

## Digital Temperature Controllers

## E5CN

### Compact and Intelligent Temperature Controllers

- Various temperature inputs: thermocouple, platinum resistance thermometer, non-contact temperature sensor, and analog inputs.
- Auto-tuning and self-tuning available. Auto-tuning is possible even while self-tuning is being executed.
- Heating or heating/cooling control is available.
- Event input allows multiple SP selection and run/stop function.
- Water-resistant construction (NEMA4X: equivalent to IP66).
- Conforms to UL, CSA, and IEC safety standards as well as CE marking.



48(W) x 48(H) x 78(D) mm

### Ordering Information

#### ■ E5CN Standard Models

Size	Power supply voltage	No. of alarm points	Output	Thermocouple model	Platinum resistance thermometer model
1/16 DIN 48(W) x 48(H) x 78(D) mm	100 to 240 VAC	---	Relay	E5CN-RMTC-500	E5CN-RMP-500
			Voltage output (for driving SSR)	E5CN-QMTC-500	E5CN-QMP-500
			Current	E5CN-CMTC-500	E5CN-CMP-500
		2	Relay	E5CN-R2MTC-500	E5CN-R2MP-500
			Voltage output (for driving SSR)	E5CN-Q2MTC-500	E5CN-Q2MP-500
			Current	E5CN-C2MTC-500	E5CN-C2MP-500
	24 VAC/VDC	---	Relay	E5CN-RMTC-500	E5CN-RMP-500
			Voltage output (for driving SSR)	E5CN-QMTC-500	E5CN-QMP-500
			Current	E5CN-CMTC-500	E5CN-CMP-500
		2	Relay	E5CN-R2MTC-500	E5CN-R2MP-500
			Voltage output (for driving SSR)	E5CN-Q2MTC-500	E5CN-Q2MP-500
			Current	E5CN-C2MTC-500	E5CN-C2MP-500

- Note:**
1. A Current Transformer (CT) is not provided with the Unit. Be sure to order one when ordering the E5CN.
  2. The heating and cooling function is available for models with two alarm points.
  3. Specify the power supply specifications when ordering.

#### ■ E5CN Option Units

The E5CN provides communications or event input functionality when mounted with one of the following Option Units.

Name	Model	Function
Communications Unit	E53-CNH03 (For relay and voltage output)	RS-485 communication and heater burnout alarm
	E53-CN03 (For current output)	RS-485 communication
Event Input Unit	E53-CNHB (For relay and voltage output)	Event input and heater burnout alarm
	E53-CNB (For current output)	Event input

**Note:** The heater burnout alarm is available by mounting the E53-CNH03 or E53-CNHB Option Unit on the E5CN.

#### ■ Current Transformer (Sold Separately)

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

#### ■ Terminal Cover (Sold Separately)

Model	E53-COV10
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## ■ Input Ranges

### Platinum Resistance Thermometer Input/Thermocouple Input

Platinum resistance thermometer input					
Input type	Platinum resistance thermometer				
Name	Pt100		JPt100		
Temperature range (°C)	-200 to 850	-199.9 to 500.0	-199.9 to 500.0	-199.9 to 100.0	-199.9 to 100.0
Set value	0	1	2	3	4

	Thermocouple input																	
Input type	Thermocouple											ES1A Non-contact Temperature Sensor				Analog input		
Name	K		J		T	E	L	U	N	R	S	B	K10 to 70°C	K60 to 120°C	K115 to 165°C	K160 to 260°C	0 to 50 mV	
Temperature range (°C)	1800	-	-	-	-	-	-	-	-	-	-	1800	-	-	-	-	Usable in the following ranges by scaling: -199.9 to 999.9 or -199.9 to 999.9	
	1700	-	-	-	-	-	-	-	-	1700	1700	-	-	-	-	-		
	1600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	1500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	1400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	1300	1300	-	-	-	-	-	-	-	1300	-	-	-	-	-	-		-
	1200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	1100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	1000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	900	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-
800	-	-	850	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
500	-	500.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-100	-	-20.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-200	-200	-	-100	-	-200	-	-	-100	-200	-	-	100	-	-	-	-	-	
Set value	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	

Applicable standards by input type are as follows:

K, J, T, E, N, R, S, B: JIS C1602-1995

L: Fe-CuNi, DIN 43710-1985

U: Cu-CuNi, DIN 43710-1985

JPt100: JIS C1604-1989, JIS C1606-1989

Pt100: JIS C1604-1997, IEC751

Shaded ranges indicate default settings.

