Economical Dual Display type, PID Control

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)

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Ordering information
T CN 4 S 2 4 R

Control output
- Relay contact output + SSRP output (AC power)
- Relay contact output + SSR output (AC/DC power)

Power supply
- 24VAC 50/60Hz, 24-48VDC
- 100-240VAC 50/60Hz

Auxiliary output
2 Alarm1 + Alarm2 output

Size
S DIN W48 x H48mm
M DIN W72 x H72mm
H DIN W48 x H96mm
L DIN W96 x H96mm

Digit
4 9999 (4 digit)

Setting type
CN Dual display type, set by touch switch
T Temperature controller

Specifications

<table>
<thead>
<tr>
<th>Series</th>
<th>TCN4S</th>
<th>TCN4M</th>
<th>TCN4H</th>
<th>TCN4L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>AC power 100-240VAC 50/60Hz</td>
<td>24VAC 50/60Hz, 24-48VDC</td>
<td>AC/DC power 100-240VAC 50/60Hz</td>
<td>24VAC 50/60Hz, 24-48VDC</td>
</tr>
<tr>
<td>Allowable voltage range</td>
<td>90 to 110% of rated voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>AC power Max. 5VA (100-240VAC 50/60Hz)</td>
<td>Max. 5VA (24VAC 50/60Hz)</td>
<td>Max. 5VA (24VAC 50/60Hz)</td>
<td>Max. 3W (24-48VDC)</td>
</tr>
<tr>
<td>Display method</td>
<td>7 Segment (PV: red, SV: green), Other display (green, red) LED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Character size</td>
<td>PV (W x H) 7.0 x 15.0 mm</td>
<td>9.5 x 20.0 mm</td>
<td>7.0 x 14.6 mm</td>
<td>11.0 x 22.0 mm</td>
</tr>
<tr>
<td>SV (W x H) 5.0 x 9.5 mm</td>
<td>7.5 x 15.0 mm</td>
<td>6.0 x 12.0 mm</td>
<td>7.0 x 14.0 mm</td>
<td></td>
</tr>
<tr>
<td>Input type</td>
<td>RTD DPT100Ω, Cu50Ω (allowable line resistance max. 5Ω per a wire)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermocouple</td>
<td>K(CA), J(IC), L(CC), T(CC), R(PR), S(PR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display accuracy</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>
</tr>
<tr>
<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>
</tr>
<tr>
<td>Control output</td>
<td>Relay 250VAC 3A 1a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSR 12VDC ±2V 20mA Max.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alarm output</td>
<td>AL1, AL2 Relay output: 250VAC 1A 1a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control method</td>
<td>ON/OFF control, P, PI, PD, PID control</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>
</tr>
</tbody>
</table>

※1: @ At room temperature (23°C ±5°C)
- Thermocouple R, S type, below 200°C: (PV ±0.5% or ±3°C, select the higher one) ±1 digit
- Thermocouple R, S type, over 200°C: (PV ±0.5% or ±2°C, select the higher one) ±1 digit
- Thermocouple L(IC) type, RTD Cu50Ω: (PV ±0.5% or ±2°C, select the higher one) ±1 digit
- Out of room temperature range
  - Thermocouple R, S type, below 200°C: (PV ±1.0% or ±6°C, select the higher one) ±1 digit
  - Thermocouple R, S type, over 200°C: (PV ±0.5% or ±5°C, select the higher one) ±1 digit
  - RTD Cu50Ω: (PV ±0.5% or ±3°C, select the higher one) ±1 digit

