

# Basic-type Digital Temperature Controller

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

CSM\_E5CN\_E5CN-U\_DS\_E\_3\_1

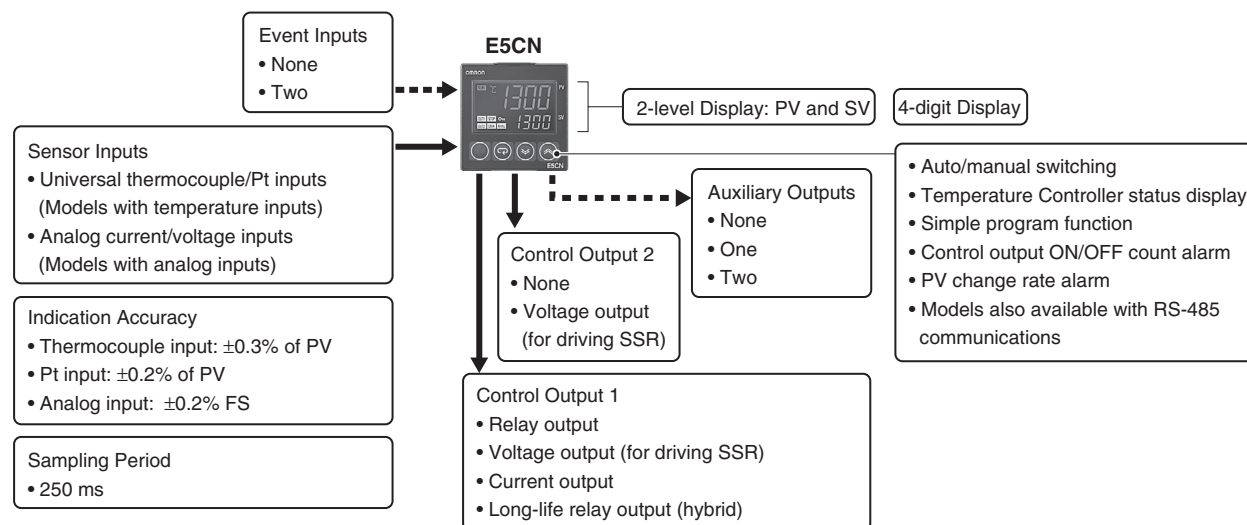
## New 48 x 48-mm Basic Temperature Controller with Enhanced Functions and Performance. Improved Indication Accuracy and Preventive Maintenance Function.



- 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*.

## Main I/O Functions

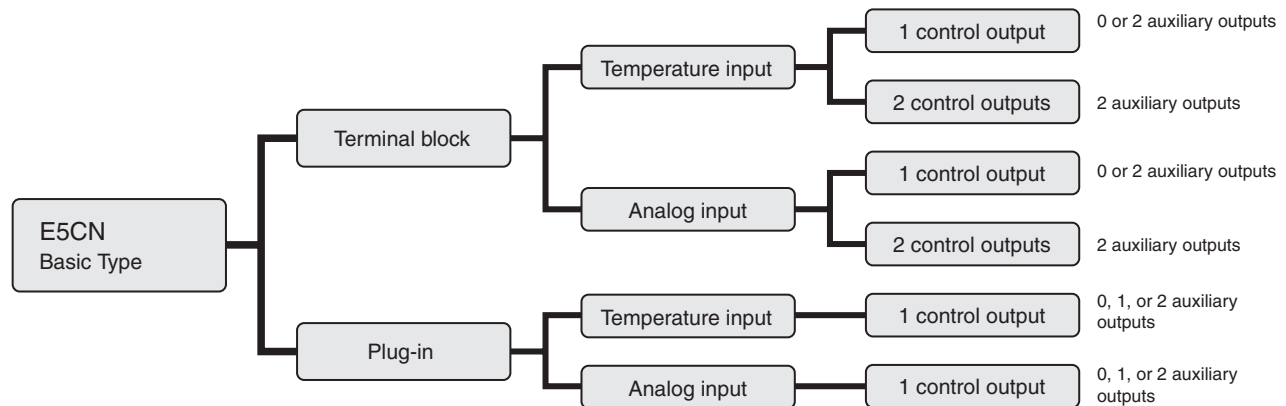


This data sheet is provided as a guideline for selecting products. Be sure to refer to the following user manuals for application precautions and other information required for operation before attempting to use the product.

