature unit, SV, In-b, H-Su, L-Su, AL1, AL2, LbAt, LbAb, AHYS parameter values are initialized. |
| Input correction | In-b | Setting range<br>● ƤCAH, JICH, LICH, tCCH, rPr, SrP, dPtH, CUSH:-999 to 999ºC/ºF<br>● ƤCAL, JICL, LICL, tCCL, dPtL, CUSL:-199.9 to 999.9ºC/ºF |
| Input digital filter | InAuF | Setting range: 0.1 to 120.0 sec. |
| SV low-limit value | L-Su | Setting range: Within the rated temperature range by input sensor[L-Su≤(H-Su-1digit)]<br>※When changing SV lower limit value, if SV<L-Su, SV is initialized as L-Su.<br>※In case of changing input sensor type[In-t], it changes automatically as min. value of the changed input sensor. |
| SV high-limit value | H-Su | Setting range: Within the rated temperature range by input sensor[H-Su≥(L-Su+1digit)]<br>※When changing SV higher limit value, if SV>H-Su, SV is initialized as H-Su.<br>※In case of changing input sensor type[In-t], it changes automatically as max. value of the changed input sensor. |
| Control output operation | o-Ft | Setting range<br>HEAt ↔ CooL<br>※When changing control output operation, ErAu is initialized. |
| Control type | C-ñd | Pid ↔ onoF<br>※When changing control type, ErAu is initialized (control output MV is below 100%) and di-t turns OFF automatically. |
| Control output type | oUt | rLY ↔ SSr |
| SSR drive output method | SSrñ | Stnd ↔ CYCL ↔ PHAS<br>※ It is displayed when selecting control output [oUt] as [SSr].<br>It is not displayed for AC/DC power model (TCN4□-22R). |
| Control cycle | t | Setting range: 0.5 to 120.0 sec.<br>※ In case of Relay drive output [rLY] of control output [oUt], it is set as 20.0 sec. In case of SSR drive output [SSr] of that, it is set as 2.0 sec.<br>※ t is not displayed when SSR drive output [SSrñ] method is set as CYCL, PHAS. |
| AL1 alarm operation mode | AL1 | (diagram of alarm operation modes) |
| AL2 alarm operation mode | AL2 | For more details refer to ▣ Functions 6. Alarm.<br>※ Black: Flashes, Gray: Fixed<br>※ When changing AL1, AL2 alarm operation mode, AL1, AL2 alarm temperature value are initialized. |
| Alarm output hysteresis | AHYS | Setting range: Refer to ▣ Functions 4. Alarm output hysteresis.<br>※ AHYS is not displayed when AL1, AL2 alarm operation mode [AL-1, AL-2] is set as [AñO□, SbA□, LbA□]. |
| LBA monitoring time | LbAt | Setting range: 0 to 9999 sec.<br>※ '0' is set, loop break alarm function is OFF.<br>※ LbAt is displayed when AL1, AL2 alarm operation mode [AL-1, AL-2] is set as LbA□. |
| LBA monitoring range | LbAb | Setting range: 0 to 999(0.0 to 999.9)ºC/ºF, '0' is set, loop break alarm function is OFF.<br>※ LbAb is displayed when AL1, AL2 alarm operation mode [AL-1, AL-2] is set as LbA□ and LbAt is not '0'. |
| Digital input key | di-t | Setting range<br>StoP ↔ ALrE ↔ At ↔ oFF<br>Press ∨ & ∧ keys for 3 sec. and it executes the set function.<br>For more information, refer to ▣ Functions 5. Digital input key.<br>※ When control type [C-ñd] is onoF, At is not displayed. |
| Control output MV in case of input break error | ErAu | Setting range: 0.0 to 100.0%<br>※ Only 0.0, 100% are displayed when control type [C-ñd] is set as onoF.<br>※ When changing PID control to ON/OFF control, if MV is below 100.0%, it is initialized as 0.0%. |
| Parameter lock | LoC | oFF ↔ LoC1 ↔ LoC2 ↔ LoC3<br>LoC1: Locks parameter 2 group.<br>LoC2: Locks parameter 1, 2 group<br>LoC3: Locks parameter 1, 2 group and SV setting<br>※ Parameter setting values are still possible to check when parameter lock is set. |

