

# Digital Temperature Controller E5EN

## Compact, Intelligent Temperature Controller

- Reduced panel depth of only 78 mm.
- Accepts thermocouple, non-contact temperature sensor and analog input, or platinum RTD.
- Auto-tuning and self-tuning available; functions can be used simultaneously.
- Heating or heating/cooling control.
- Event input option allows multiple set point selection and Run/Stop function.
- Water-resistant construction (NEMA 4X, equivalent to IP66).
- Conforms to UL, CSA, and IEC safety standards as well as CE marking.
- 3-year warranty.



## Ordering Information

### Temperature Controllers

**Stock Note:** Shaded models are normally stocked.

Optional communications and event input boards are shown on the following page.

Size	Power supply voltage	Alarm points	Output	Heater burnout alarm	Model	
					Thermocouple input	Platinum RTD input
1/8 DIN 48(W) x 96(H) x 78(D) mm	100 to 240 VAC	3	Relay	No	<b>E5EN-R3MTC-500 AC100-240</b>	<b>E5EN-R3MP-500 AC100-240</b>
				Yes	<b>E5EN-R3HMTC-500 AC100-240</b>	<b>E5EN-R3HMP-500 AC100-240</b>
			Voltage (for driving SSR)	No	<b>E5EN-Q3MTC-500 AC100-240</b>	<b>E5EN-Q3MP-500 AC100-240</b>
				Yes	<b>E5EN-Q3HMTC-500 AC100-240</b>	<b>E5EN-Q3HMP-500 AC100-240</b>
			Current	No	<b>E5EN-C3MTC-500 AC100-240</b>	<b>E5EN-C3MP-500 AC100-240</b>
				Yes	<b>E5EN-C3HMTC-500 AC100-240</b>	<b>E5EN-C3HMP-500 AC100-240</b>
	24 V AC/DC	3	Relay	No	<b>E5EN-R3MTC-500 AC/DC24</b>	<b>E5EN-R3MP-500 AC/DC24</b>
				Yes	<b>E5EN-R3HMTC-500 AC/DC24</b>	<b>E5EN-R3HMP-500 AC/DC24</b>
			Voltage (for driving SSR)	No	<b>E5EN-Q3MTC-500 AC/DC24</b>	<b>E5EN-Q3MP-500 AC/DC24</b>
				Yes	<b>E5EN-Q3HMTC-500 AC/DC24</b>	<b>E5EN-Q3HMP-500 AC/DC24</b>
			Current	No	<b>E5EN-C3MTC-500 AC/DC24</b>	<b>E5EN-C3MP-500 AC/DC24</b>
				Yes	<b>E5EN-C3HMTC-500 AC/DC24</b>	<b>E5EN-C3HMP-500 AC/DC24</b>

- Note:**
1. When the heating and cooling function is used, the number of alarm outputs will be reduced to 2.
  2. The heating and cooling function and the heater burnout alarm will disable one of the alarm outputs for each function used.

## ■ Accessories (Order Separately)

**Stock Note:** Shaded models are normally stocked.

Description	Specifications	Model
Computer communications boards	RS-232C	E53-AK01
	RS-485	E53-AK03
Event input board	For remote set point and Run/Stop functionality	E53-AKB
Current transformer; order only if using heater burnout alarm function	50 A load, 5.8 mm hole dia.	E54-CT1
	50 A load, 12 mm hole dia.	E54-CT3
Terminal cover (supplied with controller)	Provides finger protection from terminals (VDE0106 part 100)	E53-COV11
Software	For setup and monitoring; requires optional computer communications board	Thermo Tools (See Note)

**Note:** Contact Omron for current version information.

## 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>	9 VA	5 VA/4 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, 5 A (resistive load), electrical life: 100,000 operations
	<b>Voltage output</b>	12 VDC +15%/-20% (PNP), max. load current: 40 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, 3 A (resistive load), electrical life: 100,000 operations	
<b>Control method</b>	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: 14.0 mm; SV: 9.5 mm	
<b>Ambient operating temperature</b>	-10°C to 55°C (14°F to 131°F) with no condensation or icing	
<b>Storage temperature</b>	-25°C to 65°C (-13°F to 149°F) with no condensation or icing	
<b>Ambient humidity</b>	25% to 85% RH	

### ■ Characteristics

<b>Indication accuracy</b>	Thermocouple: ±0.5% of indicated value or ±1°C, whichever greater, ±1 digit max. (See Note) Platinum resistance thermometer: ±0.5% of indicated value or ±1°C, whichever greater, ±1 digit max. Analog input: ±0.5% FS±1 digit max. CT input: ±5% FS±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 MΩ min. at 500 VDC
<b>Dielectric strength</b>	2000 VAC, 50 or 60 Hz for 1 min between different charging terminals

**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 ±2°C±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 ±3°C±1 digit maximum.