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

E5CN/E5AN/E5EN 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:** Not all combinations of function 1 and function 2 specifications are possible for Option Units (E53-        ).

\*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 48 × 48 × 78 (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	
				Long-life relay output (hybrid)	E5CN-Y2ML-500	
				Relay output	E5CN-R2MLD-500	
	24 VAC/VDC	Analog (current/voltage)	2	Voltage output (for driving SSR)	E5CN-Q2MLD-500	
				Current output	E5CN-C2MLD-500	
	Silver	100 to 240 VAC	Thermocouple or Resistance thermometer	None	Relay output	E5CN-RMT-W-500
					Voltage output (for driving SSR)	E5CN-QMT-W-500
Current output					E5CN-CMT-W-500	
2				Relay output	E5CN-R2MT-W-500	
				Voltage output (for driving SSR)	E5CN-Q2MT-W-500	
				Current output	E5CN-C2MT-W-500	
24 VAC/VDC		Thermocouple or Resistance thermometer	2	Long-life relay output (hybrid)	E5CN-Y2MT-W-500	
				Relay output	E5CN-R2MTD-W-500	
				Voltage output (for driving SSR)	E5CN-Q2MTD-W-500	
			2	Current output	E5CN-C2MTD-W-500	
				Relay output	E5CN-R2MTD-W-500	
				Voltage output (for driving SSR)	E5CN-Q2MTD-W-500	
Current output	E5CN-C2MTD-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
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-CNPB2
	Heater burnout/SSR failure/Heater overcurrent detection			External power supply for ES1B	E53-CNPH2
Communications RS-485				External power supply for ES1B	E53-CNP03N2
Communications RS-485	Heater burnout/SSR failure/Heater overcurrent detection				E53-CNHH03N2
Communications RS-485					E53-CN03N2
		Event inputs			E53-CNBN2
	Heater burnout/SSR failure/Heater overcurrent detection		Control output 2 (Voltage for driving SSR)		E53-CNQH2
	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:** Option Units cannot be used for plug-in models.

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

## 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 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) 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.) 24 VAC/VDC: 3 VA/2 W (max.) (models with current output: 4 VA/2 W)	
<b>Sensor input</b>		Models with temperature inputs Thermocouple: K, J, T, E, L, U, N, R, S, B, W, or PL II Platinum resistance thermometer: Pt100 or JPt100 Infrared temperature sensor: 10 to 70°C, 60 to 120°C, 115 to 165°C, or 140 to 260°C Voltage input: 0 to 50 mV	
		Models with analog inputs Current input: 4 to 20 mA or 0 to 20 mA 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>	E5CN	SPST-NO, 250 VAC, 3 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 5 V, 10 mA
		E5CN-U	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>	E5CN E5CN-U	Output voltage: 12 VDC ±15% (PNP), max. load current: 21 mA, with short-circuit protection circuit
	<b>Current output</b>	E5CN	4 to 20 mA DC/0 to 20 mA DC, load: 600 Ω max., resolution: approx. 10,000
	<b>Long-life relay output</b>	E5CN	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. 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) 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, 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)	

## Input Ranges

### Thermocouple/Platinum Resistance Thermometer (Universal Inputs)

Input Type	Platinum resistance thermometer		Thermocouple													Infrared temperature sensor				Analog input				
	Pt100	JPt100	K	J	T	E	L	U	N	R	S	B	W	PL II	10 to 70 °C	60 to 120 °C	115 to 165 °C	140 to 260 °C	0 to 50 mV					
Temperature range (°C)																								
	Setting number	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

Usable in the following ranges by scaling:  
 -1999 to 9999 or  
 -199.9 to 999.9

Shaded settings are the default settings.

