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 the instruction manual before using.**

**Ordering Information**

<table>
<thead>
<tr>
<th>Item</th>
<th>Digit</th>
<th>Setting type</th>
<th>Power supply</th>
<th>Alarm output</th>
<th>Control output</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>C</td>
<td>4</td>
<td>S</td>
<td>1</td>
<td>4 R</td>
</tr>
<tr>
<td>Size</td>
<td>Digit</td>
<td>Setting type</td>
<td>Power supply</td>
<td>Alarm output</td>
<td>Control output</td>
</tr>
<tr>
<td>7.0×15.0mm</td>
<td>9999 (4-digit)</td>
<td>C</td>
<td>100-240VAC~ 50/60Hz</td>
<td>N</td>
<td>Indicator - Without control output</td>
</tr>
<tr>
<td>7.4×15.0mm</td>
<td>9999 (4-digit)</td>
<td>C</td>
<td>100-240VAC~ 50/60Hz</td>
<td>R</td>
<td>Relay output + SSR drive output*1</td>
</tr>
<tr>
<td>9.5×20.0mm</td>
<td>9999 (4-digit)</td>
<td>C</td>
<td>24VAC 50/60Hz, 24-48VDC</td>
<td>N</td>
<td>No alarm output</td>
</tr>
<tr>
<td>9.5×20.0mm</td>
<td>9999 (4-digit)</td>
<td>C</td>
<td>24VAC 50/60Hz, 24-48VDC</td>
<td>R</td>
<td>Relay output + SSR drive output*1</td>
</tr>
<tr>
<td>7.0×14.6mm</td>
<td>9999 (4-digit)</td>
<td>C</td>
<td>24VAC 50/60Hz</td>
<td>1</td>
<td>Alarm 1 output</td>
</tr>
<tr>
<td>11.0×22.0mm</td>
<td>9999 (4-digit)</td>
<td>C</td>
<td>100-240VAC~ 50/60Hz</td>
<td>2</td>
<td>Alarm 1 output + Alarm 2 output*2</td>
</tr>
</tbody>
</table>

**Specifications**

<table>
<thead>
<tr>
<th>Item</th>
<th>Series</th>
<th>TC4S</th>
<th>TC4SP</th>
<th>TC4Y</th>
<th>TC4M</th>
<th>TC4W</th>
<th>TC4H</th>
<th>TC4L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>AC power</td>
<td>100-240VAC~ 50/60Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC/DC power</td>
<td>24VAC~ 50/60Hz, 24-48VDC=</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allowable voltage range</td>
<td>90 to 110% of rated voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>AC power</td>
<td>Max. 5VA (100-240VAC~ 50/60Hz)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC/DC power</td>
<td>Max. 5VA (24VAC~ 50/60Hz), max. 3W (24-48VDC=)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display method</td>
<td>7-segment (red), other display (green, yellow, red) LED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Character size (W×H)</td>
<td>7.0×15.0mm</td>
<td>7.4×15.0mm</td>
<td>9.5×20.0mm</td>
<td>9.5×20.0mm</td>
<td>7.0×14.6mm</td>
<td>11.0×22.0mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input type</td>
<td>RTD</td>
<td>DP100Ω, Cu500Ω (allowable line resistance max. 5Ω per a wire)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thermocouple</td>
<td>K(CA), J(IC), L(IC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display accuracy*1</td>
<td>RTD</td>
<td>At room temperature (23°C±5°C): (PV ±0.5% or ±1°C, select the higher one) ±1-digit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thermocouple</td>
<td>Out of room temperature range: (PV ±0.5% or ±2°C, select the higher one) ±1-digit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1: Thermocouple L(IC) type, RTD Cu50Ω
- At room temperature (23°C±5°C): (PV ±0.5% or ±1°C, select the higher one) ±1-digit
- Out of room temperature range: (PV ±0.5% or ±2°C, select the higher one) ±1-digit

※ In case of TC4SP Series, ±1°C will be added.

