

These Best-selling General-purpose Temperature Controllers Are Now Even Better.

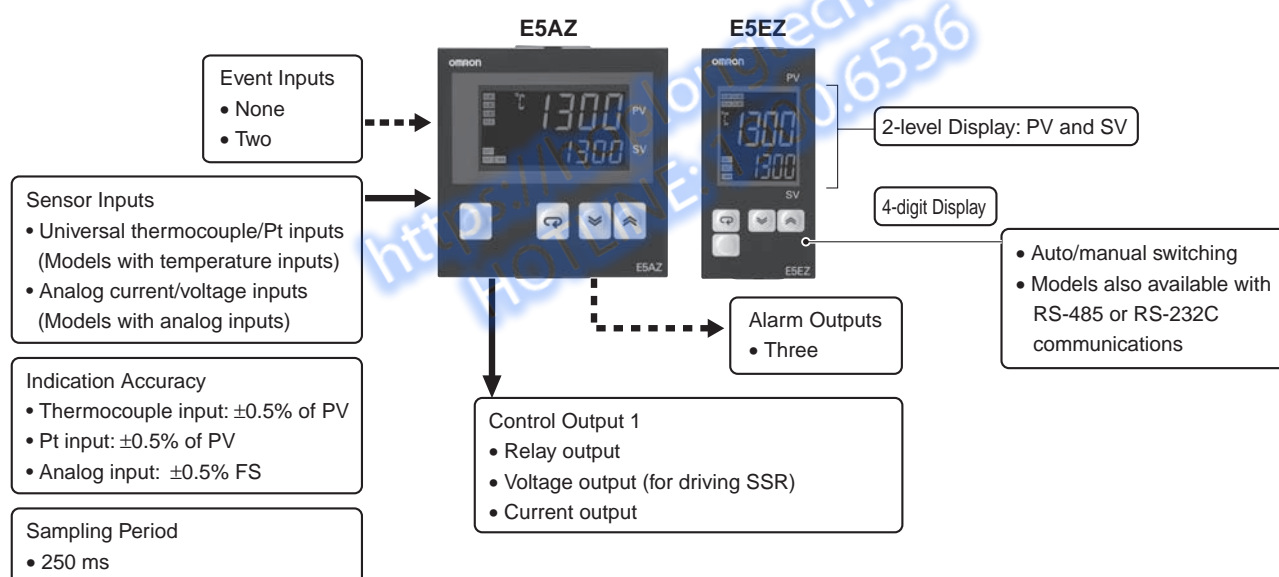
- Controllers now available with analog inputs.
- Faster sampling at 250 ms.
- Transfer output provided for easy output to recorders.
- Models available with a loop break alarm (LBA) and heater short alarm (HS alarm).
- Manual output provided.
- Easy setting with 11-segment displays.
- New protocol called Modbus is installed in the models with communications.
- USB-Serial conversion cable is available.

Note: Refer to Precautions on page 33.



Note: Refer to page 30 for information on changes in comparison to previous models.

Main I/O Functions



Model Number Structure

Model Number Legend

Controllers

E5AZ/EZ-□3□□□□□
1 2 3 4 5 6

1. Control Output 1

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

2. Number of Alarms

- 3: Three alarms

3. Heater Burnout/Heater Short

- Blank: None
- H: Heater burnout/Heater short detection (CT1)

4. Option

- Blank: None
- M: Option Unit can be mounted.

5. Input Type

- T: Thermocouple, infrared sensor/platinum resistance thermometer
- L: Analog current/voltage input