 AUTONICS
TCN Series Specifications

<table>
<thead>
<tr>
<th>Series</th>
<th>TCN4S</th>
<th>TCN4M</th>
<th>TCN4H</th>
<th>TCN4L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportional band (P)</td>
<td>0.1 to 999.9°C/F</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>
</tr>
<tr>
<td>Derivative time (D)</td>
<td>0 to 9999 sec.</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>
</tr>
<tr>
<td>Manual reset</td>
<td>0.0 to 100.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sampling period</td>
<td>100ms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dielectric strength</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC Power</td>
<td>2,000VAC 50/60Hz 1min.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC/DC power</td>
<td>1,000VAC 50/60Hz 1min.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration</td>
<td>0.75mm amplitude at frequency of 5 to 55Hz in each of X, Y, Z directions for 2 hours</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relay life cycle</td>
<td>Mechanical OUT: Over 5,000,000 times, AL1/2: Over 5,000,000 times</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electrical OUT: Over 200,000 times (250VAC 3A resistive load) AL1/2: Over 300,000 times (250VAC 1A resistive load)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>Min. 100MQ(at 500VDC megger)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise resistance</td>
<td>±2kV R-phase, S-phase the square wave noise (pulse width: 1us) by the noise simulator</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>
</tr>
<tr>
<td>Environment</td>
<td>Ambient temperature: -10 to 50°C, storage: -20 to 60°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ambient humidity: 35 to 85%RH, storage: 35 to 85%RH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation type</td>
<td>Double insulation or reinforced insulation (mark: □ 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>
</tr>
<tr>
<td>Approval</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 147g</td>
<td>Approx. 203g</td>
<td>Approx. 194g</td>
<td>Approx. 275g</td>
</tr>
<tr>
<td></td>
<td>(Approx. 100g)</td>
<td>(Approx. 133g)</td>
<td>(Approx. 124g)</td>
<td>(Approx. 179g)</td>
</tr>
</tbody>
</table>

※1: The weight is with packaging and the weight in parentheses is only unit weight.

※Environment resistance is rated at no freezing or condensation.

TCN4 Series has selectable control output; Relay output, and SSRP output. AC/DC voltage type has Relay output and SSR output and it is selectable.

TCN4 Specifications

SSROUT: 12VDC ±2V 20mA Max.

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

TCN4M Specifications

SSROUT: 12VDC ±2V 20mA Max.

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

TCN4H/L Specifications

SSROUT: 12VDC ±2V 20mA Max.

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

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

※2: The weight is with packaging and the weight in parentheses is only unit weight.
Economical Dual Display type, PID Control

### Dimensions

**TCN4S**

- Panel cut-out
  - Min. 65
  - 45°

**TCN4M**

- Panel cut-out
  - Min. 90
  - 68°

**TCN4H**

- Panel cut-out
  - Min. 65
  - 45°

**TCN4L**

- Panel cut-out
  - Min. 115
  - 92°

**Terminal cover (sold separately)**

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

---

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

Product mounting

- TCN4S(48×48mm) Series

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

Parts description

1. Present temperature (PV) display (red)
   - RUN mode: Present temperature (PV) display.
   - Parameter setting mode: Parameter display.

2. Set temperature (SV) display (green)
   - RUN mode: Set temperature (SV) display.
   - Parameter setting mode: Parameter setting value display.

3. Control/Alarm output display lamp
   - AL1/AL2: It turns ON when the alarm output is ON.
   - OUT: It turns ON when the control output is ON.
   ※During SSR drive control output type in CYCLE/PHASE control, this lamp turns ON when MV is over 3.0%.

4. Auto tuning lamp: AT lamp flashes by every 1 sec during operating auto tuning.

5. MODE key: Used when entering into parameter setting group, 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-K].

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

SV setting

You can set the temperature to control with [MODE], [ ], [ ] keys.
Set range is within SV lower limit value [L-5U] to SV higher limit value [H-5U].

Ex) In case of changing set temperature from 210℃ to 250℃

1. Press any key among [MODE], [ ], [ ] key in RUN mode, the right digit at SV display flashes and it enters to SV setting.

2. Press [ ] key to move the desired digit. (100→101→102→103→104)

3. Press [ ] or [ ] key to move the desired number (1→5).

4. Press [MODE] key to save the value and it controls with this set value.
   (even though there is no key input for over 3 sec., it saves automatically.)
Economical Dual Display type, PID Control

- Parameter setting group

- Run mode

  - Press any key among

- MODE 2 sec.

