

# Basic-type Digital Temperature Controller

# E5CN/E5CN-U (48 x 48 mm)

CSM\_E5CN\_E5CN-U\_DS\_E\_5\_1

## New 48 x 48-mm Basic Temperature Controller with Enhanced Functions and Performance. Improved Indication Accuracy and Preventive Maintenance Function.

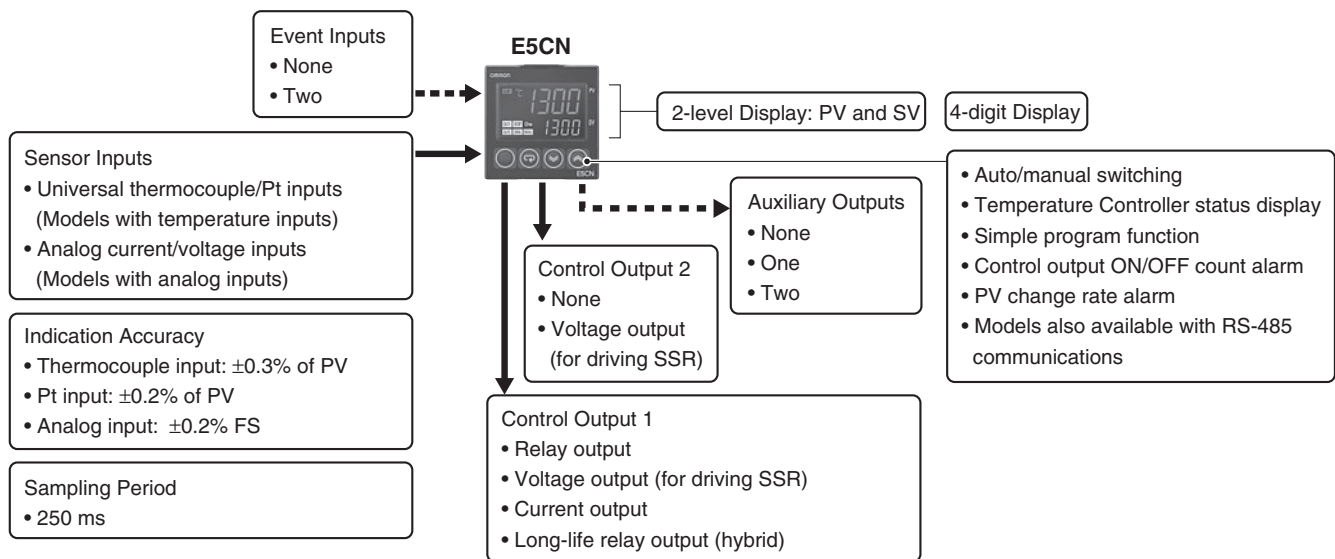


- Indication Accuracy
  - Thermocouple input:  $\pm 0.3\%$  of PV (previous models:  $\pm 0.5\%$ )
  - Pt input:  $\pm 0.2\%$  of PV (previous models:  $\pm 0.5\%$ )
  - Analog input:  $\pm 0.2\%$  FS (previous models:  $\pm 0.5\%$ )
- New E5CN-U Models (Plug-in Models) with analog inputs and current outputs.
- A PV/SV-status display function can be set to automatically alternate between displaying the status of the Temperature Controller (auto/manual, RUN/STOP, and alarms) and the PV or SV.
- Preventive maintenance for relays in the Temperature Controller using a Control Output ON/OFF Counter.

Refer to *Safety Precautions for E5□N/E5□N-H*.

Refer to *Operation for E5□N/E5□N-H* for operating procedures.

## Main I/O Functions

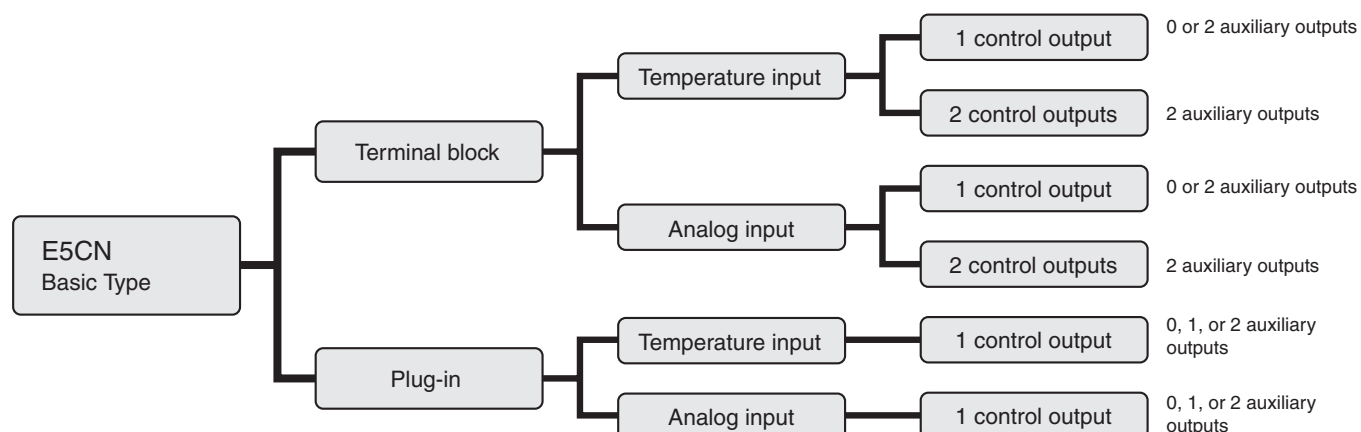


This data sheet is provided as a guideline for selecting products. Be sure to refer to the following user manuals for application precautions and other information required for operation before attempting to use the product.

E5CN/E5AN/E5EN/E5GN Digital Temperature Controllers User's Manual Basic Type (Cat. No. H156)

E5CN/E5AN/E5EN/E5GN Digital Temperature Controllers Communications Manual Basic Type (Cat. No. H158)

## Lineup



**Note:** Models with one control output and one or two auxiliary outputs and models with two control outputs can be used for heating/cooling control.

## Model Number Structure

### Model Number Legend

#### Controllers

E5CN-      M    -  -500

1 2 3 4 5 6 7

#### 1. Control Output 1

- R: Relay output
- Q: Voltage output (for driving SSR)
- C: Current output
- Y: Long-life relay output (hybrid) \*1

#### 2. Auxiliary Outputs \*2

- Blank: None
- 2: Two outputs

#### 3. Option

- M: Option Unit can be mounted.

#### 4. Input Type

- T: Universal thermocouple/platinum resistance thermometer
- L: Analog current/voltage input

#### 5. Power Supply Voltage

- Blank: 100 to 240 VAC
- D: 24 VAC/VDC

#### 6. Case Color

- Blank: Black
- W: Silver

#### 7. Terminal Cover

- 500: With terminal cover

#### Option Units

E53-CN      

1 2 3 4

#### 1. Applicable Controller

- CN: E5CN or E5CN-H

#### 2. Function 1

- Blank: None
- Q: Control output 2 (voltage for driving SSR)
- P: Power supply for sensor

#### 3. Function 2

- Blank: None
- H: Heater burnout/SSR failure/Heater overcurrent detection (CT1)
- HH: Heater burnout/SSR failure/Heater overcurrent detection (CT2)
- B: Two event inputs
- 03: RS-485 communications
- H03: Heater burnout/SSR failure/Heater overcurrent detection (CT1) + RS-485 communications
- HB: Heater burnout/SSR failure/Heater overcurrent detection (CT1) + Two event inputs
- HH03: Heater burnout/SSR failure/Heater overcurrent detection (CT2) + RS-485 communications

#### 4. Version

- N2: Applicable only to models released after January 2008

**Note: 1.** Not all combinations of function 1 and function 2 specifications are possible for Option Units (E53-      ).