Please read “Safety Considerations” in the instruction manual before using.
### Specifications

<table>
<thead>
<tr>
<th>Series</th>
<th>TC4S</th>
<th>TC4SP</th>
<th>TC4Y</th>
<th>TC4M</th>
<th>TC4W</th>
<th>TC4H</th>
<th>TC4L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control output</td>
<td>Relay</td>
<td>SSR</td>
<td>250VAC ~ 3A, 30VDC ~ 3A, 1a</td>
<td>12VDC ~ ±2V 20mA Max.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alarm output</td>
<td>AL1, AL2 Relay: 250VAC 1A 1a (×TC4SP, TC4Y have AL1 only.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td>1 to 100°C/°F (0.1 to 50.0°C/°F) variable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportional band (P)</td>
<td>0.1 to 9999.99°C/°F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integral time (I)</td>
<td>0 to 9999 sec</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Derivative time (D)</td>
<td>0 to 9999 sec</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control period (T)</td>
<td>0.5 to 120.0 sec</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manual reset</td>
<td>0.0 to 100.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sampling period</td>
<td>100ms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dielectric strength AC power</td>
<td>2,000VAC 50/60Hz for 1 min (between input terminal and power terminal)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dielectric strength AC/DC power</td>
<td>1,000VAC 50/60Hz for 1 min (between input terminal and power terminal)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration</td>
<td>0.75mm amplitude at frequency of 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relay life cycle Electrical</td>
<td>OUT: over 5,000,000 operations, AL1/2: Over 5,000,000 operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relay life cycle Mechanical</td>
<td>OUT: over 200,000 operations (250VAC 3A resistive load)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relay life cycle AL1/2:</td>
<td>Over 300,000 operations (250VAC 1A resistive load)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>Over 100Mohm (at 500VDC megger)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise immunity</td>
<td>Square-wave noise by noise simulator (pulse width 1us) ±2kV R-phase and S-phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory retention</td>
<td>Approx. 10 years (when using non-volatile semiconductor memory type)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment Ambient temperature</td>
<td>10 to 50°C; storage: -20 to 60°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment Ambient humidity</td>
<td>35 to 85%RH; storage: 35 to 85%RH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation type</td>
<td>Double insulation or reinforced insulation (mark: TC). Dielectric strength between the measuring input part and the power part: AC power 2kV, AC/DC Power 1kV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approval Weight</td>
<td>Approx. 11g (approx. 94g)</td>
<td>Approx. 123g (approx. 76g)</td>
<td>Approx. 174g (approx. 85g)</td>
<td>Approx. 204g (approx. 133g)</td>
<td>Approx. 194g (approx. 122g)</td>
<td>Approx. 194g (approx. 155g)</td>
<td></td>
</tr>
</tbody>
</table>

*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.

#### TC4S

- **SSR OUT:** 12VDC ±2V 20mA Max.
- **SOURCE:** 100-240VAC 5VA 50/60Hz, 24-48VDC 3W

#### TC4Y

- **AL1 OUT:** 250VAC 1A 1a
- **AL2 OUT:** 250VAC 1A 1a
- **Relay OUT:** 250VAC 3A 1a, 30VDC 3A 1a

#### TC4W

- **AL1 OUT:** 250VAC 1A 1a
- **AL2 OUT:** 250VAC 1A 1a
- **Relay OUT:** 250VAC 3A 1a, 30VDC 3A 1a

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

*2: The weight includes packaging. The weight in parenthesis is for unit only.

*Environment resistance is rated at no freezing or condensation.

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**Autonics**

J-121
TC Series

- **TC4M**
  - SSR OUT: 12VDC ±2V, 20mA Max.
  - Relay OUT: 250VAC 3A 1a, 30VDC 3A 1a
  - AL1 OUT: 250VAC 1A 1a
  - AL2 OUT: 250VAC 1A 1a

- **TC4H/L**
  - SSR OUT: 12VDC ±2V, 20mA Max.
  - Relay OUT: 250VAC 3A 1a, 30VDC 3A 1a

### Dimensions (unit: mm)

- **TC4S**
- **TC4SP**
- **TC4Y**
- **TC4W**
- **TC4M**
- **TC4H**
Single Display, PID Control