  - Parameter 1 group

    - AL1 alarm temperature

      - AL1

    - AL2 alarm temperature

      - AL2

    - Auto tuning

      - AR

    - Proportional band

      - P

    - Integral time

      - I

    - Derivative time

      - D

    - Manual reset

      - RES

    - Hysteresis

      - HYS

- MODE 3 sec.

- Parameter 2 group

  - Input sensor

    - I n-b

  - Temperature unit

    - Unit

  - Input correction

    - I n-b

  - Input digital filter

    - nARwF

  - Control type

    - C-nd

  - Control output operation

    - a-Fu

  - SV high-limit value

    - H-Su

  - SV low-limit value

    - L-Su

  - Control output type

    - Out

  - SSR drive output method

    - SSR, n

  - Control cycle

    - b

  - AL1 alarm operation mode

    - AL-1

  - LBA detection band

    - LbRb

  - LBA monitoring time

    - LbRb

  - Alarm output hysteresis

    - RHYS

  - Digital input key

    - dI-lE

  - Control output MV in case of input break error

    - Er, nL

  - Lock setting

    - LAC

- MODE 3 sec.

※ Press MODE key over 3 sec in any setting group, it saves the set value and 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 of the first parameter of previous setting group.

※ Press MODE key to move next parameter.

※ This parameter might not be displayed depending on other parameter settings.

※ Set parameter as ‘Parameter 2 group → Parameter 1 group → Setting of set value’ order considering parameter relation of each setting group.

※ 1: It is not displayed for AC/DC power model (TCN4□-22R).

※ Press key over 3 sec in any setting group, it saves the set value and returns to RUN mode.

※ Press MODE key once in SV setting, 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 of the first parameter of previous setting group.

※ Press MODE key to move next parameter.

※ This parameter might not be displayed depending on other parameter settings.

※ Set parameter as ‘Parameter 2 group → Parameter 1 group → Setting of set value’ order considering parameter relation of each setting group.

※ 1: It is not displayed for AC/DC power model (TCN4□□-22R).
TCN Series

Parameter 1 group

- **Run mode**
  - Press any key among ☻, ☹.
  - After checking or changing setting value in each parameter, press MODE key to save and move to next parameter setting.
  - It is displayed when control type parameter [C-□] of parameter 2 group is set PI d.
  - Press MODE key for 3 sec. to return RUN mode at any parameter.
  - This parameter might not be displayed depending on other parameter settings.

Set range: Deviation alarm (-F.S to F.S), Absolute value alarm (temperature range)
- In case alarm operation mode [AL-1] of Parameter 2 group is AM, no parameters is displayed.

- **AL1 alarm temperature**
  - Set range: 0.1 to 120.0 sec.

- **AL2 alarm temperature**
  - Set range: 0 to 9999 sec.
  - Integral operation is OFF when set value is “0”.

- **Automatic tuning**
  - Set range: 0.1 to 999.9 °C/F
  - Front AT lamp flashes during auto-tuning operation.

- **Proportional band**
  - Set range: 0.0 to 100.0%
  - It is displayed in P, PD control.

- **Integral time**
  - Set range: 0.0 to 100.0 sec.

- **Derivation time**
  - Set range: 0.0 to 100.0 sec.

- **Manual reset**
  - Set range: 0.0 to 100.0%

- **Hysteresis**
  - Set range: -999 to 999.9 °C/F

Parameter 2 group

- **Run mode**
  - Press any key among ☻, ☹.
  - After checking or changing setting value in each parameter, press MODE key to save and move to next parameter setting.
  - It is displayed when control type parameter [C-□] of parameter 2 group is set PI d.
  - Press MODE key for 3 sec. to return RUN mode at any parameter.
  - This parameter might not be displayed depending on other parameter settings.

Set range: Refer to ‘Input sensor and temperature range’.
- If changing input sensor, S.Ln-b, H-Su, L-Su, R Su, L Su, LbRb, RHYS parameter values are initialized.