The applicable standards for the input types are as follows:

K, J, T, E, N, R, S, B: JIS C 1602-1995, IEC 584-1

L: Fe-CuNi, DIN 43710-1985

U: Cu-CuNi, DIN 43710-1985

W: W5Re/W26Re, ASTM E988-1990

JPt100: JIS C 1604-1989, JIS C 1606-1989

Pt100: JIS C 1604-1997, IEC 751

PL II: According to Platinel II electromotive force charts from BASF (previously Engelhard)

### Models with Analog Inputs

Input Type	Current		Voltage	
Input specification	4 to 20mA	0 to 20 mA	1 to 5 V	0 to 10 V
Setting range	Usable in the following ranges by scaling: -1999 to 9999, -199.9 to 999.9, -19.99 to 99.99 or -1.999 to 9.999			
Setting number	0	1	2	3

Shaded settings are the default settings.

## Alarm Outputs

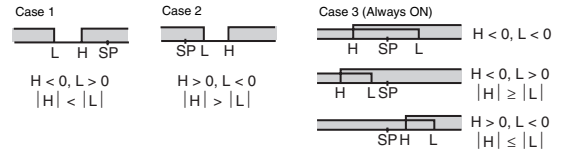
Each alarm can be independently set to one of the following 13 alarm types. The default is 2: *Upper limit*. Auxiliary outputs are allocated for alarms. ON delays and OFF delays (0 to 999 s) can also be specified.

**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).

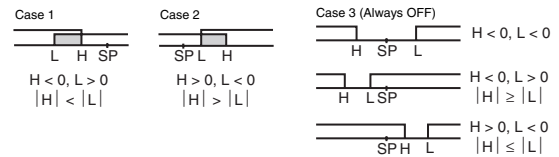
Set value	Alarm type	Alarm output operation	
		When X is positive	When X is negative
0	Alarm function OFF	Output OFF	
1 *1	Upper- and lower-limit		*2
2	Upper limit		
3	Lower limit		
4 *1	Upper- and lower-limit range		*3
5 *1	Upper- and lower-limit with standby sequence		*4
6	Upper-limit with standby sequence		
7	Lower-limit with standby sequence		
8	Absolute-value upper-limit		
9	Absolute-value lower-limit		
10	Absolute-value upper-limit with standby sequence		
11	Absolute-value lower-limit with standby sequence		
12	LBA (for alarm 1 only)	---	
13	PV change rate alarm	---	

\*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.



## Characteristics

<b>Indication accuracy</b>		Thermocouple: *1 Terminal block models (E5CN): ( $\pm 0.3\%$ of indicated value or $\pm 1^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max. Plug-in models (E5CN-U): ( $\pm 1\%$ of indicated value or $\pm 2^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max. Platinum resistance thermometer input: 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. Analog input: Terminal block models (E5CN) and plug-in models (E5CN-U): $\pm 0.2\%$ FS $\pm 1$ digit max. CT input: 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): Terminal block models (E5CN): ( $\pm 1\%$ of PV or $\pm 10^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max. Plug-in models (E5CN-U): ( $\pm 2\%$ of PV or $\pm 10^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max. Other thermocouple input: *3 Terminal block models (E5CN): ( $\pm 1\%$ of PV or $\pm 4^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max. Plug-in models (E5CN-U): ( $\pm 2\%$ of PV or $\pm 4^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max.
<b>Influence of voltage *2</b>		Platinum resistance thermometer input: Terminal block models (E5CN) and plug-in models (E5CN-U): ( $\pm 1\%$ of PV or $\pm 2^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max. Analog input: Terminal block models (E5CN) and plug-in models (E5CN-U): ( $\pm 1\%$ FS) $\pm 1$ digit max.
<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 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 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.) 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
	<b>Conformed standards</b>	EN 61010-1 (IEC 61010-1): Pollution level 2, overcurrent category II
<b>EMC</b>		EMI: Radiated Interference Electromagnetic Field Strength: EN 55011 Group 1, class A Noise Terminal Voltage: EN 55011 Group 1, class A EMS: ESD Immunity: EN 61000-4-2 Electromagnetic Field Immunity: EN 61000-4-3 Burst Noise Immunity: EN 61000-4-4 Conducted Disturbance Immunity: EN 61000-4-6 Surge Immunity: EN 61000-4-5 Power Frequency Magnetic Field Immunity: EN 61000-4-8 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.