**● TC4L**

- TC4S/TC4SP Series

<table>
<thead>
<tr>
<th>Model</th>
<th>Size</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC4S</td>
<td>Min. 65</td>
<td>Min. 65</td>
<td>45°6</td>
<td>45°6</td>
<td></td>
</tr>
<tr>
<td>TC4SP</td>
<td>Min. 65</td>
<td>Min. 65</td>
<td>45°6</td>
<td>45°6</td>
<td></td>
</tr>
<tr>
<td>TC4Y</td>
<td>Min. 91</td>
<td>Min. 40</td>
<td>68°7</td>
<td>31.5°0</td>
<td></td>
</tr>
<tr>
<td>TC4M</td>
<td>Min. 90</td>
<td>Min. 90</td>
<td>68°7</td>
<td>68°7</td>
<td></td>
</tr>
<tr>
<td>TC4H</td>
<td>Min. 65</td>
<td>Min. 115</td>
<td>45°6</td>
<td>92°8</td>
<td></td>
</tr>
<tr>
<td>TC4W</td>
<td>Min. 115</td>
<td>Min. 65</td>
<td>92°8</td>
<td>45°6</td>
<td></td>
</tr>
<tr>
<td>TC4L</td>
<td>Min. 115</td>
<td>Min. 115</td>
<td>92°8</td>
<td>92°8</td>
<td></td>
</tr>
</tbody>
</table>

**● Bracket**

- TC4S/TC4SP Series

**● Panel cut-out**

**● Terminal cover (sold separately)**

- RSA-COVER (48×48mm)
- RMA-COVER (72×72mm)
- RHA-COVER (48×96mm)
- RLA-COVER (96×96mm)
Unit Description

1. Present value (PV) display
   - RUN mode: Currently measured value (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.

<table>
<thead>
<tr>
<th>No.</th>
<th>PV deviation temp.</th>
<th>Deviation display</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Over 2°C</td>
<td>indicator ON</td>
</tr>
<tr>
<td>2</td>
<td>Below ±2°C</td>
<td>indicator ON</td>
</tr>
<tr>
<td>3</td>
<td>Under -2°C</td>
<td>indicator ON</td>
</tr>
</tbody>
</table>

   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.
   - 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-K].
   ※ 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℃.

Parameter Reset

Reset all parameters as factory default. Hold the front + keys for 5 sec, to enter parameter reset [ ] 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. (except TC4Y Series)
Parameter Group

1. Press any key among RUN mode.
2. Press MODE key over 2 sec, Parameter group 1 [PR1]
3. Press MODE key over 3 sec, Parameter group 2 [PR2]
4. 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

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

※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.
※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 Group

- AL1 alarm temperature
- AL2 alarm temperature
- Auto tuning
- Proportional band
- Integral time
- Derivative time
- Manual reset (Normal deviation correction)
- ON/OFF control hysteresis

Input type
Temperature unit
Input correction
Input digital filter
SV low-limit value
SV high-limit value
Control output operation
Control type
Control output
SSR drive output method
AL1 alarm operation mode
AL2 alarm operation mode
Alarm output hysteresis
LBA monitoring time
LBA detection range
Digital input key
Control output MV in case of input break error
Parameter lock

Parameter Group

- AL1 alarm temperature
- AL2 alarm temperature
- Auto tuning
- Proportional band
- Integral time
- Derivative time
- Manual reset (Normal deviation correction)
- ON/OFF control hysteresis

Input type
Temperature unit
Input correction
Input digital filter
SV low-limit value
SV high-limit value
Control output operation
Control type
Control output
SSR drive output method
AL1 alarm operation mode
AL2 alarm operation mode
Alarm output hysteresis
LBA monitoring time
LBA detection range
Digital input key
Control output MV in case of input break error
Parameter lock
### Parameter Group 1

- **Run mode**
  - Press any key among [A], [B], [C], [D]
  - After checking/changing set value at each parameter, and press [MODE] key, set value flashes twice and it moves to next parameter automatically.
  - Press [MODE] key for 3 sec to return RUN mode at any parameter.
  - This parameter might not be displayed depending on other parameter settings.

- **AL1 alarm temperature**
  - Setting range: Deviation alarm (- [F.S] to [F.S], Absolute value alarm (temperature range)

- **AL2 alarm temperature**
  - In case alarm operation mode [AL-1, AL-2], AM) / SBa / LBa of parameter group 2 is set to [AL-1, AL-2], no parameters is displayed.

- **Auto-tuning**
  - It starts to operate auto-tuning when it is ON and set as OFF automatically after finish the operation.

- **Proportional band**
  - Setting range: 0.1 to 999.9 ℃/℉

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

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

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

- **Hysteresis**
  - Setting range: 1 to 1000 ℃/℉ (0.1 to 50.0 ℃/℉)
  - It is displayed when control type parameter [C-MD] of parameter group 2 is set PID.

- **Hysteresis**
  - Press [MODE] key for 3 sec to return RUN mode at any parameter.