(This table continues on the next page.)

Specifications Table - continued from previous page

<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. 310 g; mounting bracket: Approx. 100 g	
<b>Protective structure</b>	Front panel: NEMA 4X 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:	EN55011 Group 1 class A
	Emission AC Mains:	EN55011 Group 1 class A
	Immunity ESD:	EN61000-4-2: 4 kV contact discharge (level 2) 8 kV air discharge (level 3)
	Immunity RF-interference:	ENV50140: 10 V/m (amplitude modulated, 80 MHz to 1 GHz) (level 3) 10 V/m (pulse modulated, 900 MHz)
	Immunity Conducted Disturbance:	ENV50141: 10 V (0.15 to 80 MHz) (level 3)
	Immunity Burst:	EN61000-4-4: 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.	

## ■ Communications Specifications

<b>Transmission path connection</b>	Multiple points
<b>Communications method (See Note 1)</b>	RS-485 (two-wire, half duplex)/RS-232C
<b>Synchronization method</b>	Start-stop synchronization
<b>Baud rate</b>	1,200/2,400/4,800/9,600/19,200 bps
<b>Transmission code</b>	ASCII
<b>Data bit length (See Note 2)</b>	7 or 8 bits
<b>Stop bit length (See Note 2)</b>	1 or 2 bits
<b>Error detection</b>	Vertical parity (none, even, odd) Frame check sequence (FCS): with SYSMAC WAY Block check character (BCC): with CompoWay/F
<b>Flow control</b>	Not available
<b>Interface (See Note 1)</b>	RS-485/RS-232C
<b>Retry function</b>	Not available
<b>Communications buffer</b>	40 bytes

- Note:** 1. RS-232C communications are only supported for the E5AN and E5EN models.  
2. The baud rate, data bit length, stop bit length, or vertical parity can be individually set using the communications setting level.

## ■ Current Transformer Ratings

Model	E54-CT1	E54-CT3
<b>Max. continuous heater current</b>	50 amps	120 amps (See Note 1)
<b>Dielectric strength</b>	1,000 VAC (for 1 min)	
<b>Vibration resistance</b>	50 Hz, 98 m/s <sup>2</sup> (10G)	
<b>Weight</b>	Approx. 11.5 g	Approx. 50 g
<b>Accessories</b>	--	Armature: 2; Plug: 2

- Note:** 1. Use within the max heater current rating of controller table shown below.

## ■ Heater Burnout Alarm

<b>Max. heater current</b>	Single-phase 50 A AC
<b>Heater current value display accuracy</b>	±5% FS ±1 digit max.
<b>Heater burnout alarm setting range</b>	0.1 to 49.9 A (in units of 0.1 A) (See Note 1)
<b>Min. detection ON time</b>	190 ms (See Note 2)

- Note:** 1. The heater burnout alarm is always OFF if the alarm is set to 0.0 A and always ON if the alarm is set to 50.0 A.  
2. No heater burnout detection or heater current value measurement is possible if the control output (heat) is ON for less than 190 ms.

**Input Types (selectable with input jumper connector)**

**Thermocouple**

Input (field selectable) (See Note)	K1	K2	J1	J2	T1	T2	E	L	U1	U2	
Set value	0	1	2	3	4	17	5	6	7	18	
Range	°C	-200 to 1,300	-20 to 500.0	-100 to 850	-20.0 to 400.0	-200 to 400	-199.9 to 850	0 to 600	100 to 850	-200 to 400	-199.9 to 400.0
	°F	-328 to 2,372	-4 to 932	-148 to 1,562	-4 to 752	-328 to 752	-327.82 to 1,562	32 to 1,132	212 to 1,562	-328 to 752	-327.82 to 752