## Specifications

## ■ Ratings

<b>Supply voltage</b>		100 to 240 VAC, 50/60 Hz	24 VAC, 50/60 Hz/24 VDC
<b>Operating voltage range</b>		85% to 110% of rated supply voltage	
<b>Power consumption</b>		7 VA	4 VA/3 W
<b>Sensor input</b>		Thermocouple: K, J, T, E, L, U, N, R, S, B Platinum resistance thermometer: Pt100, JPt100 Non-contact temperature sensor: 10 to 70°C, 60 to 120°C, 115 to 165°C, 160 to 260°C Voltage input: 0 to 50 mV	
<b>Control output</b>	<b>Relay output</b>	SPST-NO, 250 VAC, 3 A (resistive load), electrical life: 100,000 operations	
	<b>Voltage output</b>	12 VDC (PNP), max. load current: 21 mA, with short-circuit protection circuit	
	<b>Current output</b>	4 to 20 mA DC, load: 600 Ω max., resolution: approx. 2,600	
<b>Alarm output</b>		SPST-NO, 250 VAC, 1 A (resistive load), electrical life: 100,000 operations	
<b>Control method</b>		2-PID or ON/OFF control	
<b>Setting method</b>		Digital setting using front panel keys	
<b>Indication method</b>		7-segment digital display and single-lighting indicator Character height: PV: 9.9 mm; SV: 6.4 mm	
<b>Other functions</b>		According to Controller model	
<b>Ambient temperature</b>		-10 to 55°C (with no condensation or icing)	
<b>Ambient humidity</b>		25% to 85%	
<b>Storage temperature</b>		-25 to 65°C (with no condensation or icing)	

## ■ Characteristics

<b>Indication accuracy</b>	Thermocouple: ( $\pm 0.5\%$ of indicated value or $\pm 1^\circ\text{C}$ , whichever greater) $\pm 1$ digit max. (see note ) Platinum resistance thermometer: ( $\pm 0.5\%$ of indicated value or $\pm 1^\circ\text{C}$ , whichever greater) $\pm 1$ digit max. Analog input: $\pm 0.5\%$ FS $\pm 1$ digit max. CT input: $\pm 5\%$ FS $\pm 1$ digit max.	
<b>Hysteresis</b>	0.1 to 999.9 EU (in units of 0.1 EU)	
<b>Proportional band (P)</b>	0.1 to 999.9 EU (in units of 0.1 EU)	
<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)	
<b>Control period</b>	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>Sampling period</b>	500 ms	
<b>Insulation resistance</b>	20 M $\Omega$ min. (at 500 VDC)	
<b>Dielectric strength</b>	2000 VAC, 50 or 60 Hz for 1min (between different charging terminals)	
<b>Vibration resistance</b>	10 to 55 Hz, 10 m/s <sup>2</sup> for 2 hours each in X, Y and Z directions	
<b>Shock resistance</b>	300 m/s <sup>2</sup> , 3 times each in 3 axes, 6 directions (relay: 100 m/s <sup>2</sup> )	
<b>Weight</b>	Approx. 150 g	Mounting bracket: Approx. 10 g
<b>Protective structure</b>	Front panel: NEMA4X for indoor use (equivalent to IP66), rear case: IP20, terminals: IP00	
<b>Memory protection</b>	EEPROM (non-volatile memory) (number of writes: 100,000)	
<b>EMC</b>	Emission Enclosure: Emission AC Mains: Immunity ESD: Immunity RF-interference: Immunity Conducted Disturbance: Immunity Burst:	EN55011 Group 1 class A EN55011 Group 1 class A EN61000-4-2: 4 kV contact discharge (level 2) 8 kV air discharge (level 3) 10 V/m (amplitude modulated, 80 MHz to 1 GHz) (level 3) 10 V/m (pulse modulated, 900 MHz) 10 V (0.15 to 80 MHz) (level 3) 2 kV power-line (level 3) 2 kV I/O signal-line (level 4)
<b>Approved standards</b>	UL3121-1, CSA22.2 No. 14, E.B.1402C Conforms to EN50081-2, EN50082-2, EN61010-1 (IEC61010-1) Conforms to VDE0106/part 100 (Finger Protection), when the terminal cover is mounted.	

**Note:** The indication of K thermocouples in the -200 to 1300°C range, and T and N thermocouples at a temperature of -100°C or less, and U and L thermocouples at any temperature is  $\pm 2^{\circ}\text{C} \pm 1$  digit maximum. The indication of B thermocouples at a temperature of 400°C or less is unrestricted.  
The indication of R and S thermocouples at a temperature of 200°C or less is  $\pm 3^{\circ}\text{C} \pm 1$  digit maximum.