**2.** Estimates can be provided for coatings and other specifications that are not given in the datasheet. Ask your OMRON representative for details.

\*1. Always connect an AC load to a long-life relay output. The output will not turn OFF if a DC load is connected because a triac is used for switching the circuit. For details, check the conditions in *Ratings*.

\*2. Auxiliary outputs are contact outputs that can be used to output alarms or results of logic operations.

## Ordering Information

### Controllers with Terminal Blocks

| Size                                    | Case color     | Power supply voltage                   | Input type                             | Auxiliary outputs                | Control output 1                 | Model          |
|---|----------------|--|--|----------------------------------|----------------------------------|----------------|
| 1/16 DIN<br>48 × 48 × 78<br>(W × H × D) | Black          | 100 to 240 VAC                         | Thermocouple or Resistance thermometer | None                             | Relay output                     | E5CN-RMT-500   |
|   |                |  |  |                                  | Voltage output (for driving SSR) | E5CN-QMT-500   |
|   |                |  |  |                                  | Current output                   | E5CN-CMT-500   |
|   |                |  |  | 2                                | Relay output                     | E5CN-R2MT-500  |
|   |                |  |  |                                  | Voltage output (for driving SSR) | E5CN-Q2MT-500  |
|   |                |  |  |                                  | Current output                   | E5CN-C2MT-500  |
|   |                | 24 VAC/VDC                             | Thermocouple or Resistance thermometer | None                             | Relay output                     | E5CN-RMTD-500  |
|   |                |  |  |                                  | Voltage output (for driving SSR) | E5CN-QMTD-500  |
|   |                |  |  |                                  | Current output                   | E5CN-CMTD-500  |
|   |                |  |  | 2                                | Relay output                     | E5CN-R2MTD-500 |
|   |                |  |  |                                  | Voltage output (for driving SSR) | E5CN-Q2MTD-500 |
|   |                |  |  |                                  | Current output                   | E5CN-C2MTD-500 |
|   | 100 to 240 VAC | Analog (current/voltage)               | None                                   | Relay output                     | E5CN-RML-500                     |                |
|   |                |  |  | Voltage output (for driving SSR) | E5CN-QML-500                     |                |
|   |                |  |  | Current output                   | E5CN-CML-500                     |                |
|   |                |  | 2                                      | Relay output                     | E5CN-R2ML-500                    |                |
|   |                |  |  | Voltage output (for driving SSR) | E5CN-Q2ML-500                    |                |
|   |                |  |  | Current output                   | E5CN-C2ML-500                    |                |
|   |                | 24 VAC/VDC                             | Analog (current/voltage)               | 2                                | Long-life relay output (hybrid)  | E5CN-Y2ML-500  |
|   |                |  |  |                                  | Relay output                     | E5CN-R2MLD-500 |
|   |                |  |  |                                  | Voltage output (for driving SSR) | E5CN-Q2MLD-500 |
|   |                |  |  | 2                                | Current output                   | E5CN-C2MLD-500 |
|   |                |  |  |                                  | Relay output                     | E5CN-RMT-W-500 |
|   |                |  |  |                                  | Voltage output (for driving SSR) | E5CN-QMT-W-500 |
| Silver                                  | 100 to 240 VAC | Thermocouple or Resistance thermometer | None                                   | Current output                   | E5CN-CMT-W-500                   |                |
|   |                |  |  | Relay output                     | E5CN-R2MT-W-500                  |                |
|   |                |  |  | Voltage output (for driving SSR) | E5CN-Q2MT-W-500                  |                |
|   |                |  | 2                                      | Current output                   | E5CN-C2MT-W-500                  |                |
|   |                |  |  | Long-life relay output (hybrid)  | E5CN-Y2MT-W-500                  |                |
|   |                |  |  | Relay output                     | E5CN-R2MTD-W-500                 |                |
|   | 24 VAC/VDC     | Thermocouple or Resistance thermometer | 2                                      | Voltage output (for driving SSR) | E5CN-Q2MTD-W-500                 |                |
|   |                |  |  | Current output                   | E5CN-C2MTD-W-500                 |                |
|   |                |  |  | Relay output                     | E5CN-R2MTD-W-500                 |                |

**Note:** Models with analog inputs do not have temperature unit indicators.

### Option Units

One of the following Option Units can be mounted to provide the E5CN with additional functions.

| Functions             |   |              |  |                                | Model<br>(See Note 2.) |
|-----------------------|---|--------------|--|--------------------------------|------------------------|
| Communications RS-485 | 3-phase heater burnout/SSR failure/Heater overcurrent detection |              |  |                                | E53-CNHH03N2           |
|                       | Heater burnout/SSR failure/Heater overcurrent detection         | Event inputs |  |                                | E53-CNHB2              |
| Communications RS-485 |   |              | Control output 2 (Voltage for driving SSR) |                                | E53-CNQ03N2            |
|                       |   | Event inputs |  | External power supply for ES1B | E53-CNPBN2             |
|                       | Heater burnout/SSR failure/Heater overcurrent detection         |              |  | External power supply for ES1B | E53-CNPHN2             |
| Communications RS-485 |   |              |  | External power supply for ES1B | E53-CNP03N2            |
| Communications RS-485 | Heater burnout/SSR failure/Heater overcurrent detection         |              |  |                                | E53-CNH03N2            |
| Communications RS-485 |   |              |  |                                | E53-CN03N2             |
|                       |   | Event inputs |  |                                | E53-CNBN2              |
|                       | Heater burnout/SSR failure/Heater overcurrent detection         |              | Control output 2 (Voltage for driving SSR) |                                | E53-CNQHN2             |
|                       | 3-phase heater burnout/SSR failure/Heater overcurrent detection |              | Control output 2 (Voltage for driving SSR) |                                | E53-CNQH2N2            |
|                       |   | Event inputs | Control output 2 (Voltage for driving SSR) |                                | E53-CNQB2              |

**Note: 1.** Option Units cannot be used for plug-in models.

These Option Units are applicable only to models released after January 2008.

- 2.** If the E53-CNQHN2 or E53-CNQH2N2 Option Unit is used together with the E5CN-C□ Temperature Controller and control output 1 (current output) is assigned to the heating control output, heater burnout detection will be disabled.