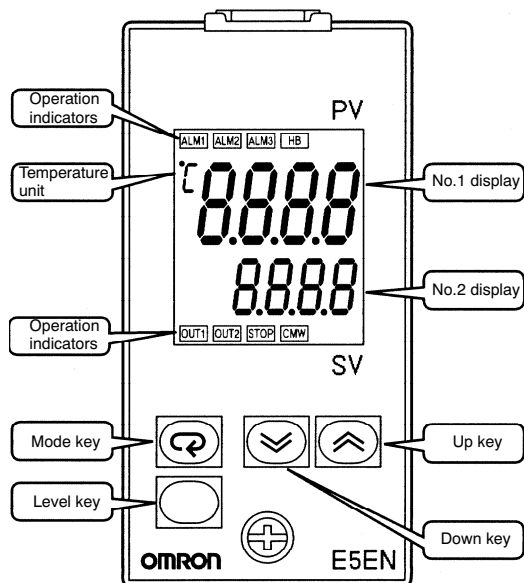
Input (field selectable) (See Note)	N	R	S	B	K10 to 70°C	K60 to 120°C	K115 to 165°C	K160 to 260°C	0 to 50 mV	
Set value	8	9	10	11	12	13	14	15	16	
Range	°C	-200 to 1,300	0 to 1,700	0 to 1,700	100 to 1,800	0 to 90	0 to 120	0 to 165	0 to 260	-1999 to 9999
	°F	-328 to 2,372	32 to 3,092	32 to 3,092	212 to 3,272	32 to 194	32 to 248	32 to 329	32 to 500	-199.9 to 999.9 (scalable)

**Note:** Setting number is factory-set to 0 (K1).

**Platinum Resistance Thermometer (RTD's)**

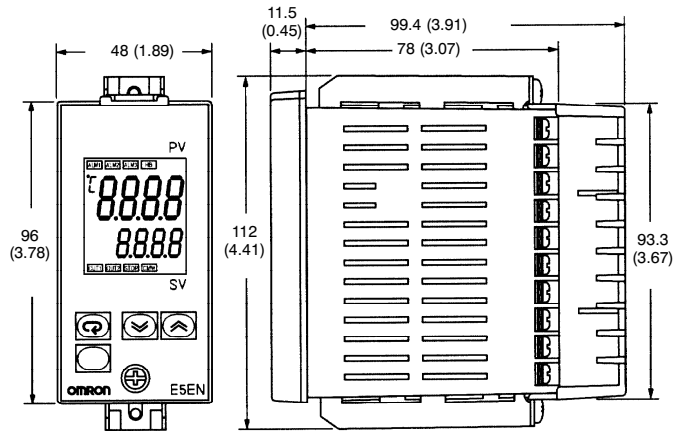
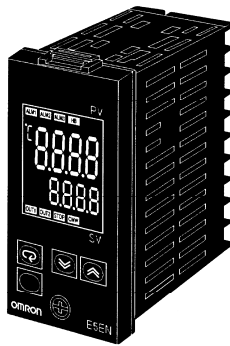
Input (field selectable)	Pt100	Pt100	Pt100	JPt100	JPt100
Set value	0	1	2	3	4
Range °C	-200 to 850	-199.9 to 500.0	0.0 to 100.0	-199.9 to 500.0	0.0 to 100.0
Range °F	-300 to 1500	-199.9 to 900	0.0 to 210.0	-199.9 to 900.0	0.0 to 210.0

## Nomenclature



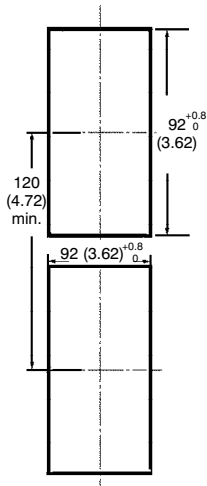
# Dimensions

Unit: mm (inch)



Panel Cutouts

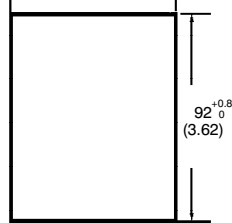
Mounted Separately



Group Mounted

$$48 \times \text{number of units} - 3.5 \begin{matrix} +1.0 \\ 0 \end{matrix}$$

$$(1.89 \times \text{number of units} - 0.14)$$

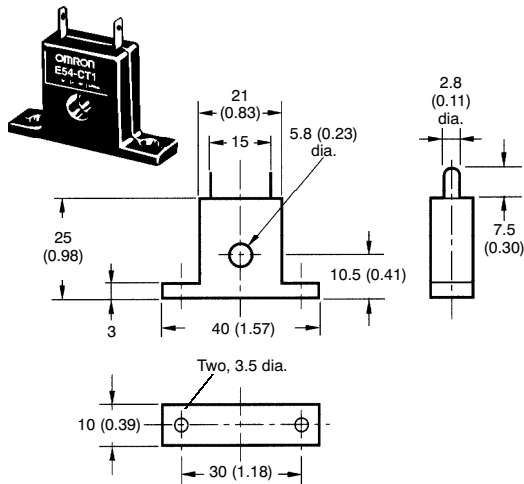


Group mounting does not allow waterproofing.