- **Input sensor**
  - Set range: Refer to ‘Input sensor and temperature range’.

- **Temperature unit**
  - If changing temperature unit, S.Ln-b, H-Su, L-Su, R Su, L Su, LbRb, RHYS parameter values are initialized.

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

- **SV low-limit value**: Set range: Within the rated temperature range by input sensor \[ L - S_U \leq ( H - S_U - 1 \text{digit}) \] ※When changing SV lower limit value, if \( SV < L - S_U \), SV is initialized as \( L - S_U \).

- **SV high-limit value**: Set range: Within the rated temperature range by input sensor \[ H - S_U \geq ( L - S_U + 1 \text{digit}) \] ※When changing SV lower limit value, if \( SV > H - S_U \) is initialized as \( H - S_U \).

- **Control output operation**: ※When changing control output operation, \( Er \) is initialized.

- **Control type**: ※When changing control type, \( Er \), \( d1 - d1' \) are initialized as \( off \).

- **SSR drive output method**: ※It is displayed when selecting control output [\( oU \)] as \( SSR \). It is not displayed for AC/DC power model (TCN4 \( -22R \)).

- **Set range**: 0.5 to 120.0 sec.
  - In case of Relay output \([ R-Ly] \) of control output \([ oU] \) it is set as 20.0 sec.
  - In case of SSR output \([ sSr] \) of that, it is set as 2.0 sec.
  ※It is not displayed when SSR drive output \([ sSr] \) method is set as \( CYCL \), \( PHAS \).

- **AL1 alarm operation mode**: For more details refer to Functions ‘Alarm’.
  ※Black: Flashes, Gray: Fixed
  ※When changing AL1, AL2 alarm operation mode, AL1, AL2 alarm temperature value are initialized.

- **AL2 alarm operation mode**: Refer to Functions ‘Alarm’ output hysteresis’.
  ※It is not displayed when AL1, AL2 alarm operation mode \([ AL-1, AL-2] \) is set as \( R-A \), \( Sb-R \), \( Lb-R \).

- **Alarm output hysteresis**: ※It is not displayed when AL1, AL2 alarm operation mode \([ AL-1, AL-2] \) is set as \( R-A \), \( Sb-R \), \( Lb-R \).

- **LBA monitoring time**: ※‘0’ is set, loop break alarm function is OFF.
  ※It is displayed when AL1, AL2 alarm operation mode \([ AL-1, AL-2] \) is set as \( Lb-R \).
  ※‘0’ is set, loop break alarm function is OFF.
  ※It is displayed when AL1, AL2 alarm operation mode \([ AL-1, AL-2] \) is set as \( Lb-R \) and \( Lb-lb \) is not ‘0’.

- **LBA detection band**: ※Press \( S + R \) keys for 3 sec. and it executes the set function. For more information, refer to Functions ‘Digital input key’.
  ※When control type \( [ \hat{a} \hat{a}d] \) is \( on \), \( R \) is not displayed.

- **Digital input key**: ※Only 0.0, 100% are displayed when ON/OFF control.
  ※When changing PID control \( \rightarrow \) ON/OFF control, if MV is below 100.0%, it is initialized as 0.0%.

- **Control output MV in case of input break error**: ※When changing PID control \( \rightarrow \) ON/OFF control, if MV is below 100.0%, it is initialized as 0.0%.

- **Lock setting**: ※Parameter setting values are still possible to check while Lock mode is ON.