## Model Number Structure

### Model Number Legend (Plug-in-type Controllers)

E5CN-□□□□U  
1 2 3 4

#### 1. Output Type

- R: Relay output
- Q: Voltage output (for driving SSR)
- C: Current output

#### 2. Number of Alarms

- Blank: No alarm
- 1: One alarm
- 2: Two alarms

#### 3. Input Type

- T: Universal thermocouple/platinum resistance thermometer
- L: Analog Input

#### 4. Plug-in type

- U: Plug-in type

## Ordering Information

### Plug-in-type Controllers

| Size     | Case color | Power supply voltage | Input type                             | Auxiliary outputs                | Control output 1                 | Model      |
|----------|------------|----------------------|--|----------------------------------|----------------------------------|------------|
| 1/16 DIN | Black      | 100 to 240 VAC       | Thermocouple or resistance thermometer | None                             | Relay output                     | E5CN-RTU   |
|          |            |                      |  |                                  | Voltage output (for driving SSR) | E5CN-QTU   |
|          |            |                      |  |                                  | Current output                   | E5CN-CTU   |
|          |            |                      |  | 1                                | Relay output                     | E5CN-R1TU  |
|          |            |                      |  |                                  | Voltage output (for driving SSR) | E5CN-Q1TU  |
|          |            |                      |  |                                  | Current output                   | E5CN-C1TU  |
|          |            |                      | 2                                      | Relay output                     | E5CN-R2TU                        |            |
|          |            |                      |  | Voltage output (for driving SSR) | E5CN-Q2TU                        |            |
|          |            |                      |  | Current output                   | E5CN-C2TU                        |            |
|          |            |                      | Analog (current/voltage)               | 1                                | Relay output                     | E5CN-R1LU  |
|          |            |                      |  |                                  | Voltage output (for driving SSR) | E5CN-Q1LU  |
|          |            |                      |  |                                  | Current output                   | E5CN-C1LU  |
|          |            | 2                    |  | Relay output                     | E5CN-R2LU                        |            |
|          |            |                      |  | Voltage output (for driving SSR) | E5CN-Q2LU                        |            |
|          |            |                      |  | Current output                   | E5CN-C2LU                        |            |
|          |            | 24 VAC/VDC           | Thermocouple or resistance thermometer | None                             | Relay output                     | E5CN-RTDU  |
|          |            |                      |  |                                  | Voltage output (for driving SSR) | E5CN-QTDU  |
|          |            |                      |  |                                  | Current output                   | E5CN-CTDU  |
|          |            |                      |  | 1                                | Relay output                     | E5CN-R1TDU |
|          |            |                      |  |                                  | Voltage output (for driving SSR) | E5CN-Q1TDU |
|          |            |                      |  |                                  | Current output                   | E5CN-C1TDU |
|          |            |                      | 2                                      | Relay output                     | E5CN-R2TDU                       |            |
|          |            |                      |  | Voltage output (for driving SSR) | E5CN-Q2TDU                       |            |
|          |            |                      |  | Current output                   | E5CN-C2TDU                       |            |

**Note:** Models with analog inputs do not have temperature unit indicators.

## Accessories (Order Separately)

### USB-Serial Conversion Cable

| Model     |
|-----------|
| E58-CIFQ1 |

### Terminal Cover

| Connectable models    | Model     |
|-----------------------|-----------|
| Terminal block models | E53-COV17 |

**Note:** The Terminal Cover comes with the E5CN-□□□-500 models.

### Waterproof Packing

| Model   |
|---------|
| Y92S-29 |

**Note:** The Waterproof Packing is included with the Controller only for models with terminal blocks.

### Current Transformers (CTs)

| Hole diameter | Model   |
|---------------|---------|
| 5.8 dia.      | E54-CT1 |
| 12.0 dia.     | E54-CT3 |

### Adapter

| Connectable models    | Model   |
|-----------------------|---------|
| Terminal block models | Y92F-45 |

**Note:** Use this Adapter when the panel has been previously prepared for the E5B□.

### Sockets (for Plug-in Models)

| Type   | Model     |
|--|-----------|
| Front-connecting Socket  | P2CF-11   |
| Front-connecting Socket with Finger Protection                   | P2CF-11-E |
| Back-connecting Socket   | P3GA-11   |
| Terminal Cover for Back-connecting socket with Finger Protection | Y92A-48G  |

### Front cover

| Type             | Model    |
|------------------|----------|
| Hard Front Cover | Y92A-48B |
| Soft Front Cover | Y92A-48D |

### CX-Thermo Support Software

| Model       |
|-------------|
| EST2-2C-MV4 |

## Specifications

### Ratings

|                                       |  |  |   |
|---------------------------------------|--|--|---|
| <b>Power supply voltage</b>           |  | No D in model number: 100 to 240 VAC, 50/60 Hz<br>D in model number: 24 VAC, 50/60 Hz; 24 VDC  |   |
| <b>Operating voltage range</b>        |  | 85% to 110% of rated supply voltage  |   |
| <b>Power consumption</b>              | <b>E5CN</b>                                  | 100 to 240 VAC: 7.5 VA (max.) (E5CN-R2T at 100 VAC: 3.0 VA)<br>24 VAC/VDC: 5 VA/3 W (max.) (E5CN-R2TD at 24 VAC: 2.7 VA)   |   |
|                                       | <b>E5CN-U</b>                                | 100 to 240 VAC: 6 VA (max.)<br>24 VAC/VDC: 3 VA/2 W (max.) (models with current output: 4 VA/2 W)  |   |
| <b>Sensor input</b>                   |  | Models with temperature inputs<br>Thermocouple: K, J, T, E, L, U, N, R, S, B, W, or PL II<br>Platinum resistance thermometer: Pt100 or JPt100<br>Infrared temperature sensor: 10 to 70°C, 60 to 120°C, 115 to 165°C, or 140 to 260°C<br>Voltage input: 0 to 50 mV  |   |
|                                       |  | Models with analog inputs<br>Current input: 4 to 20 mA or 0 to 20 mA<br>Voltage input: 1 to 5 V, 0 to 5 V, or 0 to 10 V  |   |
| <b>Input impedance</b>                |  | Current input: 150 Ω max., Voltage input: 1 MΩ min. (Use a 1:1 connection when connecting the ES2-HB.)   |   |
| <b>Control method</b>                 |  | ON/OFF control or 2-PID control (with auto-tuning)   |   |
| <b>Control outputs</b>                | <b>Relay output</b>                          | <b>E5CN</b>  | SPST-NO, 250 VAC, 3 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 5 V, 10 mA  |
|                                       |  | <b>E5CN-U</b>  | SPDT, 250 VAC, 3 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 5 V, 10 mA   |
|                                       | <b>Voltage output (for driving SSR)</b>      | <b>E5CN</b><br><b>E5CN-U</b>   | Output voltage: 12 VDC ±15% (PNP), max. load current: 21 mA, with short-circuit protection circuit  |
|                                       | <b>Current output</b>                        | <b>E5CN</b>  | 4 to 20 mA DC/0 to 20 mA DC, load: 600 Ω max., resolution: approx. 10,000   |
|                                       | <b>Long-life relay output</b>                | <b>E5CN</b>  | SPST-NO, 250 VAC, 3 A (resistive load), electrical life: 1,000,000 operations, load power supply voltage: 75 to 250 VAC (DC loads cannot be connected.), minimum applicable load: 5 V, 10 mA, leakage current: 5 mA max. (250 VAC, 60 Hz) |
| <b>Auxiliary outputs</b>              | <b>Number of outputs</b>                     | 1 or 2 max. (Depends on the model.)  |   |
|                                       | <b>Output specifications</b>                 | Relay output: SPST-NO, 250 VAC, 3 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 5 V, 10 mA   |   |
| <b>Event inputs</b>                   | <b>Number of inputs</b>                      | 2  |   |
|                                       | <b>External contact input specifications</b> | Contact input: ON: 1 kΩ max., OFF: 100 kΩ min.   |   |
|                                       |  | Non-contact input: ON: Residual voltage: 1.5 V max., OFF: Leakage current: 0.1 mA max.<br>Current flow: Approx. 7 mA per contact   |   |
| <b>External power supply for ES1B</b> |  | 12 VDC ±10%, 20 mA, short-circuit protection circuit provided  |   |
| <b>Setting method</b>                 |  | Digital setting using front panel keys   |   |
| <b>Indication method</b>              |  | 11-segment digital display and individual indicators (7-segment display also possible)<br>Character height: PV: 11 mm, SV: 6.5 mm  |   |
| <b>Multi SP</b>                       |  | Up to four set points (SP0 to SP3) can be saved and selected using event inputs, key operations, or serial communications.   |   |
| <b>Bank switching</b>                 |  | Not supported  |   |
| <b>Other functions</b>                |  | Manual output, heating/cooling control, loop burnout alarm, SP ramp, other alarm functions, heater burnout detection (including SSR failure and heater overcurrent detection), 40% AT, 100% AT, MV limiter, input digital filter, self-tuning, temperature input shift, run/stop, protection functions, control output ON/OFF counter, extraction of square root, MV change rate limit, logic operations, PV/SV status display, simple program, automatic cooling coefficient adjustment |   |
| <b>Ambient operating temperature</b>  |  | -10 to 55°C (with no condensation or icing), for 3-year warranty: -10 to 50°C  |   |
| <b>Ambient operating humidity</b>     |  | 25% to 85%   |   |
| <b>Storage temperature</b>            |  | -25 to 65°C (with no condensation or icing)  |   |



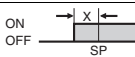

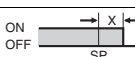
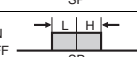
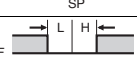
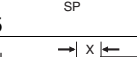
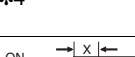
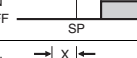
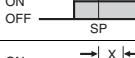
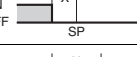
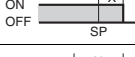
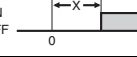

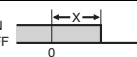
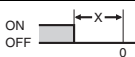
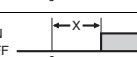



## Alarm Outputs

Each alarm can be independently set to one of the following 13 alarm types. The default is 2: *Upper limit*.