6. Power Supply Voltage

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

Option Units

E53-AZ□
1 2

1. Applicable Controller

- AZ: E5AZ/E5EZ

2. Function

- 01: RS-232C communications
- 03: RS-485 communications
- B: Two event inputs

Ordering Information

Controllers with Terminal Blocks

Size	Power supply voltage	Input type	Alarm output	Control output	Functions		Previous model	New model
					Heater burnout	Mounting option units		
1/4 DIN 96 × 96 × 78 (W × H × D)	100 to 240 VAC	Thermocouple or Resistance thermometer	3	Relay output	No	No	E5AZ-R3 E5AZ-A3 + E53-AZR	E5AZ-R3T
				Voltage output (for driving SSR)	No	No	E5AZ-Q3 E5AZ-A3 + E53-AZQ	E5AZ-Q3T
				Current output	No	No	E5AZ-C3 E5AZ-A3 + E53-AZC	E5AZ-C3T
				Relay output	No	Yes	E5AZ-R3 + E53-AZM	E5AZ-R3MT
				Voltage output (for driving SSR)	No	Yes	E5AZ-Q3 + E53-AZM	E5AZ-Q3MT
				Current output	No	Yes	E5AZ-C3 + E53-AZM	E5AZ-C3MT
				Relay output	Yes (CT1)	Yes	E5AZ-R3 + E53-AZM + E53-AZH	E5AZ-R3HMT
				Voltage output (for driving SSR)	Yes (CT1)	Yes	E5AZ-Q3 + E53-AZM + E53-AZH	E5AZ-Q3HMT
		Analog (current/voltage)	3	Relay output	Yes (CT1)	Yes	None	E5AZ-R3HML
				Voltage output (for driving SSR)	Yes (CT1)	Yes	None	E5AZ-Q3HML
				Current output	No	Yes	None	E5AZ-C3ML
	24 VAC/VDC	Thermocouple or Resistance thermometer	3	Relay output	No	Yes	None	E5AZ-R3MTD
				Voltage output (for driving SSR)	No	Yes	None	E5AZ-Q3MTD
				Current output	No	Yes	None	E5AZ-C3MTD
				Relay output	Yes (CT1)	Yes	None	E5AZ-R3HMTD
				Voltage output	Yes (CT1)	Yes	None	E5AZ-Q3HMTD
		Analog (current/voltage)	3	Relay output	Yes (CT1)	Yes	None	E5AZ-R3HMLD
				Voltage output (for driving SSR)	Yes (CT1)	Yes	None	E5AZ-Q3HMLD
				Current output	---	Yes	None	E5AZ-C3MLD

Controllers with Terminal Blocks

Size	Power supply voltage	Input type	Alarm output	Control output	Functions		Previous model	New model
					Heater burnout	Mounting option units		
1/8 DIN 48 × 96 × 78 (W × H × D)	100 to 240 VAC	Thermocouple or Resistance thermometer	3	Relay output	No	No	E5EZ-R3 E5EZ-A3 + E53-AZR	E5EZ-R3T
				Voltage output (for driving SSR)	No	No	E5EZ-Q3 E5EZ-A3 + E53-AZQ	E5EZ-Q3T
				Current output	No	No	E5EZ-C3 E5EZ-A3 + E53-AZC	E5EZ-C3T
				Relay output	No	Yes	E5EZ-R3 + E53-AZM	E5EZ-R3MT
				Voltage output (for driving SSR)	No	Yes	E5EZ-Q3 + E53-AZM	E5EZ-Q3MT
				Current output	No	Yes	E5EZ-C3 + E53-AZM	E5EZ-C3MT
				Relay output	Yes (CT1)	Yes	E5EZ-R3 + E53-AZM + E53-AZH	E5EZ-R3HMT
				Voltage output (for driving SSR)	Yes (CT1)	Yes	E5EZ-Q3 + E53-AZM + E53-AZH	E5EZ-Q3HMT
		Analog (current/voltage)	3	Relay output	Yes (CT1)	Yes	None	E5EZ-R3HML
				Voltage output (for driving SSR)	Yes (CT1)	Yes	None	E5EZ-Q3HML
				Current output	No	Yes	None	E5EZ-C3ML
	24 VAC/VDC	Thermocouple or Resistance thermometer	3	Relay output	No	Yes	None	E5EZ-R3MTD
				Voltage output (for driving SSR)	No	Yes	None	E5EZ-Q3MTD
				Current output	No	Yes	None	E5EZ-C3MTD
				Relay output	Yes (CT1)	Yes	None	E5EZ-R3HMTD
				Voltage output	Yes (CT1)	Yes	None	E5EZ-Q3HMTD
		Analog (current/voltage)	3	Relay output	Yes (CT1)	Yes	None	E5EZ-R3HMLD
				Voltage output (for driving SSR)	Yes (CT1)	Yes	None	E5EZ-Q3HMLD
				Current output	-	Yes	None	E5EZ-C3MLD

Option Units

Name	Function	Model
Communications Unit	RS-232C Communications	E53-AZ01
	RS-485 Communications	E53-AZ03
Event Input Unit	Event input	E53-AZB