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**Legend**

- \( L - S_U \): Lower limit value
- \( H - S_U \): Upper limit value
- \( oU \): Output type
- \( sSr \): SSR drive output method
- \( AL-1 \): AL1 alarm operation mode
- \( AL-2 \): AL2 alarm operation mode
- \( AHYS \): Alarm output hysteresis
- \( Lb-R \): LBA monitoring time
- \( Lb-lb \): LBA detection band
- \( d1 - d1' \): Digital input key
- \( Er \): Control output MV in case of input break error
- \( LOC1 \): Locks parameter 2 group
- \( LOC2 \): Locks parameter 1, 2 group
- \( LOC3 \): Locks parameter 1, 2 group and SV setting

---

**Notes**

- ※When changing control output operation, \( Er \) is initialized.
- ※When changing control type, \( Er \), \( d1 - d1' \) are initialized as \( off \).
- ※It is displayed when selecting control output \([ oU] \) as \( SSR \).
- ※It is not displayed for AC/DC power model (TCN4 \( -22R \)).
- ※‘0’ is set, loop break alarm function is OFF.
- ※It is not displayed when AL1, AL2 alarm operation mode \([ AL-1, AL-2] \) is set as \( AM) \_ \), \( SBa \), \( LB a \).

---

**Additional Notes**

- ※It is not displayed when AL1, AL2 alarm operation mode \([ AL-1, AL-2] \) is set as \( AM) \_ \), \( SBa \), \( LB a \).
- ※It is not displayed when AL1, AL2 alarm operation mode \([ AL-1, AL-2] \) is set as \( AM) \_ \), \( SBa \), \( LB a \).
- ※‘0’ is set, loop break alarm function is OFF.
- ※‘0’ is set, loop break alarm function is OFF.
- ※‘0’ is set, loop break alarm function is OFF.
- ※‘0’ is set, loop break alarm function is OFF.
- ※‘0’ is set, loop break alarm function is OFF.
- ※‘0’ is set, loop break alarm function is OFF.
- ※‘0’ is set, loop break alarm function is OFF.
- ※‘0’ is set, loop break alarm function is OFF.
## Input type and range

<table>
<thead>
<tr>
<th>Input sensor</th>
<th>Display</th>
<th>Temperature range (°C)</th>
<th>Temperature range (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>K(CA)</td>
<td>℃CRH</td>
<td>-50 to 1200</td>
<td>-58 to 2192</td>
</tr>
<tr>
<td></td>
<td>℃CRL</td>
<td>-50.0 to 999.9</td>
<td>-58.0 to 999.9</td>
</tr>
<tr>
<td>J(IC)</td>
<td>℃JCH</td>
<td>-30 to 800</td>
<td>-22 to 1472</td>
</tr>
<tr>
<td></td>
<td>℃JCL</td>
<td>-30.0 to 800.0</td>
<td>-22.0 to 999.9</td>
</tr>
<tr>
<td>L(IC)</td>
<td>℃LCH</td>
<td>-40 to 800</td>
<td>-40 to 1472</td>
</tr>
<tr>
<td></td>
<td>℃LCL</td>
<td>-40.0 to 800.0</td>
<td>-40 to 999.9</td>
</tr>
<tr>
<td>T(CC)</td>
<td>℃TCCH</td>
<td>-50 to 400</td>
<td>-58 to 752</td>
</tr>
<tr>
<td></td>
<td>℃TCCL</td>
<td>-50.0 to 400.0</td>
<td>-58.0 to 752.0</td>
</tr>
<tr>
<td>R(PR)</td>
<td>℃Pr</td>
<td>0 to 1700</td>
<td>32 to 3092</td>
</tr>
<tr>
<td>S(PR)</td>
<td>℃Pr</td>
<td>0 to 1700</td>
<td>32 to 3092</td>
</tr>
<tr>
<td>RTD</td>
<td>DPt100Ω</td>
<td>-100 to 400</td>
<td>-148 to 752</td>
</tr>
<tr>
<td></td>
<td>Dp tH</td>
<td>-100.0 to 400.0</td>
<td>-148.0 to 752.0</td>
</tr>
<tr>
<td></td>
<td>Dp tL</td>
<td>-50 to 200</td>
<td>-58 to 392</td>
</tr>
<tr>
<td></td>
<td>CusH</td>
<td>-50.0 to 200.0</td>
<td>-58.0 to 392.0</td>
</tr>
<tr>
<td></td>
<td>CusL</td>
<td>-50.0 to 200.0</td>
<td>-58.0 to 392.0</td>
</tr>
</tbody>
</table>