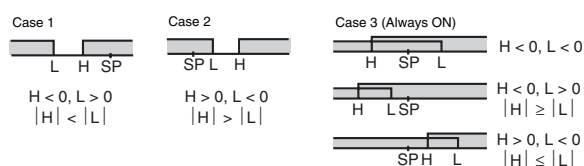
Auxiliary outputs are allocated for alarms. ON delays and OFF delays (0 to 999 s) can also be specified.

**Note:** For models with heater burnout, SSR failure, and heater overcurrent detection, alarm 1 will be an OR output of the alarm selected from the following alarm types and the alarms for heater burnout, SSR failure, and heater overcurrent. To output only a heater burnout alarm, SSR failure alarm, and heater overcurrent alarm for alarm 1, set the alarm type to 0 (i.e., no alarm function).

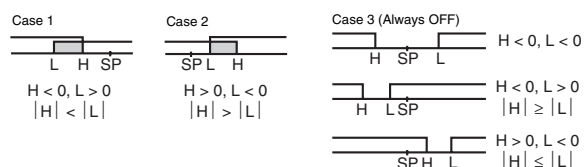
| Set value | Alarm type                                       | Alarm output operation   |  | Description of function  |
|-----------|--|--|--|--|
|           |  | When alarm value X is positive   | When alarm value X is negative   |  |
| 0         | Alarm function OFF                               | Output OFF   |  | No alarm   |
| 1 *1      | Upper- and lower-limit                           | ON OFF    | *2   | Set the deviation in the set point by setting the alarm upper limit (H) and alarm lower limit (L).           |
| 2         | Upper-limit                                      | ON OFF    | ON OFF    | Set the upward deviation in the set point by setting the alarm value (X).                                    |
| 3         | Lower-limit                                      | ON OFF    | ON OFF    | Set the downward deviation in the set point by setting the alarm value (X).                                  |
| 4 *1      | Upper- and lower-limit range                     | ON OFF    | *3   | Set the deviation in the set point by setting the alarm upper limit (H) and alarm lower limit (L).           |
| 5 *1      | Upper- and lower-limit with standby sequence     | ON OFF    | *4   | A standby sequence is added to the upper- and lower-limit alarm (1). *6                                      |
| 6         | Upper-limit with standby sequence                | ON OFF    | ON OFF    | A standby sequence is added to the upper-limit alarm (2). *6   |
| 7         | Lower-limit with standby sequence                | ON OFF    | ON OFF    | A standby sequence is added to the lower-limit alarm (3). *6   |
| 8         | Absolute-value upper-limit                       | ON OFF    | ON OFF    | The alarm will turn ON if the process value is larger than the alarm value (X) regardless of the set point.  |
| 9         | Absolute-value lower-limit                       | ON OFF   | ON OFF   | The alarm will turn ON if the process value is smaller than the alarm value (X) regardless of the set point. |
| 10        | Absolute-value upper-limit with standby sequence | ON OFF  | ON OFF  | A standby sequence is added to the absolute-value upper-limit alarm (8). *6                                  |
| 11        | Absolute-value lower-limit with standby sequence | ON OFF  | ON OFF  | A standby sequence is added to the absolute-value lower-limit alarm (9). *6                                  |
| 12        | LBA (alarm 1 type only)                          | ---  |  | *7   |
| 13        | PV change rate alarm                             | ---  |  | *8   |

\*1. With set values 1, 4 and 5, the upper and lower limit values can be set independently for each alarm type, and are expressed as "L" and "H."

\*2. Set value: 1, Upper- and lower-limit alarm



\*3. Set value: 4, Upper- and lower-limit range



\*4. Set value: 5, Upper- and lower-limit with standby sequence  
For Upper- and Lower-Limit Alarm Described Above

- Case 1 and 2  
Always OFF when the upper-limit and lower-limit hysteresis overlaps.
- Case 3: Always OFF

\*5. Set value: 5, Upper- and lower-limit with standby sequence  
Always OFF when the upper-limit and lower-limit hysteresis overlaps.

\*6. Refer to the *E5CN/E5AN/E5EN/E5GN Digital Temperature Controllers User's Manual Basic Type* (Cat. No. H156) for information on the operation of the standby sequence.

\*7. Refer to the *E5CN/E5AN/E5EN/E5GN Digital Temperature Controllers User's Manual Basic Type* (Cat. No. H156) for information on the loop burnout alarm (LBA).

\*8. Refer to the *E5CN/E5AN/E5EN/E5GN Digital Temperature Controllers User's Manual Basic Type* (Cat. No. H156) for information on the PV change rate alarm.