## USB-Serial Conversion Cable

Applicable OS	Windows 2000, XP, or Vista
Applicable software	CX-Thermo version 4.0 or higher
Applicable models	E5AN/E5EN/E5CN/E5CN-U/E5AN-H/ E5EN-H/E5CN-H
USB interface standard	Conforms to USB Specification 1.1.
DTE speed	38400 bps
Connector specifications	Computer: USB (type A plug) Temperature Controller: Setup Tool port (on bottom of Controller)
Power supply	Bus power (Supplied from USB host controller.)
Power supply voltage	5 VDC
Current consumption	70 mA
Ambient operating temperature	0 to 55°C (with no condensation or icing)
Ambient operating humidity	10% to 80%
Storage temperature	-20 to 60°C (with no condensation or icing)
Storage humidity	10% to 80%
Altitude	2,000 m max.
Weight	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

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

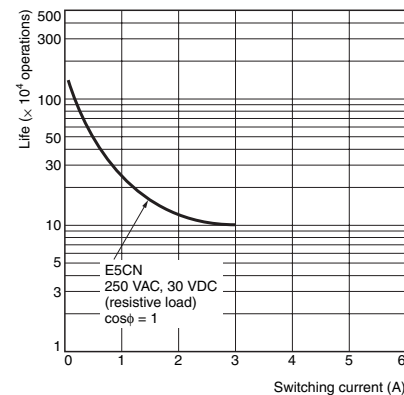
Dielectric strength	1,000 VAC for 1 min
Vibration resistance	50 Hz, 98 m/s <sup>2</sup>
Weight	E54-CT1: Approx. 11.5 g, E54-CT3: Approx. 50 g
Accessories (E54-CT3 only)	Armatures (2) Plugs (2)

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

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

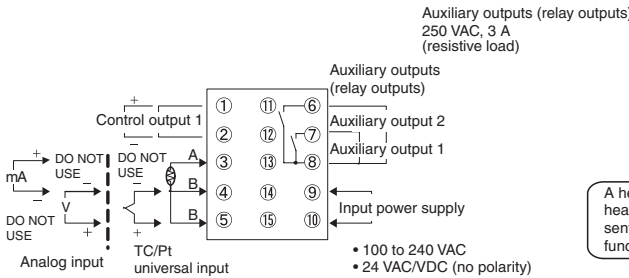
## E5CN

### 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.

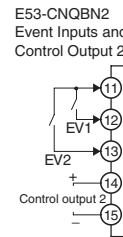
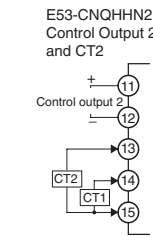
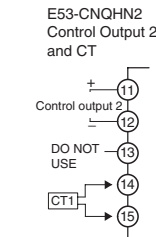
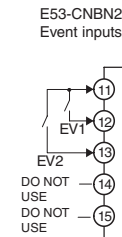
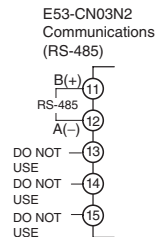
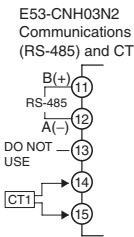
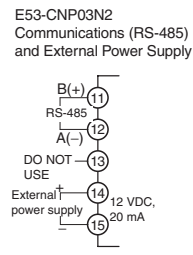
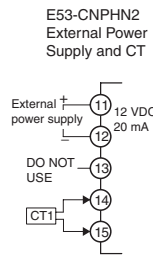
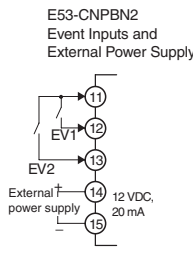
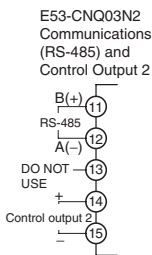
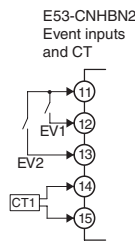
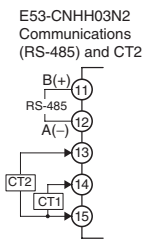
The E5□N-□□□□□ is set for a K-type thermocouple (input type = 5) by default. An input error (S.ERR) will occur if the input type setting does not agree with the temperature sensor. Check the input type.