### Parameter Group 2

- **Run mode**
  - When changing input type SV \[IN-B, H-SV, L-SV, AL1, AL2, LBaT, LBaB, AHYS\] parameters are initialized.

- **Input type**
  - Setting range: -999 to 999 \( (\text{DPtL, CUsL}: -199.9 \text{ to } 999.9)\)

- **Temperature unit**
  - Front temperature unit indicator will flash when selecting the unit.

- **Input correction**
  - Setting range: 0.1 to 120.0 sec
  - Set input digital filter time for average input value affected control, and display value.
Single Display, PID Control

SV low-limit value

SV high-limit value

Control output operation

Control type

Control output type

SSR drive output method

Control cycle

AL1 alarm operation

AL2 alarm operation

Alarm output hysteresis

LBA monitoring time

LBA detection band

Digital input key

Control output MV in case of input break error

Parameter lock

Setting range: Within the rated temperature range by input sensor \([L - 5u \leq T \leq H - 5u\) -1digit\].

※When changing SV low-limit value, if \(SV < L - 5u\), SV is initialized as \(L - 5u\).

※When changing control output operation, \(ER\) is initialized.

※Press \(\Phi\) key to convert alarm operation mode into alarm option.

※Refer to ‘Alarm’ in \(\Phi\) Functions.

※In case of changing input sensor type \([L - \text{digit}\) -1digit\], it changes automatically as max./min. value of the changed input sensor.

※When changing control output operation, \(ER\) is initialized.

※When changing control type, \(ER\) is initialized (control output MV is below 100%) and \(dl\) turns OFF automatically.

※It is displayed when selecting control output \([OUT]\) as \(SSR\).

※It operates only selected output between Relay or SSR.

※When changing alarm operation \(AL-1\), \(AL-2\) alarm temperature of \(LBA\) is initialized.

※When changing alarm operation \(AL1\), \(AL2\) alarm temperature of \(LBA\) is initialized.

※Same with the above \([RL - 1]\).

※When changing alarm operation \(AL1\), \(AL2\) alarm temperature of \(LBA\) is initialized.

※Press \(\Phi\) + \(\Phi\) keys for 3 sec and it executes the set function. For more information, refer to ‘Digital input key’ in \(\Phi\) Functions.

※When changing alarm operation \(AL1\), \(AL2\) alarm temperature of \(LBA\) is initialized.

※When changing PID control to ON/OFF control, if MV is below 100%, it is initialized as 0.0%.

※0.0/100.0% is displayed when control type parameter \([\text{ON/OFF}\) is set as \(ON\).

※When changing SV high-limit value, if \(SV > H - 5u\), SV is initialized as \(H - 5u\).

※001 is displayed when \(H - 5u\) is set as \(L - 5u\).

※When changing SV high-limit value, if \(SV > H - 5u\), SV is initialized as \(H - 5u\).

※000 is displayed when \(H - 5u\) is set as \(L - 5u\).

※When changing SV high-limit value, if \(SV > H - 5u\), SV is initialized as \(H - 5u\).

※000 is displayed when \(H - 5u\) is set as \(L - 5u\).

※For indicator model (TC4°N\(\text{ON}\)), only \(\text{ON}\), \(\text{OL}1\) are available.
TC Series

Input Sensor and Temperature Range

<table>
<thead>
<tr>
<th>Input sensor</th>
<th>Thermocouple</th>
<th>RTD</th>
</tr>
</thead>
<tbody>
<tr>
<td>K(CA)</td>
<td>-50 to 1200</td>
<td>-100 to 400</td>
</tr>
<tr>
<td>J(IC)</td>
<td>-30 to 500</td>
<td>-100.0 to 400.0</td>
</tr>
<tr>
<td>L(IC)</td>
<td>-40 to 800</td>
<td>-40 to 1472</td>
</tr>
</tbody>
</table>

Mount the product on the panel, fasten bracket by pushing with tools as shown above.
(In case of TC4Y, fasten bolts for bracket.)