## Characteristics

|   |  |  |
|---|--|--|
| <b>Indication accuracy</b>                |  | Thermocouple: *1<br>Terminal block models (E5CN): ( $\pm 0.3\%$ of indicated value or $\pm 1^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max.<br>Plug-in models (E5CN-U): ( $\pm 1\%$ of indicated value or $\pm 2^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max.<br>Platinum resistance thermometer input:<br>Terminal block models (E5CN) and plug-in models (E5CN-U): ( $\pm 0.2\%$ of indicated value or $\pm 0.8^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max.<br>Analog input:<br>Terminal block models (E5CN) and plug-in models (E5CN-U): $\pm 0.2\%$ FS $\pm 1$ digit max.<br>CT input:<br>Terminal block models (E5CN): $\pm 5\%$ FS $\pm 1$ digit max.  |
| <b>Influence of temperature *2</b>        |  | Thermocouple input (R, S, B, W, PL II):<br>Terminal block models (E5CN): ( $\pm 1\%$ of PV or $\pm 10^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max.<br>Plug-in models (E5CN-U): ( $\pm 2\%$ of PV or $\pm 10^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max.<br>Other thermocouple input: *3<br>Terminal block models (E5CN): ( $\pm 1\%$ of PV or $\pm 4^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max.<br>Plug-in models (E5CN-U): ( $\pm 2\%$ of PV or $\pm 4^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max.<br>Platinum resistance thermometer input:<br>Terminal block models (E5CN) and plug-in models (E5CN-U):<br>( $\pm 1\%$ of PV or $\pm 2^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max.<br>Analog input:<br>Terminal block models (E5CN) and plug-in models (E5CN-U): ( $\pm 1\%$ FS) $\pm 1$ digit max. |
| <b>Influence of voltage *2</b>            |  |  |
| <b>Input sampling period</b>              |  | 250 ms   |
| <b>Hysteresis</b>                         |  | Models with thermocouple/platinum resistance thermometer input (universal input): 0.1 to 999.9 EU (in units of 0.1 EU) *4<br>Models with analog input: 0.01 to 99.99% FS (in units of 0.01% FS)  |
| <b>Proportional band (P)</b>              |  | Models with thermocouple/platinum resistance thermometer input (universal input): 0.1 to 999.9 EU (in units of 0.1 EU) *4<br>Models with analog input: 0.1 to 999.9% FS (in units of 0.1% FS)  |
| <b>Integral time (I)</b>                  |  | 0 to 3999 s (in units of 1 s)  |
| <b>Derivative time (D)</b>                |  | 0 to 3999 s (in units of 1 s) *5   |
| <b>Control period</b>                     |  | 0.5, 1 to 99 s (in units of 1 s)   |
| <b>Manual reset value</b>                 |  | 0.0 to 100.0% (in units of 0.1%)   |
| <b>Alarm setting range</b>                |  | -1999 to 9999 (decimal point position depends on input type)   |
| <b>Affect of signal source resistance</b> |  | Thermocouple: $0.1^\circ\text{C}/\Omega$ max. (100 $\Omega$ max.)<br>Platinum resistance thermometer: $0.1^\circ\text{C}/\Omega$ max. (10 $\Omega$ max.)   |
| <b>Insulation resistance</b>              |  | 20 M $\Omega$ min. (at 500 VDC)  |
| <b>Dielectric strength</b>                |  | 2,300 VAC, 50 or 60 Hz for 1 min (between terminals with different charge)   |
| <b>Vibration resistance</b>               | <b>Malfunction</b>   | 10 to 55 Hz, 20 m/s <sup>2</sup> for 10 min each in X, Y, and Z directions   |
|   | <b>Destruction</b>   | 10 to 55 Hz, 0.75-mm single amplitude for 2 hrs each in X, Y, and Z directions   |
| <b>Shock resistance</b>                   | <b>Malfunction</b>   | 100 m/s <sup>2</sup> , 3 times each in X, Y, and Z directions  |
|   | <b>Destruction</b>   | 300 m/s <sup>2</sup> , 3 times each in X, Y, and Z directions  |
| <b>Weight</b>                             | <b>E5CN</b>  | Controller: Approx. 150 g, Mounting Bracket: Approx. 10 g  |
|   | <b>E5CN-U</b>  | Controller: Approx. 110 g, Mounting Bracket: Approx. 10 g  |
| <b>Degree of protection</b>               | <b>E5CN</b>  | Front panel: IP66, Rear case: IP20, Terminals: IP00  |
|   | <b>E5CN-U</b>  | Front panel: IP50, Rear case: IP20, Terminals: IP00  |
| <b>Memory protection</b>                  |  | Non-volatile memory (number of writes: 1,000,000 times)  |
| <b>Setup Tool</b>                         |  | CX-Thermo version 4.0 or higher  |
| <b>Setup Tool port</b>                    |  | Provided on the bottom of the E5CN. Use this port to connect a computer to the E5CN when using the Setup Tool. An E58-CIFQ1 USB-Serial Conversion Cable is required to connect the computer to the E5CN. *6  |
| <b>Standards</b>                          | <b>Approved standards *7</b>   | UL 61010-1, CSA C22.2 No. 1010-1, KOSHA certified (some models) *8   |
|   | <b>Conformed standards</b>   | EN 61010-1 (IEC 61010-1): Pollution level 2, overcurrent category II, Lloyd's standards *9   |
| <b>EMC</b>                                | EMI:<br>Radiated Interference Electromagnetic Field Strength: EN 55011 Group 1, class A<br>Noise Terminal Voltage: EN 55011 Group 1, class A<br>EMS: EN 61326<br>ESD Immunity: EN 61000-4-2<br>Electromagnetic Field Immunity: EN 61000-4-3<br>Burst Noise Immunity: EN 61000-4-4<br>Conducted Disturbance Immunity: EN 61000-4-6<br>Surge Immunity: EN 61000-4-5<br>Power Frequency Magnetic Field Immunity: EN 61000-4-8<br>Voltage Dip/Interrupting Immunity: EN 61000-4-11 |  |

\*1. The indication accuracy of K thermocouples in the  $-200$  to  $1300^\circ\text{C}$  range, T and N thermocouples at a temperature of  $-100^\circ\text{C}$  max., and U and L thermocouples at any temperatures is  $\pm 2^\circ\text{C} \pm 1$  digit max. The indication accuracy of the B thermocouple at a temperature of  $400^\circ\text{C}$  max. is not specified. The indication accuracy of B thermocouples in the  $400$  to  $800^\circ\text{C}$  range is  $\pm 3^\circ\text{C}$  max. The indication accuracy of the R and S thermocouples at a temperature of  $200^\circ\text{C}$  max. is  $\pm 3^\circ\text{C} \pm 1$  digit max. The indication accuracy of W thermocouples is  $\pm 0.3$  of PV or  $\pm 3^\circ\text{C}$ , whichever is greater,  $\pm 1$  digit max. The indication accuracy of PL II thermocouples is  $\pm 0.3$  of PV or  $\pm 2^\circ\text{C}$ , whichever is greater,  $\pm 1$  digit max.

\*2. Ambient temperature:  $-10^\circ\text{C}$  to  $23^\circ\text{C}$  to  $55^\circ\text{C}$ , Voltage range:  $-15\%$  to  $10\%$  of rated voltage

\*3. K thermocouple at  $-100^\circ\text{C}$  max.:  $\pm 10^\circ$  max.

\*4. "EU" stands for Engineering Unit and is used as the unit after scaling. For a temperature sensor, the EU is  $^\circ\text{C}$  or  $^\circ\text{F}$ .

\*5. When robust tuning (RT) is ON, the differential time is 0.0 to 999.9 (in units of 0.1 s).

\*6. External communications (RS-485) and cable communications for the Setup Tool can be used at the same time.

\*7. The E5CN-U plug-in model is certified for UL listing only when used together with the OMRON P2CF-11 or P2CF-11-E Socket. The P3GA-11 is not certified for UL listing.

\*8. Access the following website for information on certified models. <http://www.ia.omron.com/support/models/index.html>

\*9. Refer to information on maritime standards in *Safety Precautions for E5□N/E5□N-H* for compliance with Lloyd's Standards.

## USB-Serial Conversion Cable

|                                      |   |
|--------------------------------------|---|
| <b>Applicable OS</b>                 | Windows 2000, XP, or Vista  |
| <b>Applicable software</b>           | CX-Thermo version 4 or higher   |
| <b>Applicable models</b>             | E5AN/E5EN/E5CN/E5CN-U/E5AN-H/<br>E5EN-H/E5CN-H/E5GN   |
| <b>USB interface standard</b>        | Conforms to USB Specification 1.1.  |
| <b>DTE speed</b>                     | 38400 bps   |
| <b>Connector specifications</b>      | Computer: USB (type A plug)<br>Temperature Controller: Setup Tool port<br>(on bottom of Controller) |
| <b>Power supply</b>                  | Bus power (Supplied from USB host controller.)  |
| <b>Power supply voltage</b>          | 5 VDC   |
| <b>Current consumption</b>           | 70 mA   |
| <b>Ambient operating temperature</b> | 0 to 55°C (with no condensation or icing)   |
| <b>Ambient operating humidity</b>    | 10% to 80%  |
| <b>Storage temperature</b>           | -20 to 60°C (with no condensation or icing)   |
| <b>Storage humidity</b>              | 10% to 80%  |
| <b>Altitude</b>                      | 2,000 m max.  |
| <b>Weight</b>                        | Approx. 100 g   |

**Note:** A driver must be installed in the personal computer. Refer to installation information in the operation manual for the Conversion Cable.