**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.

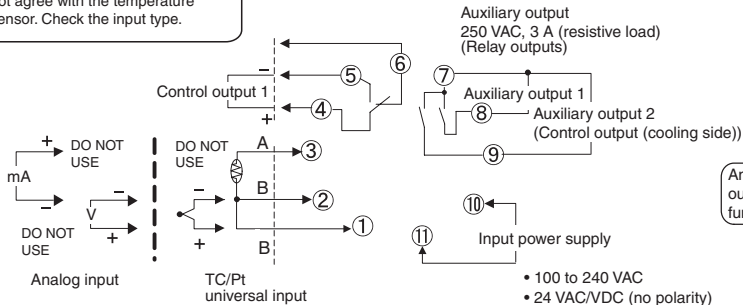
### Option Units



## E5CN-U

The E5□N-□□□□□ is set for a K-type thermocouple (input type = 5) by default. An input error (S.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.



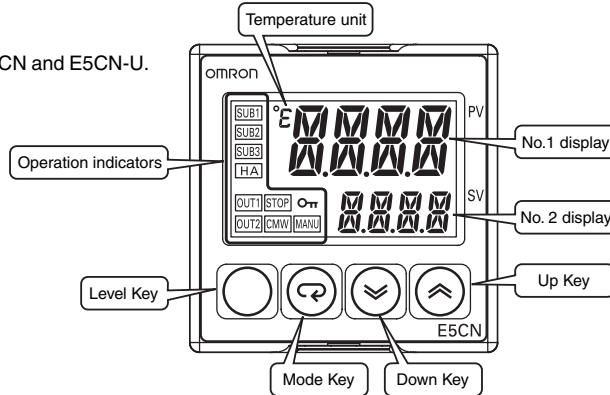
An input error is sent to the output to which the alarm 1 function is assigned.

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

# Nomenclature

## E5CN E5CN-U

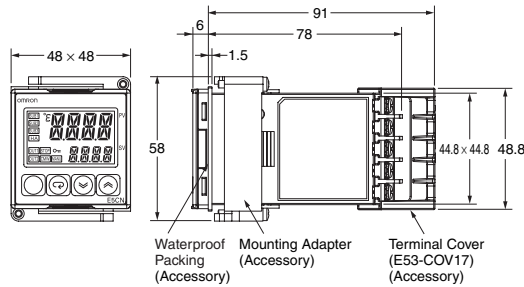
The front panel is the same for the E5CN and E5CN-U.



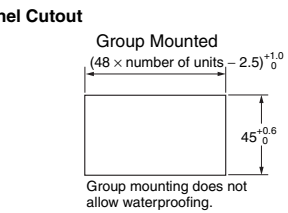
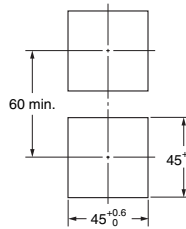
# Dimensions

(Unit: mm)

## E5CN Terminal Models



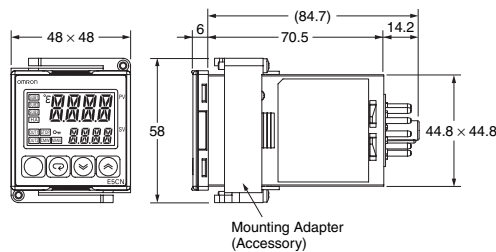
### Panel Cutout



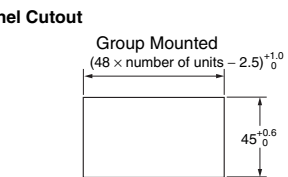
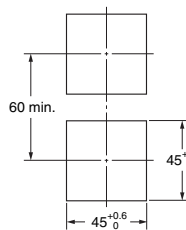
- Recommended panel thickness is 1 to 5 mm.
- Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers.)
- To mount the Controller so that it is waterproof, insert the waterproof packing onto the Controller.
- When two or more Controllers are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