## Factory default

### Parameter 1 group

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Factory default</th>
</tr>
</thead>
<tbody>
<tr>
<td>SV setting</td>
<td>0</td>
</tr>
<tr>
<td>AL1 alarm temperature</td>
<td>1250</td>
</tr>
<tr>
<td>AL2 alarm temperature</td>
<td>1250</td>
</tr>
<tr>
<td>Auto tuning</td>
<td>off</td>
</tr>
<tr>
<td>Proportional band</td>
<td>0.000</td>
</tr>
<tr>
<td>Integral time</td>
<td>0.000</td>
</tr>
<tr>
<td>Derivative time</td>
<td>0.000</td>
</tr>
<tr>
<td>Manual reset</td>
<td>0500</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>002</td>
</tr>
</tbody>
</table>

### Parameter 2 group

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Factory default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input sensor</td>
<td>℃CRH</td>
</tr>
<tr>
<td>Temperature unit</td>
<td>℃C</td>
</tr>
<tr>
<td>Input correction</td>
<td>0000</td>
</tr>
<tr>
<td>Input digital filter</td>
<td>000.0</td>
</tr>
<tr>
<td>SV low-limit value</td>
<td>050</td>
</tr>
<tr>
<td>SV high-limit value</td>
<td>1200</td>
</tr>
<tr>
<td>Control output operation</td>
<td>HEAT</td>
</tr>
<tr>
<td>Control type</td>
<td>Pl d</td>
</tr>
<tr>
<td>Control output</td>
<td>rLY</td>
</tr>
<tr>
<td>SSR drive output method</td>
<td>5Srά</td>
</tr>
<tr>
<td>Control cycle</td>
<td>0200</td>
</tr>
<tr>
<td>AL1 alarm operation mode</td>
<td>Rά1</td>
</tr>
<tr>
<td>AL2 alarm operation mode</td>
<td>Rά2</td>
</tr>
<tr>
<td>Alarm output hysteresis</td>
<td>001</td>
</tr>
<tr>
<td>LBA monitoring time</td>
<td>0000</td>
</tr>
<tr>
<td>LBA detection band</td>
<td>0002</td>
</tr>
<tr>
<td>Digital input key</td>
<td>5ά0P</td>
</tr>
<tr>
<td>Control output MV in case of input break error</td>
<td>0000</td>
</tr>
<tr>
<td>Lock setting</td>
<td>off</td>
</tr>
</tbody>
</table>
Functions

© Alarm [AL - 1 / AL - 2]

There are two alarms which operate individually. You can set combined alarm operation and alarm option. Use digital input key(set as AL - 1 / AL - 2) or turn OFF power and re-start this unit to release alarm operation.

● Alarm operation

<table>
<thead>
<tr>
<th>Mode</th>
<th>Name</th>
<th>Alarm operation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL1</td>
<td>Deviation high-limit alarm</td>
<td>OFF ON 100℃ 110℃</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>AL2</td>
<td>Deviation low-limit alarm</td>
<td>ON OFF 90℃ 100℃</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>AL3</td>
<td>Deviation high/low-limit alarm</td>
<td>ON OFF 90℃ 100℃</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>AL4</td>
<td>Deviation high/low-limit reserve alarm</td>
<td>OFF ON 90℃ 100℃</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 OFF.</td>
</tr>
<tr>
<td>AL5</td>
<td>Absolute value high limit alarm</td>
<td>OFF ON 90℃ 100℃</td>
<td>If PV is higher than the absolute value, the output will be ON.</td>
</tr>
<tr>
<td>AL6</td>
<td>Absolute value low limit alarm</td>
<td>OFF ON 90℃ 100℃</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>AL1</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>AL2</td>
<td>Standby sequence1</td>
<td>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.</td>
</tr>
<tr>
<td>AL3</td>
<td>Alarm latch and standby sequence1</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, alarm latch operates.</td>
</tr>
<tr>
<td>AL4</td>
<td>Alarm latch and standby sequence2</td>
<td>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.</td>
</tr>
<tr>
<td>AL5</td>
<td>Alarm latch and standby sequence2</td>
<td>Basic operation is same as alarm latch and standby sequence1. It operates not only by power ON/OFF, but also alarm setting value, or alarm option changing. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, alarm latch operates.</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 [SBAL], or alarm latch [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 alarm operation mode \([AL-1, AL-2]\) is set as loop break alarm (LBA) \([LbR_b]\), LBA detection band \([LbR_b]\) and LBA monitoring time \([LbT]\) parameter is displayed.