## ■ Communications Specifications

Transmission path connection	Multiple points
Communications method	RS-485 (two-wire, half duplex)
Synchronization method	Start-stop synchronization
Baud rate	1,200/2,400/4,800/9,600/19,200 bps
Transmission code	ASCII
Data bit length (see note)	7 or 8 bits
Stop bit length (see note)	1 or 2 bits
Error detection	Vertical parity (none, even, odd) Frame check sequence (FCS): with SYSMAC WAY Block check character (BCC): with CompoWay/F
Flow control	Not available
Interface (see note)	RS-485
Retry function	Not available
Communications buffer	40 bytes

**Note:** The baud rate, data bit length, stop bit length, or vertical parity can be individually set using the communications setting level.

## ■ Current Transformer (Sold Separately) Ratings

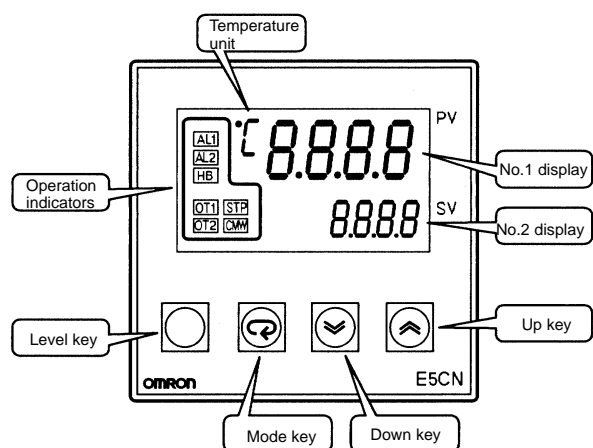
Dielectric strength	1,000 VAC (1 min)
Vibration resistance	50 Hz 98 m/s <sup>2</sup>
Weight	E54-CT1: Approx. 11.5 g E54-CT3: Approx. 50 g
Accessories (E54-CT3 only)	Armature (2) Plug (2)

## ■ Heater Burnout Alarm Specifications

Max. heater current	Single-phase AC: 50 A (see note 1)
Input current readout accuracy	±5%FS±1 digit max.
Heater burnout alarm setting range	0.0 to 50.0 A (0.1 A units) (see note 2)
Min. detection ON time	190 ms (see note 3)

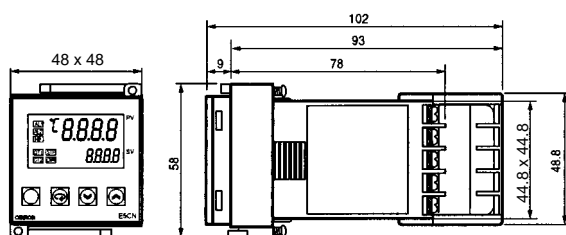
- Note:**
- When heater burnout is detected on a 3-phase heater, use the K2CU-F□□A-□GS (with gate input terminal).
  - When the set value is "00 A," the heater burnout alarm will always be OFF. When the set value is "50.0 A," the heater burnout alarm will always be ON.
  - When the control output ON time is less than 190 ms, heater burnout detection and heater current measurement will not be carried out.

## Nomenclature



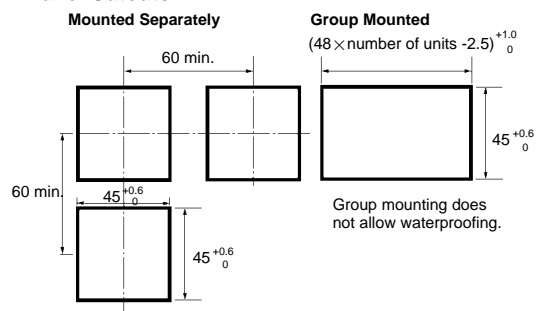
## Dimensions

**Note:** All units are in millimeters unless otherwise indicated.



**Note:** The suffix "500" is added to the model number of each Controller provided with a E53-COV10 Terminal Cover.

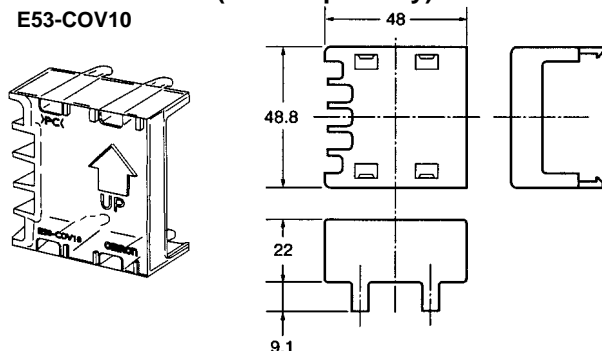
### Panel Cutouts



- 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 they are group mounted.)
- To mount the E5CN so that it is waterproof, apply the waterproof packing to the E5CN.
- When two or more E5CNs are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature specified in the specifications.