## 3. Parameter 1 group

MODE key: Moves parameter and saves the set, ◁ key: Moves digit, ∨ or ∧ key: Changes the set

| Parameter | Display | Description |
|---|---|---|
| AL1 alarm temp. | AL1 | Setting range: Deviation alarm(-F.S to F.S), Absolute value alarm(temperature range) |
| AL2 alarm temp. | AL2 | In case alarm operation mode [AL-1, AL-2] of Parameter 2 group AñO□ / SbA□/LbA□, no parameters is displayed. |
| Auto tuning | At | oFF ↔ on    Front AT indicator flashes during auto tuning operation. |
| Proportional band | P | Setting range: 0.1 to 999.9ºC/ºF |
| Integral time | I | Setting range: 0 to 9999 sec. Integral operation is OFF when set value is "0". |
| Derivative time | d | Setting range: 0 to 9999 sec. Derivative operation is OFF when set value is "0". |
| Manual reset | rESt | Setting range: 0.0 to 100.0%/ It is displayed in P/PD control. |
| Hysteresis | HYS | Setting range<br>● ƤCAH, JICH, LICH, tCCH, rPr, SrP, dPtH, CUSH: 1 to 100ºC/ºF<br>● ƤCAL, JICL, LICL, tCCL, dPtL, CUSL: 0.1 to 50.0ºC/ºF<br>※ It is displayed when control type [C-ñd] of parameter 2 group is set onoF. |

## 4. SV setting

You can set the temperature to control with MODE, ◁, ∨, ∧ keys.
Setting range is within SV lower limit value [L-Su] to SV higher limit value [H-Su].
E.g.) In case of changing set temperature from 210ºC to 250ºC

①RUN mode

Press any key among MODE, ◁, ∨, ∧ once.

②SV setting mode
Change SV by ◁, ∨, ∧ keys    MODE    ③Completes SV setting

④Check SV    MODE

## 5. Parameter reset

Reset all parameters as factory default. Hold the front ◁+∧ keys for 5 sec., to enter parameter reset [InIt] parameter. Select 'YES' and all parameters are reset as factory default. Select 'no' and previous settings are maintained. If setting parameter lock [LoC] or processing auto-tuning, parameter reset is unavailable.
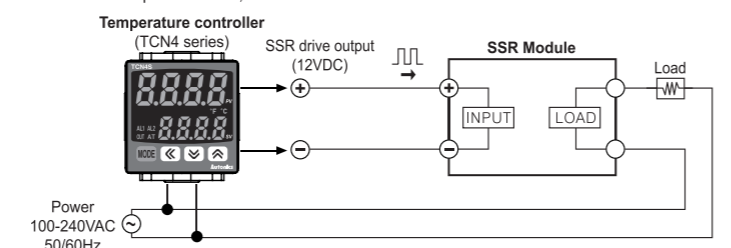
---

## ▣ Functions

### 1. Auto tuning [At]

Auto tuning measures the control subject's thermal characteristics and thermal response rate, and then determines the necessary PID time constant. (When control type[C-ñd] is set as Pid, it is displayed.) Application of the PID time constant realizes fast response and high precision temperature control. If error [oPEn] occurs during auto tuning, it stops this operation automatically. To stop auto tuning, change the set as [oFF]. (It maintains P, I, D values of before auto tuning.)

### 2. Hysteresis [HYS]

In case of ON/OFF control, set between ON and OFF intervals as hysteresis. (When control type [C-ñd] is set as onoF, it is displayed.) If hysteresis is too small, it may cause control output hunting (takeoff, chattering) by external noise, etc.