## Communications Specifications

|  |  |
|--|--|
| <b>Transmission line connection method</b> | RS-485: Multipoint   |
| <b>Communications</b>                      | RS-485 (two-wire, half duplex)   |
| <b>Synchronization method</b>              | Start-stop synchronization   |
| <b>Protocol</b>                            | CompoWay/F, SYSWAY, or Modbus  |
| <b>Baud rate</b>                           | 1200, 2400, 4800, 9600, 19200, 38400, or 57600 bps   |
| <b>Transmission code</b>                   | ASCII  |
| <b>Data bit length *</b>                   | 7 or 8 bits  |
| <b>Stop bit length *</b>                   | 1 or 2 bits  |
| <b>Error detection</b>                     | Vertical parity (none, even, odd)<br>Frame check sequence (FCS) with SYSWAY<br>Block check character (BCC) with<br>CompoWay/F or CRC-16 Modbus |
| <b>Flow control</b>                        | None   |
| <b>Interface</b>                           | RS-485   |
| <b>Retry function</b>                      | None   |
| <b>Communications buffer</b>               | 217 bytes  |
| <b>Communications response wait time</b>   | 0 to 99 ms<br>Default: 20 ms   |

\* The baud rate, data bit length, stop bit length, and vertical parity can be individually set using the Communications Setting Level.

## Current Transformer (Order Separately) Ratings

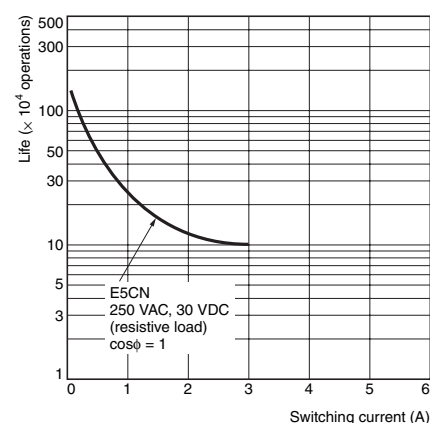
|                                   |   |
|-----------------------------------|---|
| <b>Dielectric strength</b>        | 1,000 VAC for 1 min                               |
| <b>Vibration resistance</b>       | 50 Hz, 98 m/s <sup>2</sup>                        |
| <b>Weight</b>                     | E54-CT1: Approx. 11.5 g,<br>E54-CT3: Approx. 50 g |
| <b>Accessories (E54-CT3 only)</b> | Armatures (2)<br>Plugs (2)                        |

## Heater Burnout Alarms, SSR Failure Alarms, and Heater Overcurrent Alarms

|  |  |
|--|--|
| <b>CT input (for heater current detection)</b>   | Models with detection for single-phase heaters: One input<br>Models with detection for single-phase or three-phase heaters: Two inputs |
| <b>Maximum heater current</b>                    | 50 A AC  |
| <b>Input current indication accuracy</b>         | ±5% FS ±1 digit max.   |
| <b>Heater burnout alarm setting range *1</b>     | 0.1 to 49.9 A (in units of 0.1 A)<br>Minimum detection ON time: 100 ms   |
| <b>SSR failure alarm setting range *2</b>        | 0.1 to 49.9 A (in units of 0.1 A)<br>Minimum detection OFF time: 100 ms  |
| <b>Heater overcurrent alarm setting range *3</b> | 0.1 to 49.9 A (in units of 0.1 A)<br>Minimum detection ON time: 100 ms   |

- \*1. For heater burnout alarms, the heater current will be measured when the control output is ON, and the output assigned to the alarm 1 function will turn ON if the heater current is lower than the set value (i.e., heater burnout detection current value).
- \*2. For SSR failure alarms, the heater current will be measured when the control output is OFF, and the output assigned to the alarm 1 function will turn ON if the heater current is higher than the set value (i.e., SSR failure detection current value).
- \*3. For heater overcurrent alarms, the heater current will be measured when the control output is ON, and the output assigned to the alarm 1 function will turn ON if the heater current is higher than the set value (i.e., heater overcurrent detection current value).

## Electrical Life Expectancy Curve for Relays (Reference Values)



**Note:** Do not connect a DC load to a Controller with a Long-life Relay Output.

# External Connections

- A voltage output (control output, for driving SSR) is not electrically insulated from the internal circuits. When using a grounding thermocouple, do not connect any of the control output terminals to ground. (If the control output terminals are connected to ground, errors will occur in the measured temperature values as a result of leakage current.)
- Consult with your OMRON representative before using the external power supply for the ES1B for any other purpose.

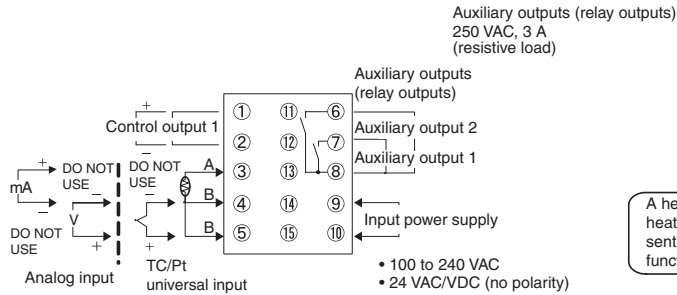
## E5CN

### Controllers

**Control output 1**  
 Long-life relay output  
 250 VAC, 3 A (resistive load)  
 Relay output  
 250 VAC, 3 A (resistive load)  
 Voltage output (for driving SSR)  
 12 VDC, 21 mA  
 Current output  
 0 to 20 mA DC  
 4 to 20 mA DC  
 Load: 600 Ω max.

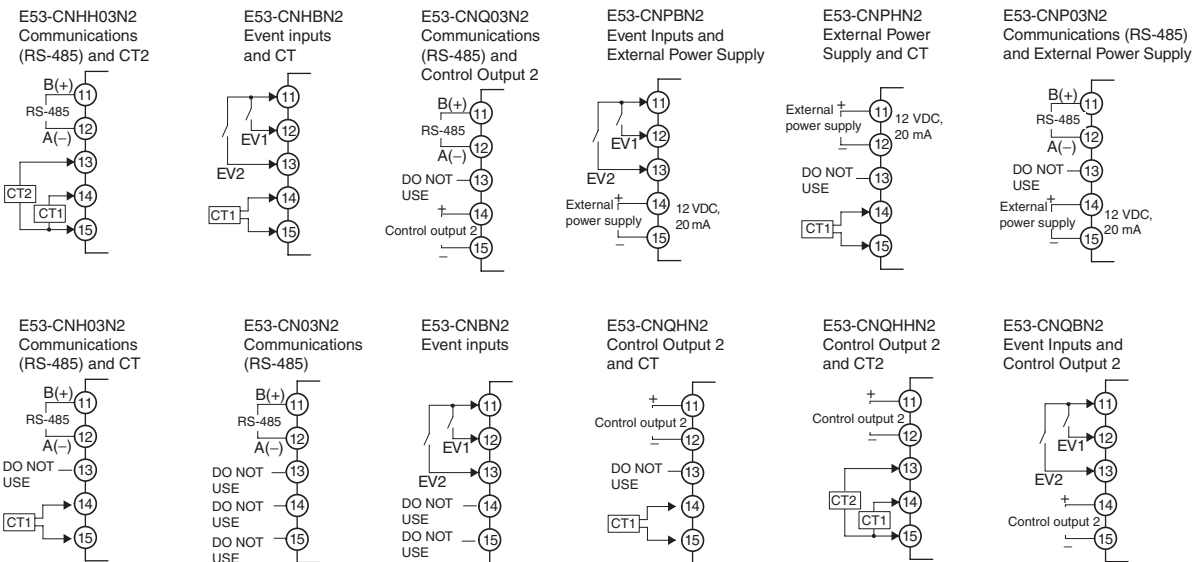
The E5CN-□□□□□□ is set for a K-type thermocouple (input type = 5) by default. An input error (5.ERR) will occur if the input type setting does not agree with the temperature sensor. Check the input type.

**Control output 2**  
 Voltage output (for driving SSR)  
 12 VDC, 21 mA



A heater burnout alarm, heater short alarm, heater overcurrent alarm, or input alarm is sent to the output to which the alarm 1 function is assigned.