Factory Default

<table>
<thead>
<tr>
<th>Parameter setting</th>
<th>Factory default</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>0</td>
</tr>
</tbody>
</table>

Parameter group 1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Factory default</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL1</td>
<td>1250</td>
</tr>
<tr>
<td>AL2</td>
<td>OFF</td>
</tr>
<tr>
<td>A1</td>
<td>0.100</td>
</tr>
<tr>
<td>I</td>
<td>0.000</td>
</tr>
<tr>
<td>rE5t</td>
<td>0.0500</td>
</tr>
<tr>
<td>HYS</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Parameter group 2

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Factory default</th>
</tr>
</thead>
<tbody>
<tr>
<td>l</td>
<td>0.200</td>
</tr>
<tr>
<td>l'</td>
<td>0.000</td>
</tr>
<tr>
<td>H-SV</td>
<td>-0.500</td>
</tr>
<tr>
<td>Hys</td>
<td>0.000</td>
</tr>
<tr>
<td>H-SV</td>
<td>1200</td>
</tr>
<tr>
<td>lbAb</td>
<td>0.002</td>
</tr>
<tr>
<td>C-rd</td>
<td>PI d</td>
</tr>
<tr>
<td>rLY</td>
<td>0.000</td>
</tr>
<tr>
<td>5Sr/n</td>
<td>5nd</td>
</tr>
<tr>
<td>rMV</td>
<td>0FF</td>
</tr>
</tbody>
</table>

Input Sensor and Temperature Range

<table>
<thead>
<tr>
<th>Input Sensor</th>
<th>Display</th>
<th>Input range (°C)</th>
<th>Input range (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>K(CA)</td>
<td>tCA</td>
<td>-50 to 1200</td>
<td>-58 to 2192</td>
</tr>
<tr>
<td>J(IC)</td>
<td>tJ</td>
<td>-30 to 500</td>
<td>-22 to 932</td>
</tr>
<tr>
<td>L(IC)</td>
<td>tL</td>
<td>-40 to 800</td>
<td>-40 to 1472</td>
</tr>
<tr>
<td>DP100Ω</td>
<td>dPLH</td>
<td>-100 to 400</td>
<td>-148 to 752</td>
</tr>
<tr>
<td></td>
<td>dPLN</td>
<td>-100.0 to 400.0</td>
<td>-148.0 to 752.0</td>
</tr>
<tr>
<td>Cu50Ω</td>
<td>tUSM</td>
<td>-50 to 200</td>
<td>-58 to 392</td>
</tr>
<tr>
<td></td>
<td>tUSL</td>
<td>-50.0 to 200.0</td>
<td>-58.0 to 392.0</td>
</tr>
</tbody>
</table>

Factory Default

<table>
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<td>5Sr/n</td>
<td>5nd</td>
</tr>
<tr>
<td>rMV</td>
<td>0FF</td>
</tr>
</tbody>
</table>

AC/DC power type has no SSR drive output method [SSrM] and supports only ON/OFF output when selecting 5Sr/n in control output [rMV].

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 [RL - 1/RL - 2]

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 \( \text{[AHYS]} \) 3 sec, digital input key \( \text{[di - \cdot -]}' \) of Parameter group 2 set as \( \text{RL} \), or turn OFF the power and turn ON to clear alarm.

### Alarm operation

<table>
<thead>
<tr>
<th>Mode</th>
<th>Name</th>
<th>Alarm operation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Deviation high-limit alarm</td>
<td>OFF ( \text{PV} ) ON ( \text{SV} ) ( 90^\circ \text{C} ) ( 100^\circ \text{C} )</td>
<td>If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.</td>
</tr>
<tr>
<td>A</td>
<td>Deviation low-limit alarm</td>
<td>ON ( \text{PV} ) OFF ( \text{SV} ) ( 90^\circ \text{C} ) ( 100^\circ \text{C} )</td>
<td>If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON.</td>
</tr>
<tr>
<td>A</td>
<td>Deviation high/low-limit alarm</td>
<td>OFF ( \text{PV} ) ON ( \text{SV} ) ( 90^\circ \text{C} ) ( 100^\circ \text{C} )</td>
<td>If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON.</td>
</tr>
<tr>
<td>A</td>
<td>Deviation high/low-limit reserve alarm</td>
<td>ON ( \text{PV} ) OFF ( \text{SV} ) ( 90^\circ \text{C} ) ( 100^\circ \text{C} )</td>
<td>If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON.</td>
</tr>
<tr>
<td>A</td>
<td>Absolute value high limit alarm</td>
<td>OFF ( \text{PV} ) ON ( \text{SV} ) ( 90^\circ \text{C} ) ( 100^\circ \text{C} )</td>
<td>If PV is higher than the absolute value, the output will be ON.</td>
</tr>
<tr>
<td>A</td>
<td>Absolute value low limit alarm</td>
<td>OFF ( \text{PV} ) ON ( \text{SV} ) ( 90^\circ \text{C} ) ( 100^\circ \text{C} )</td>
<td>If PV is lower than the absolute value, the output will be ON.</td>
</tr>
</tbody>
</table>