Heating operation

(hysteresis diagram)

### 3. SSR drive output selection(SSRP function) [SSrñ]

● 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 [Stnd], cycle control [CYCL], phase control [PHAS] at [SSrñ] parameter of parameter 2 group. For cycle control, connect zero cross turn-on SSR or random turn-on SSR. For phase control, connect random turn-on SSR.
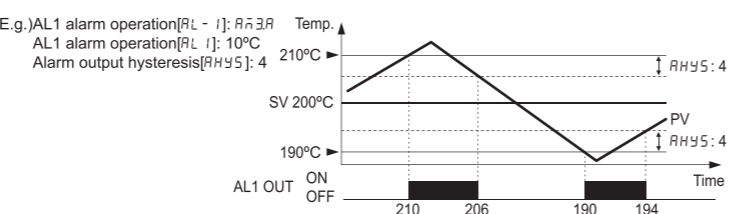
Temperature controller (TCN4 series)

SSR drive output (12VDC)    SSR Module    Load

INPUT    LOAD

Power 100-240VAC 50/60Hz

※ When selecting phase or cycle control mode, the power supply for load and temperature controller must be the sensor.
※ In case of selecting PID control type and phase [PHAS] / cycle [PHAS] control output modes, control cycle [t] is not allowed to set.
※ For AC/DC power model (TCN□-22R), this parameter is not displayed and it is available only standard control by relay or SSR.

#### 1)Standard ON/OFF control mode [Stnd]

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

AC    OUT    ON  OFF  ON  OFF

#### 2)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 by Zero Cross type.

AC    OUT    50Cycle 50%    50Cycle 80%

#### 3)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.

AC    OUT    10%    50%

### 4. Alarm output hysteresis [AHYS]

It displays alarm output ON and OFF interval and hysteresis is applied to both AL1 OUT and AL2 OUT.
• ƤCAH, JICH, LICH, tCCH, rPr, SrP, dPtH, CUSH: 1 to 100
• ƤCAL, JICL, LICL, tCCL, dPtL, CUSL: 0.1 to 50.0

E.g.)AL1 alarm operation[AL-1]: AñÅA
AL1 alarm operation[AL-1]: 10ºC
Alarm output hysteresis[AHYS]: 4

(temperature vs time diagram with SV 200ºC, 210ºC, 190ºC, AHYS:4)

### 5. Digital input key (∨+∧ 3sec.) [di-t]

| Parameter | | Operation |
|---|---|---|
| OFF | oFF | It does not use digital input key function. |
| RUN/STOP | StoP | 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.<br>(Digital input key (t: over 3 sec.))<br>RUN  STOP  RUN  STOP  RUN |
| Clear alarm | ALrE | Clears alarm output by force.<br>(only when alarm option is alarm latch, or alarm latch and standby sequence 1/2 .)<br>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 | At | Starts/Stops auto-tuning. This function is same as auto-tuning[At] of parameter 1 group. (You can start auto-tuning [At] of parameter 1 group and stop it by digital input key.)<br>※This parameter At appears only when control method [C-ñd] parameter 2 group is set as Pid. When control method [C-ñd] parameter 2 group is set as onoF, this parameter is changed as oFF. |

---

## 6. Alarm

Añ1A    Alarm operation    Alarm option

Set both alarm operation and alarm option by combining.
Alarm outputs are two and each one operates individually.
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[di-t] 3 sec., digital input key[di-t] of parameter 2 group set as ALrE, or turn OFF the power and turn ON to clear alarm.

### 1)Alarm operation

| Mode | Name | Alarm operation | Description |
|---|---|---|---|
| AñO_ | | | No alarm output |
| Añ1□ | Deviation high-limit alarm | (diagram) | If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON. |
| Añ2□ | Deviation low-limit alarm | (diagram) | If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON. |
| Añ3□ | Deviation high/low-limit alarm | (diagram) | If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON. |
| Añ4□ | Deviation high/low-limit reserve alarm | (diagram) | If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be OFF. |
| Añ5□ | Absolute value high limit alarm | (diagram) | If PV is higher than the absolute value, the output will be ON. |
| Añ6□ | Absolute value low limit alarm | (diagram) | If PV is lower than the absolute value, the output will be ON. |
| SbA□ | 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[AHYS]