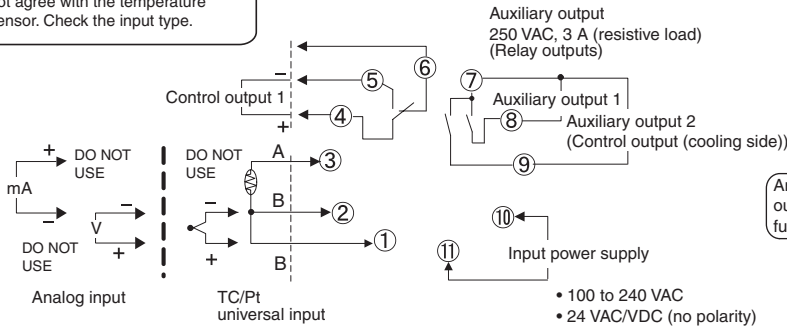
### Option Units



## E5CN-U

The E5CN-□□□□□□ is set for a K-type thermocouple (input type = 5) by default. An input error (5.ERR) will occur if the input type setting does not agree with the temperature sensor. Check the input type.

**Control output 1**  
 Relay output (three terminals used)  
 SPDT, 250 VAC, 3 A (resistive load)  
 Voltage output (for driving SSR)  
 12 VDC, 21 mA  
 Current output  
 4 to 20 mA DC  
 0 to 20 mA DC  
 Load: 600 W max.



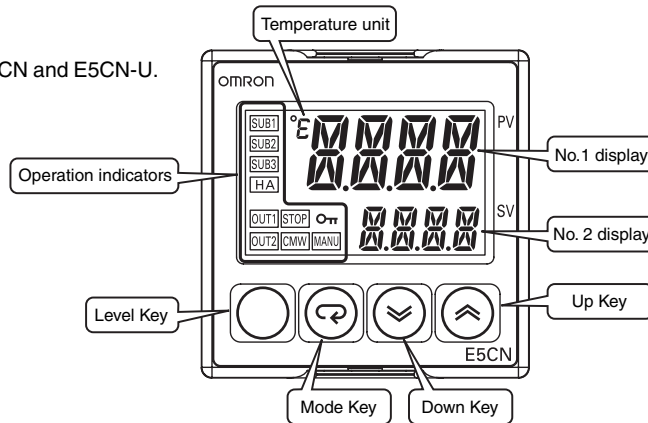
An input error is sent to the output to which the alarm 1 function is assigned.

**Note:** For the Wiring Socket, purchase the P2CF-11 or PG3A-11 separately.

# Nomenclature

## E5CN E5CN-U

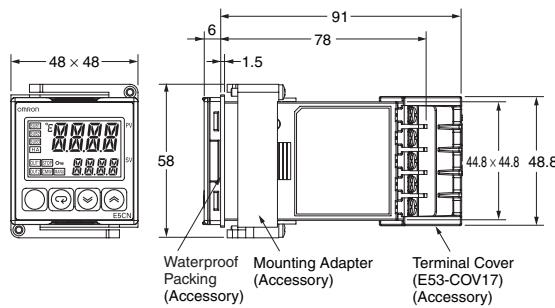
The front panel is the same for the E5CN and E5CN-U.



# Dimensions

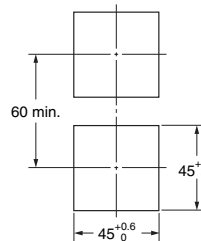
(Unit: mm)

## E5CN Terminal Models



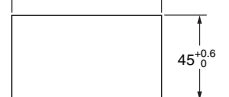
### Panel Cutout

Mounted Separately



Group Mounted

$$(48 \times \text{number of units} - 2.5)^{+1.0}_0$$

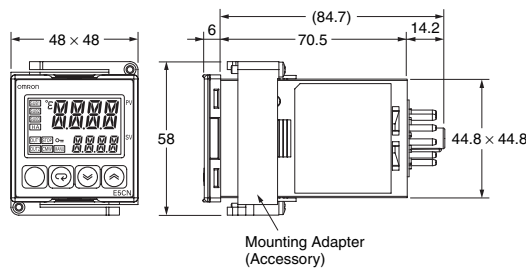


Group mounting does not allow waterproofing.

- Recommended panel thickness is 1 to 5 mm.
- Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers.)
- To mount the Controller so that it is waterproof, insert the waterproof packing onto the Controller.
- When two or more Controllers are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature specified in the specifications.

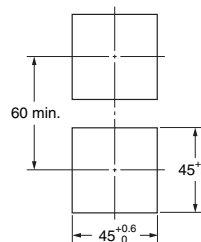
**Note:** The terminal block cannot be removed.

## E5CN-U Plug-in Models



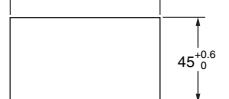
### Panel Cutout

Mounted Separately



Group Mounted

$$(48 \times \text{number of units} - 2.5)^{+1.0}_0$$

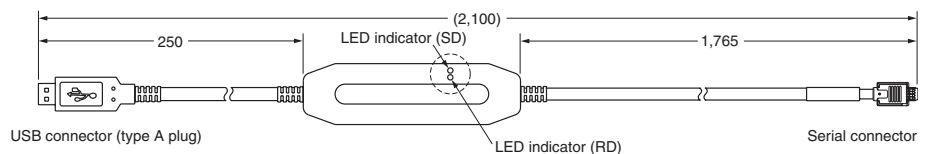
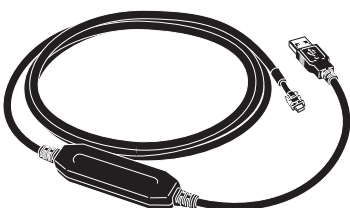


- Recommended panel thickness is 1 to 5 mm.
- Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers.)
- When two or more Controllers are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature specified in the specifications.

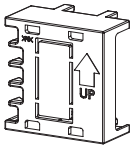
# Accessories (Order Separately)

## USB-Serial Conversion Cable

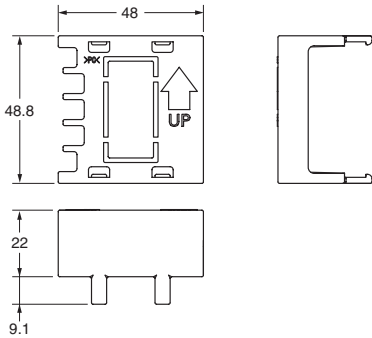
### E58-CIFQ1



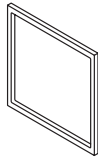
**Terminal Cover**  
E53-COV17



**Note:** The E53-COV10 cannot be used.



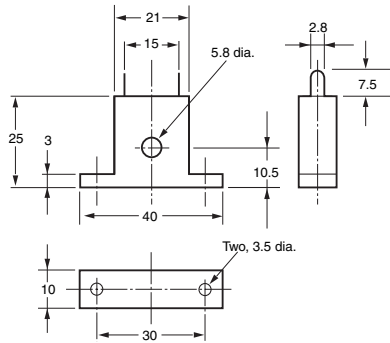
**Waterproof Packing**  
Y92S-29 (for DIN 48 × 48)



Order the Waterproof Packing separately if it becomes lost or damaged.  
The Waterproof Packing can be used to achieve an IP66 degree of protection.  
(Deterioration, shrinking, or hardening of the waterproof packing may occur depending on the operating environment. Therefore, periodic replacement is recommended to ensure the level of waterproofing specified in IP66. The time for periodic replacement depends on the operating environment. Be sure to confirm this point at your site. Consider one year a rough standard. OMRON shall not be liable for the level of water resistance if the customer does not perform periodic replacement.)  
The Waterproof Packing does not need to be attached if a waterproof structure is not required.