### Alarm option

<table>
<thead>
<tr>
<th>Mode</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Standard alarm</td>
<td>If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.</td>
</tr>
<tr>
<td>A</td>
<td>Alarm latch</td>
<td>If it is an alarm condition, alarm output is ON and maintains ON status. (Alarm output HOLD)</td>
</tr>
<tr>
<td>A</td>
<td>Standby sequence 1</td>
<td>First alarm condition is ignored and from second alarm condition, standard alarm operates.</td>
</tr>
<tr>
<td>A</td>
<td>Alarm latch and standby sequence 1</td>
<td>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, standard alarm operates.</td>
</tr>
<tr>
<td>A</td>
<td>Standby sequence 2</td>
<td>First alarm condition is ignored and from second alarm condition, standard alarm operates.</td>
</tr>
<tr>
<td>A</td>
<td>Alarm latch and standby sequence 2</td>
<td>First alarm condition is ignored and from second alarm condition, standard alarm operates.</td>
</tr>
</tbody>
</table>

### 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 \( \text{[SBa]} \), or alarm latch \( \text{[SbAl]} \).
© 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 \([LbR_b]\) during LBA monitoring time \([LbT]\), or when control output MV is 0% (100% for cooling control) and PV is not decreased below than LBA detection band \([LbR_b]\) during LBA monitoring time \([LbT]\), alarm output turns ON.

Start control to ① When control output MV is 0% and PV is not decreased below than LBA detection band \([LbR_b]\) during LBA monitoring time \([LbT]\)
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 \([LbR_b]\) during LBA monitoring time \([LbT]\), 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 \([LbR_b]\) during LBA monitoring time \([LbT]\), loop break alarm (LBA) turns ON after LBA monitoring time.
⑥ to ⑦ When control output MV is 100% and PV is increased over than LBA detection band \([LbR_b]\) during LBA monitoring time \([LbT]\), loop break alarm (LBA) turns OFF after LBA monitoring time.
⑦ to ⑧ The status of changing control output MV (LBA monitoring time is reset.)
※When executing auto-tuning, LBA detection band \([LbR_b]\) 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) \([LbA]\), LBA detection band \([LbR_b]\) and LBA monitoring time \([LbT]\) parameter is displayed.

© SSR drive output function (SSRP function) \([S5rA]\)
- 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 \([S5rA]\) 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 \([PHAS]\) control mode for PID control, control cycle \([T]\) is not allowed to set.
※For AC/DC power model (TC4-2R), this parameter \([S5rA]\) is not displayed and it is available only standard control by relay or SSR.
● 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%)

● 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 (°C or °F) indicator will be flickering during Auto tuning. After completing auto tuning, temperature unit display indicator returns to normal operation and AT parameter automatically becomes [OFF → 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 - n d] is set to ONOFF, no parameters are displayed.
● Finish auto tuning when [P E n] error occurs during the operation.
   ※ In case of [P E n] error, auto tuning operation is not applicable.

© Input correction [I - b]
Controller itself does not have errors but there may be error by external input temperature sensor.
E.g.) If actual temperature is 80°C but controller displays 78°C, set input correction value [I - b] as 002 and controller displays 80°C.
   ※ 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 [n w F]
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 - n d]
It is selectable PID, ON/OFF control.
● In case of ON/OFF [ONOFF] 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 [U n b]
A function to select display temperature unit
● Unit display indicator will be ON when converting temperature unit.
Troubleshooting

Description

STOP

AT

RUN

STOP

-N

Lock parameter group 1, 2, SV setting

Flashes if measured sensor input

Operation

Lock parameter group 1, 2

Lock off

Flashes if measured sensor input

N)

It does not use digital input key function.

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

-LOC Lock parameter group 2

-LOC Lock parameter group 1, 2

-LOC Lock parameter group 1, 2, SV setting

※-OFF, LOC are available only for indicator (TC4□□□□N).

- 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.

When input is within the rated temperature range, this display disappears.
Output connections

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 ‘SSR drive output function (SSRP function)’ 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.
- 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.
  ① Indoors (in the environment condition rated in 'Specifications')
  ② Altitude max. 2,000m
  ③ Pollution degree 2
  ④ Installation category II