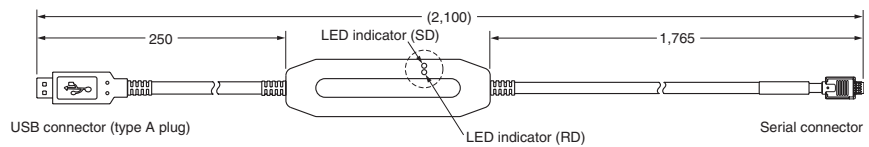
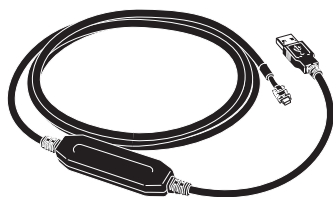


- Recommended panel thickness is 1 to 5 mm.
- Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers.)
- When two or more Controllers are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature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

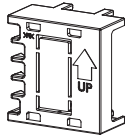
# Accessories (Order Separately)

## USB-Serial Conversion Cable

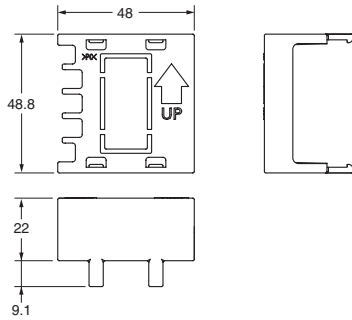
### E58-C1FQ1



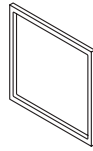
**Terminal Cover**  
E53-COV17



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



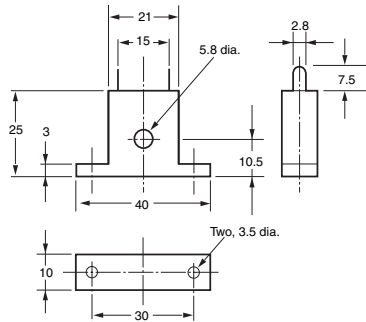
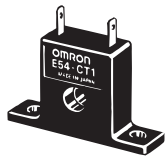
**Waterproof Packing**  
Y92S-29 (for DIN 48 × 48)



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.

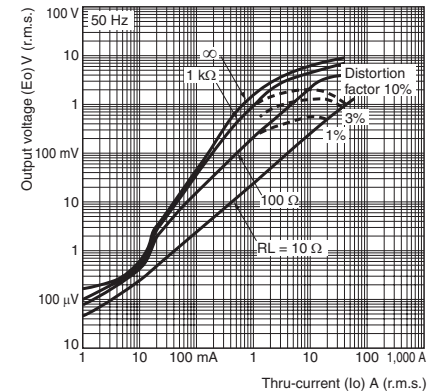
**Current Transformers**

**E54-CT1**

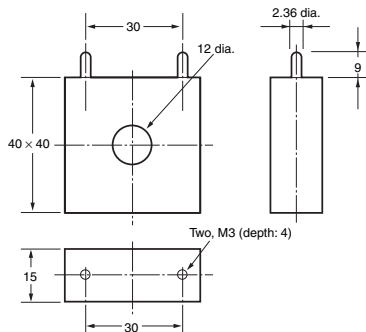


**E54-CT1**  
**Thru-current (Io) vs. Output Voltage (Eo) (Reference Values)**

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

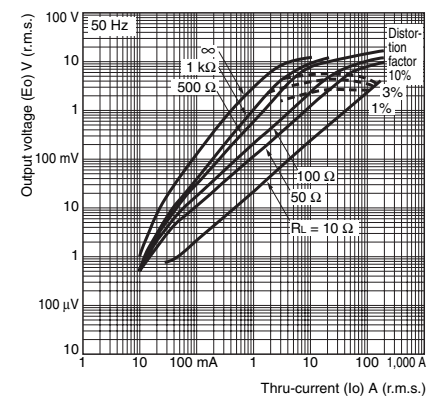


**E54-CT3**



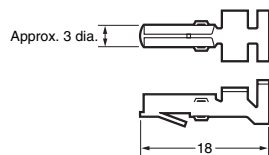
**E54-CT3**  
**Thru-current (Io) vs. Output Voltage (Eo) (Reference Values)**