SSR drive output function (SSRP function) \([SSr\_\_]\)

- Realizing high accuracy and cost effective temperature control with both current output (4-20mA) and linear output (cycle control and phase control)
- SSRP output is selectable one of standard ON/OFF control, cycle control, phase control by utilizing standard SSR drive voltage output.
- Select one of standard ON/OFF control \([STND]\), cycle control \([CYCL]\), phase control \([PHAS]\) at SSR parameter of setting 2 group. For cycle control, connect zero cross turn-on SSR (random turn-on SSR is also available). For phase control, connect random turn-on SSR.

※ When selecting phase or cycle control mode, the power supply for load and temperature controller must be the same.

※ In case of selecting PID control type and phase \([PHAS]\) / cycle \([CYCL]\) control output modes, control cycle \([T]\) is not allowed to set.

※ For AC/DC power model (TCN4 22R), this parameter is not displayed and it is available only standard control by relay or SSR.
Economical Dual Display type, PID Control

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

● Cycle control mode [CYC]
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 mode [PHASE]
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]
- Auto tuning measures the control subject’s thermal characteristics and thermal response rate, and then determines the necessary PID time constant. (When control type [SET] is set to PI d, it is displayed.)
- If error [OPF] 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.)

© Input correction [IN-]
Controller itself does not have errors but there may be error by external input temperature sensor.
Ex) If actual temperature is 80°C but controller displays 78°C, set input correction value [IN-] as 0.2 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 [INDF]
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.

© SV High/Low limit [L~S~U / H~S~U]
- It sets SV high/low limit Range of using temperature within temperature range for each sensor, user can set/change set temperature(SV) within SV high limit [H~S~U] to SV low limit [L~S~U]. (※L~S~U > H~S~U cannot be set.)
- When changing input type [IN-] and SV low limit [L~S~U] and SV high limit [H~S~U] of using temperature will be initialized as max./min. value of sensor temperature range automatically.

© Hysteresis [HYS]
- In case of ON/OFF control, set between ON and OFF intervals as hysteresis. (When control type [SET] is set as ONOFF, it is displayed.)
- If hysteresis is too small, it may cause control output hunting (take off, chattering) by external noise, etc.

© Manual reset [RE]
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 [RE] 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 [RE] by control result

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

© Temperature unit selection [UNIT]
- A function to select display temperature unit.
- Unit display lamp will be ON when converting temperature unit.
**Cool / Heat function [o-F]**

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 [Heat] 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.

**Control method selection [C]***

It is selectable PID, ON/OFF control.

- In case of ON/OFF [o-F] mode, Hysteresis [HYS] parameter is displayed.
- In case of PID [P] mode, Proportional band [P], Integral time [I], and Derivative time [T] parameters are displayed.

**Control output type selection [o-U]**

It is selectable output type; relay output [R-L], SSR drive output [SS].

**Alarm output hysteresis [AHYS]**

It displays alarm output ON and OFF interval and hysteresis is applied to both AL1 OUT and AL2 OUT.

- \[L_1\text{RH}. \text{Pr}. \text{Sp}, \text{dPr}, \text{CmH} : 1 \text{ to } 100\]
- \[L_2\text{RL}. \text{Li} \text{CL}, \text{CmL}, \text{dPrL}, \text{CusL} : 0.1 \text{ to } 50.0\]

Ex) AL1 alarm operation \[AL-1\]: \[\text{AHYS}: 4\]

**Control output MV [Er] when input sensor line is broken [oPE] when setting error [Er] occur**

When input sensor line is broken or setting value error occurs, this function is to set control output. You can set ON/OFF setting for ON/OFF control, MV setting for PID control.