### 2)Alarm opetion

| Option | Name | Description |
|---|---|---|
| AñŏA | Standard alarm | If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF. |
| AñŏB | Alarm latch | If it is an alarm condition, alarm output is ON and maintains ON status. (Alarm output HOLD) |
| AñŏC | 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. |
| AñŏD | 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. |
| AñŏE | 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. |
| AñŏF | 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 change setting. 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 (AL1, AL2) or alarm operation (AL-1, AL-2), switching STOP mode to RUN mode.

### 3)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 [SbAA] or alarm latch [SbAb].
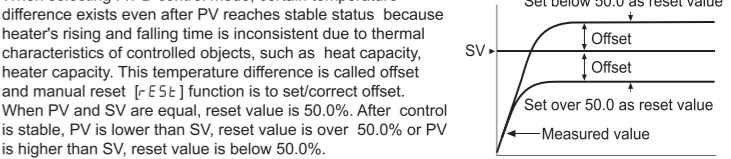
### 4)Loop break alarm(LBA)

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

(LBA diagram with Temperature/SV/PV, Control output MV, Loop break alarm)
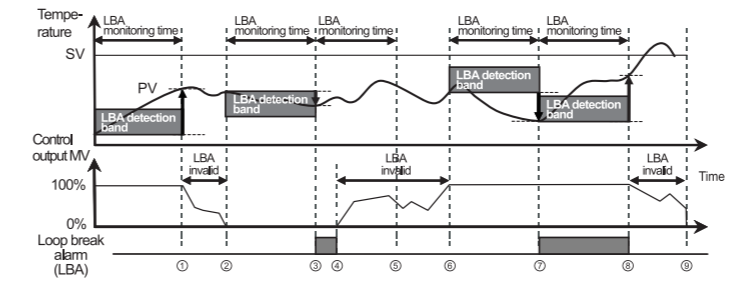
| | Description |
|---|---|
| Start control to ① | When control output MV is 100%, PV is increased over than LBA detection band [LbAb] during LBA monitoring time [LbAt]. |
| ① to ② | The status of changing control output MV (LBA monitoring time is reset.) |
| ② to ③ | When control output MV is 0% and PV is not decreased below than LBA detection band [LbAb] during LBA monitoring time [LbAt], 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 ⑤ | The status of changing control output MV (LBA monitoring time is reset.) |
| ⑤ to ⑥ | When control output MV is 100% and PV is not increased over than LBA detection band [LbAb] during LBA monitoring time [LbAt], 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 [LbAb] during LBA monitoring time [LbAt], loop break alarm (LBA) turns OFF after LBA monitoring time. |
| ⑧ to □ | The status of changing control output MV (LBA monitoring time is reset.) |

※When executing auto-tuning, LBA detection band[LbAb] 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) [LbA□], LBA detection band [LbAb] and LBA monitoring time [LbAt] parameter is displayed.

---

## 7. Manual reset[rESt]

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 [rESt] 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 [rESt] by control result
Set below 50.0 as reset value
SV    Offset    Offset
Set over 50.0 as reset value
Measured value

### 8. Input correction[In-b]

Controller itself does not have errors but there may be error by external input temperature sensor. This function is for correcting this error.
E.g.) If actual temperature is 80ºC but controller displays 78ºC, set input correction value [In-b] as '002' and controller displays 80ºC.
※ As the result of input correction, if current temperature value (PV) is over each temperature range of input sensor, it displays 'HHHH' or 'LLLL'.

### 9. Input digital filter[InAuF]

If current temperature (PV) is fluctuating repeatedly by rapid change of input signal, it reflects to MV and stable 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.