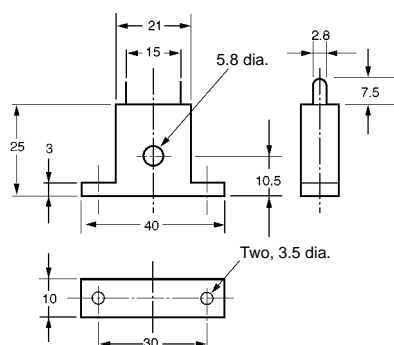
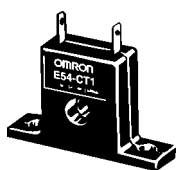
### Terminal Cover (Sold Separately)

E53-COV10

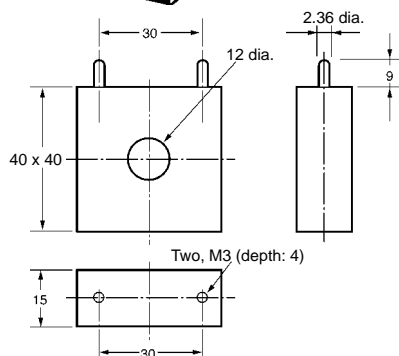
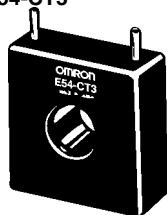


### Current Transformer (Sold Separately)

E54-CT1



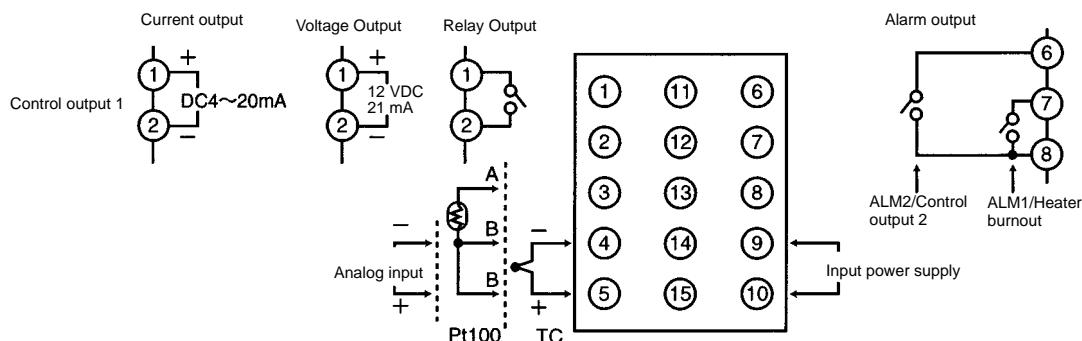
E54-CT3



## Wiring Terminals

- The voltage output (control output) is not electrically insulated from the internal circuits. When using a grounding thermocouple, do not connect the control output terminals to the ground. If the control output terminals are connected to the ground, errors will occur in the measured temperature values as a result of leakage current.

### ■ E5CN

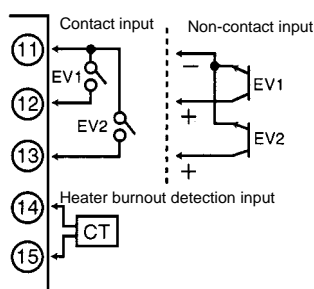


Two input power supplies are available: 100 to 240 VAC or 24 VDC.

### ■ E5CN Option Units

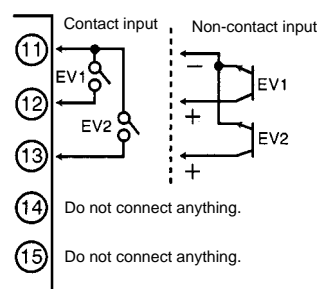
#### E53-CNHB Event Input/Heater Burnout Alarm Unit

Event Input/Heater Burnout Detection



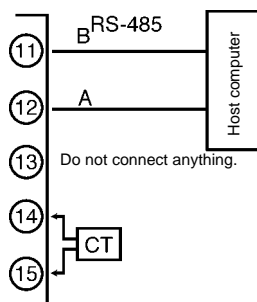
#### E53-CNB Event Input

Event Input



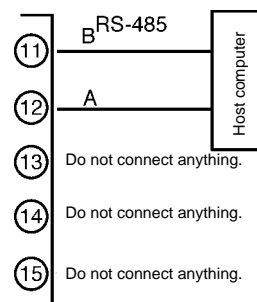
#### E53-CNH03 Communications/Heater Burnout Alarm Unit

Communications Specification/Heater Burnout Specification



#### E53-CN03 Communications Unit

Communications Specification



**ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.**

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.