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

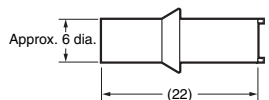


**E54-CT3 Accessory**

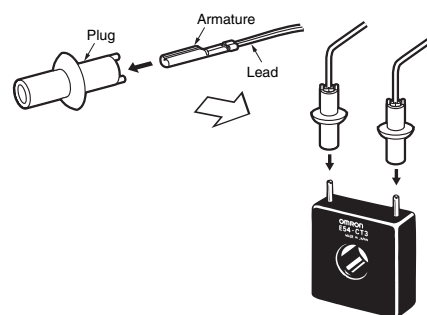
• **Armature**



• **Plug**

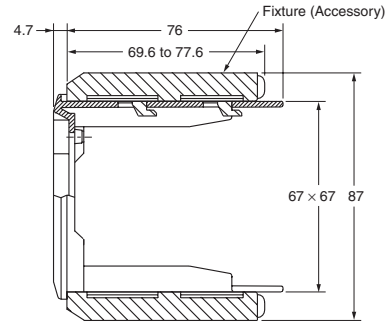
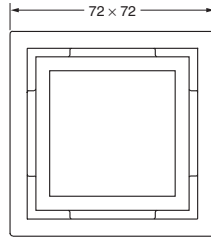
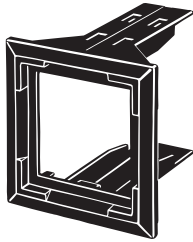


**Connection Example**

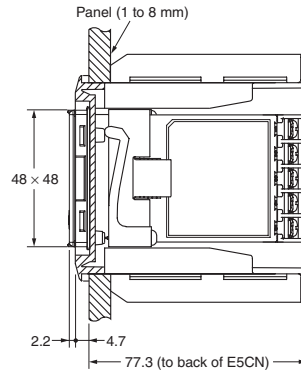
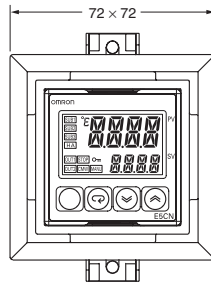
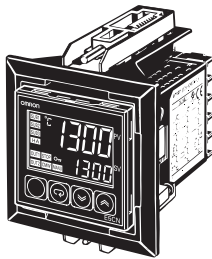


**Adapter**

**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.

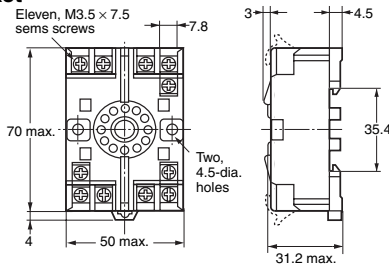
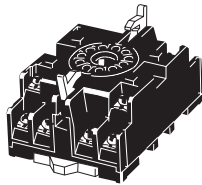


**Mounted to E5CN**

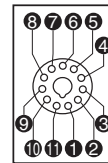


**E5CN-U Wiring Socket**

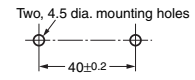
**Front-connecting Socket**  
**P2CF-11**



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



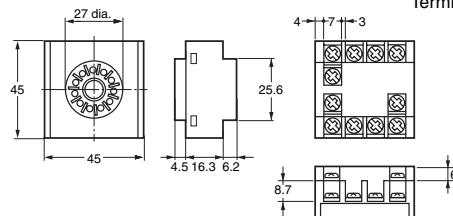
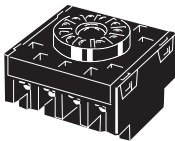
**Mounting Holes**



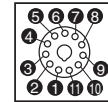
Note: Can also be mounted to a DIN track.

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.

## Read and Understand This Catalog

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

## Warranty and Limitations of Liability

### WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

### LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

## Application Considerations

### SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

### PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

## Disclaimers

### CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

### DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

### PERFORMANCE DATA

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

### ERRORS AND OMISSIONS

The information in this document has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

2009.4

In the interest of product improvement, specifications are subject to change without notice.

**OMRON Corporation**  
Industrial Automation Company

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