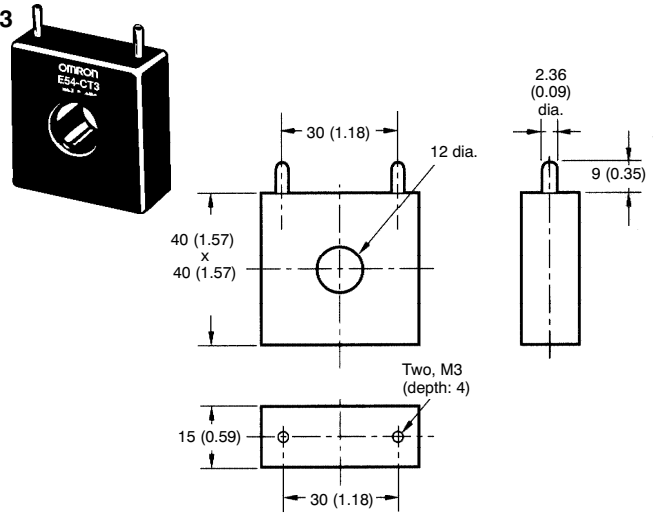
- Recommended panel thickness is 1 to 8 mm (0.04 to 0.31 inch).
- Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers when they are group mounted.)
- To mount the E5EN so that it is waterproof, apply the waterproof packing to the E5EN.
- When two or more E5ENs are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature range in the specifications.

## Current Transformer (Sold Separately)

E54-CT1

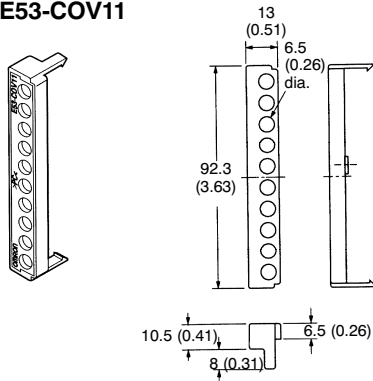


E54-CT3



## TERMINAL COVER

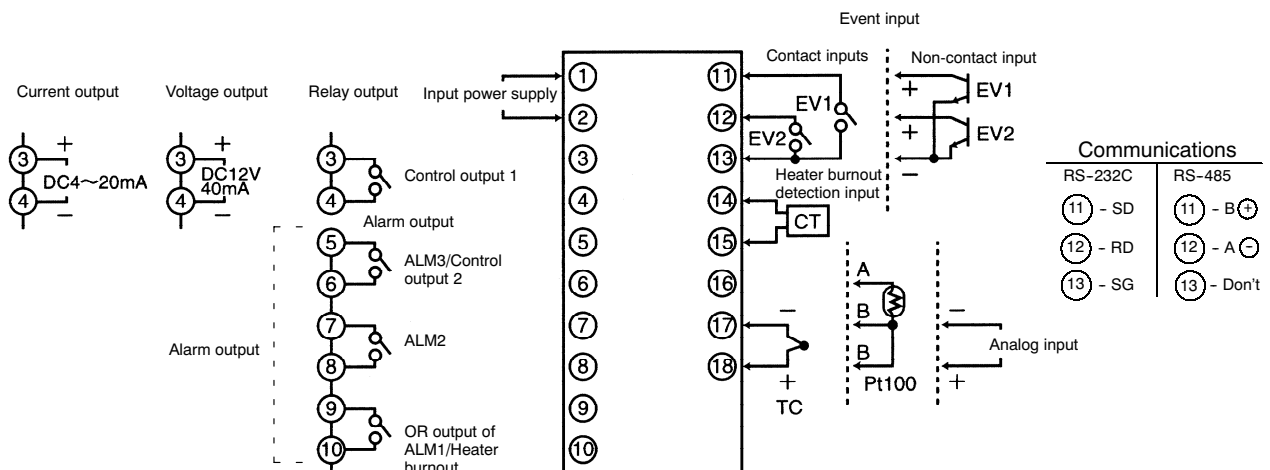
E53-COV11



## Wiring Terminals

The voltage output (control output) is not electrically isolated from the internal circuits. When using a grounded thermocouple, do not connect the control output terminals to 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.

Standard insulation is applied to the power supply I/O sections. If reinforced insulation is required, connect the input and output terminals to a device without any exposed current-carrying parts or to a device with standard insulation suitable for the maximum operating voltage of the power supply I/O section.



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**ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.**

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

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