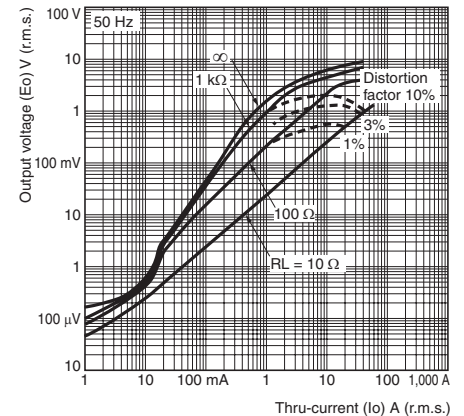
**Current Transformers**

**E54-CT1**

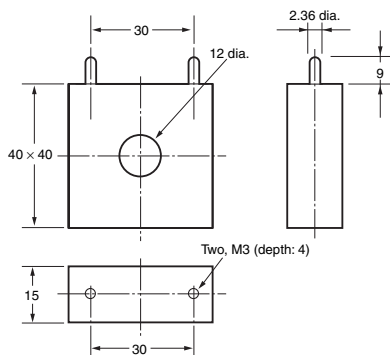


**E54-CT1**  
**Thru-current (Io) vs. Output Voltage (Eo) (Reference Values)**

Maximum continuous heater current: 50 A (50/60 Hz)  
Number of windings: 400±2  
Winding resistance: 18±2 Ω

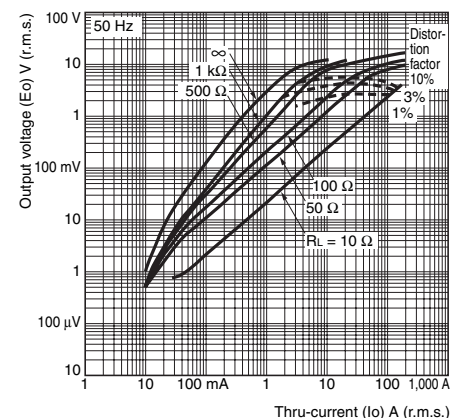


**E54-CT3**



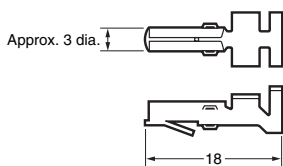
**E54-CT3**  
**Thru-current (Io) vs. Output Voltage (Eo) (Reference Values)**

Maximum continuous heater current: 120 A (50/60 Hz)  
(Maximum continuous heater current for the Temperature Controller is 50 A.)  
Number of windings: 400±2  
Winding resistance: 8±0.8 Ω

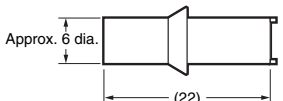


**E54-CT3 Accessory**

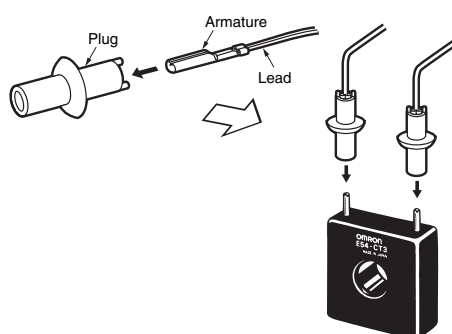
• Armature



• Plug

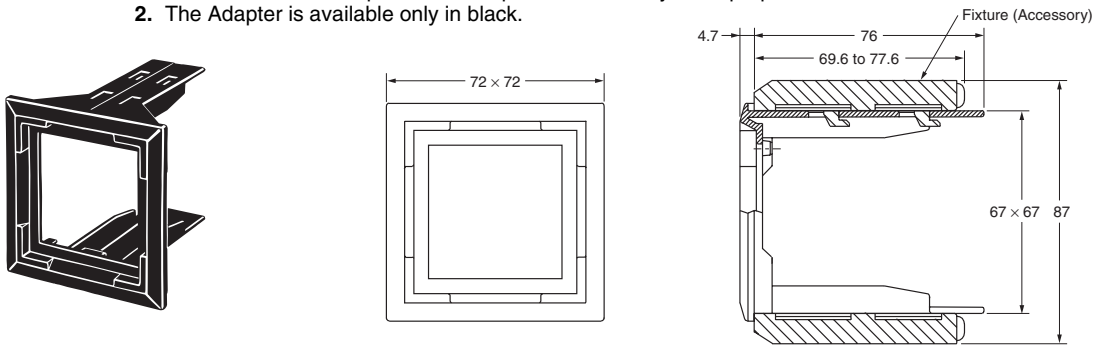


**Connection Example**

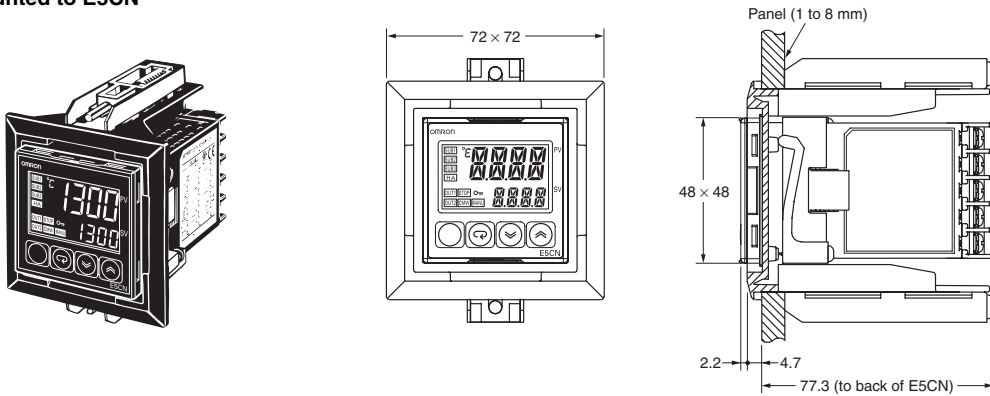


**Adapter**

**Y92F-45** Note: 1. Use this Adapter when the panel has already been prepared for the E5B□.  
 2. The Adapter is available only in black.

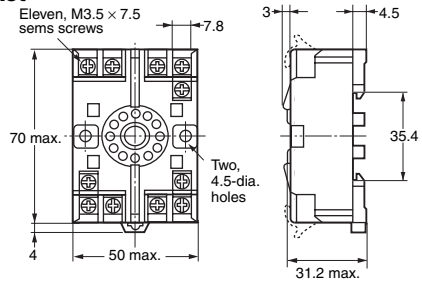
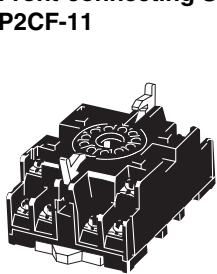


**Mounted to E5CN**

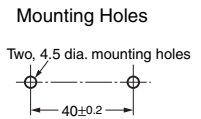
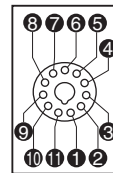


**E5CN-U Wiring Socket**

**Front-connecting Socket  
P2CF-11**



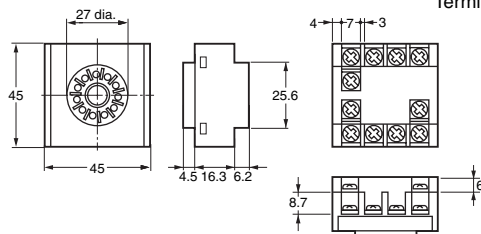
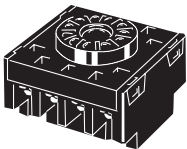
**Terminal Layout/Internal Connections  
(Top View)**



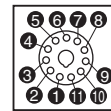
**Note:** Can also be mounted to a DIN track.

**Note:** A model with finger protection (P2CF-11-E) is also available.

**Back-connecting Socket  
P3GA-11**



**Terminal Layout/Internal Connections  
(Bottom View)**



**Note:** 1. Using any other sockets will adversely affect accuracy. Use only the specified sockets.  
 2. A Protective Cover for finger protection (Y92A-48G) is also available.

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- Systems, machines, and equipment that could present a risk to life or property.

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2011.1

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