### 10. 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 | |

## ▣ Factory Default

### 1. SV setting

| Parameter | Default |
|---|---|
| — | 0 |

### 2. Parameter 1 group

| Parameter | Default | Parameter | Default | Parameter | Default | Parameter | Default |
|---|---|---|---|---|---|---|---|
| AL1 | 1250 | At | oFF | I | 0000 | rESt | 050.0 |
| AL2 | 1250 | P | 010.0 | d | 0000 | HYS | 002 |

### 3. Parameter 2 group

| Parameter | Default | Parameter | Default | Parameter | Default | Parameter | Default |
|---|---|---|---|---|---|---|---|
| In-t | ƤCAH | H-Su | 1200 | t | 020.0 | LbAb | 0002 |
| Unit | ºC | o-Ft | HEAt | AL1 | AñÅA | di-t | StoP |
| In-b | 0000 | C-ñd | Pid | LbA2 | AñÅA | ErAu | 000.0 |
| InAuF | 000.1 | oUt | rLY | AHYS | 001 | LoC | oFF |
| L-Su | -050 | SSrñ | Stnd | LbAt | 0000 | | |

※ The AC/DC voltage models do not have SSR drive output method[SSrñ]. In case of control output [oUt], if set as SSr, it supports only ON/OFF output.

## ▣ Installation

● TCN4S(48×48mm) Series    ● Other Series

※ Insert product into a panel, fasten bracket by pushing with tools as shown above.
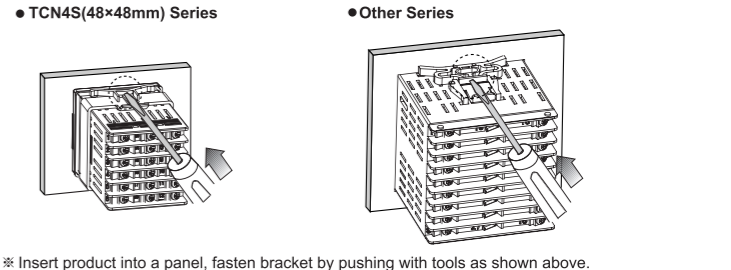
## ▣ Caution During Use

1. Please separate the unit wiring from high voltage lines or power lines to prevent inductive noise.
2. For crimp terminal, select following shaped terminal (M3).

Max. 5.8mm    Max. 5.8mm

3. Install a power switch or circuit breaker to control the power supply.
4. The power switch or circuit breaker should be installed where it is easily accessible by the user.
5. The unit is for temperature controller. Do not use the unit as volt-meter or ampere-meter.
6. When using RTD temperature sensor, must wire it as 3-wire type. If cable is extended, use 3 wires which are same thickness as the line. It might cause the deviation of temperature when line resistance is different.
7. If power line and input signal line are close each other, install a line filter for noise protection at power line and use shielded input signal line.
8. Keep away from the high frequency instruments. (High frequency welding machine & sewing machine, large capacity SCR controller).
9. When supplying the measured input, the unit displays HHHH or LLLL, the measured input may have problem. Turn OFF the power to the unit and check the line.
10. This unit may be used in the following environments.
   ①It shall be used indoor.
   ②Altitude up to 2,000m
   ③Pollution degree 2
   ④Installation category II

※Failure to follow these instructions may result in product damage.

## ▣ Major Products

■ Photoelectric Sensors
■ Fiber Optic Sensors
■ Door Sensors
■ Door Side Sensors
■ Area Sensors
■ Proximity Sensors
■ Pressure Sensors
■ Rotary Encoders
■ Connector/Sockets
■ Switching Mode Power Supplies
■ Control Switches/Lamps/Buzzers
■ I/O Terminal Blocks & Cables
■ Stepper Motors/Drivers/Motion Controllers
■ Graphic/Logic Panels
■ Field Network Devices
■ Laser Marking System(Fiber, CO₂, Nd:yag)
■ Laser Welding/Cutting System

■ Temperature Controllers
■ Temperature/Humidity Transducers
■ SSR/Power Controllers
■ Counters
■ Timers
■ Panel Meters
■ Tachometer/Pulse(Rate) Meters
■ Display Units
■ Sensor Controllers

EP-KE-03-0350F