<table>
<thead>
<tr>
<th>Parameter input key( + 3sec.) [d - ]</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>oFF</td>
<td>It does not use digital input key function.</td>
</tr>
<tr>
<td>d oP</td>
<td>It is available to pause on control output and auxiliary output (except loop break alarm, sensor break alarm) except control output operates normally as set. Press digital input key for 3sec to re-start the operation.</td>
</tr>
<tr>
<td>RLr E</td>
<td>It is available to clear alarm output by force. (It is only when alarm option is alarm latch, standby sequence.) Clear alarm is able to only for out of alarm operation range. Alarm operates normally right after clear alarm.</td>
</tr>
<tr>
<td>Rb</td>
<td>Auto tuning function, it is same as auto tuning function [Rb] of parameter 1 group. (You can execute auto tuning from parameter 1 group, and finish it by digital input key.) When control type [C] is set as [P] d, Rb is displayed. When it is set as [o-F], digital input key [d - ] is changed as [oFF].</td>
</tr>
</tbody>
</table>

**Lock setting [L]**

A function to prevent changing SV and parameters of each setting group. Parameter setting values are still possible to check while Lock mode is ON.

<table>
<thead>
<tr>
<th>Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>oFF</td>
<td>Lock off</td>
</tr>
<tr>
<td>L1</td>
<td>Lock parameter group 1</td>
</tr>
<tr>
<td>L2</td>
<td>Lock parameter group 2</td>
</tr>
<tr>
<td>L3</td>
<td>Lock parameter group 1, 2, SV setting</td>
</tr>
</tbody>
</table>

**Error**

<table>
<thead>
<tr>
<th>Display</th>
<th>Description</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>oPE</td>
<td>Flashes if input sensor is disconnected or sensor is not connected.</td>
<td>Check input sensor state.</td>
</tr>
<tr>
<td>HHHH</td>
<td>Flashes if measured sensor input is higher than temperature range.</td>
<td>When input is within the rated temperature range, this display disappears.</td>
</tr>
<tr>
<td>LLLL</td>
<td>Flashes if measured sensor input is lower than temperature range.</td>
<td></td>
</tr>
</tbody>
</table>

Autonis
© Output connections
See H-139 page 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 "A" (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 the H-50 page for phase/cycle control connections.

Proper usage

© Simple "error" diagnosis

● When the load (Heater etc) is not operated

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

● When it displays "OPEN" during operation

This is a warning that external sensor is open. Please turn off the power and check the wire state of the sensor. If sensor is not open disconnect sensor line from the unit and short the input +, - terminal. Turn on the power of the unit and check the controller displays room temperature.
If this unit cannot display room temperature, this unit is broken. Please remove this unit and contact our service center. (When the input mode is thermocouple, it is available to display room temperature.)

© Caution for using

● The connection wire of this unit should be separated from the power line and high voltage line in order to prevent from inductive noise.

● For crimp terminal, select following shaped terminal (M3) Max. 5.8mm

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

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

● This unit is designed for temperature controlling only. Do not apply this unit as a voltmeter or a current meter.

● In case of using RTD sensor, 3-wire type must be used. If you need to extend the line, 3-wires must be used with the same thickness as the line. It might cause temperature difference if the resistance of line is different.

● In case of making power line and input signal line close, line filter for noise protection should be installed at power line and input signal line should be shielded.

● Keep away from the high frequency instruments. (High frequency welding machine & sewing machine, big capacitive SCR controller)

● When supplying measured input, if "HHHH" or "LLLL" is displayed, measured input may have problem. Turn off the power and check the line.

● Installation environment
  • It shall be used indoor.
  • Altitude Max. 2000m.
  • Pollution Degree 2
  • Installation Category II.