Accessories (Order Separately)

USB-Serial Conversion Cable

Model
E58-CIFQ1

Terminal Cover

Connectable models	Model
E5AZ	E53-COV11
E5EZ	

Waterproof Packing

Connectable models	Model
E5AZ	Y92S-P4
E5EZ	Y92S-P5

Current Transformers (CTs)

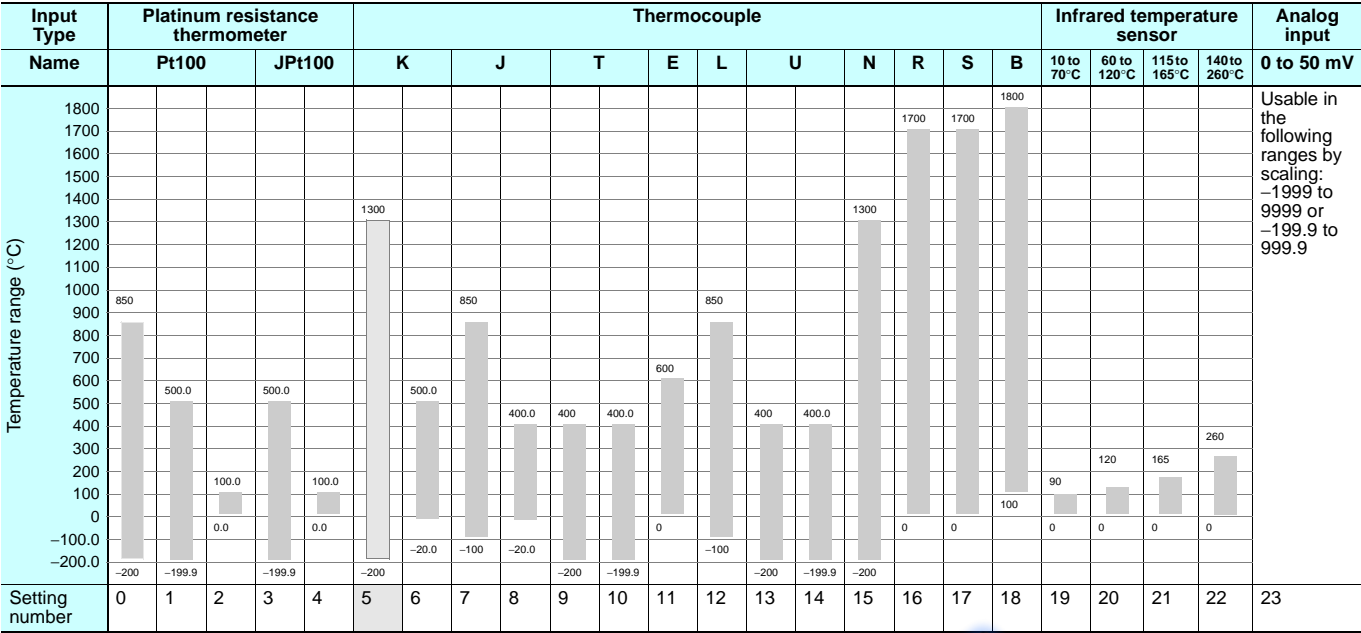
Hole diameter	Model
5.8 dia.	E54-CT1
12.0 dia.	E54-CT3

Specifications

Ratings

Power supply voltage		100 to 240 VAC, 50/60 Hz	24 VAC, 50/60 Hz or 24 VDC
Operating voltage range		85% to 110% of rated supply voltage	
Power consumption		8.5 VA	6 VA (24 VAC)/4 W (24 VDC)
Sensor input		Models with temperature inputs Thermocouple: K, J, T, E, L, U, N, R, S, or B 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	
Input impedance		Current input: 150 Ω, Voltage input: 1 MΩ (Use a 1:1 connection when connecting the ES2-HB.)	
Control output	Relay output	SPST-NO, 250 VAC, 5 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 5 V, 10 mA	
	Voltage output (for driving SSR)	Output voltage: 12 VDC +15%/–20% (PNP), max. load current: 40 mA, with short-circuit protection circuit	
	Current output	4 to 20 mA DC/0 to 20 mA DC, load: 600 Ω max., resolution: approx. 2,700	
Alarm output		SPST-NO, 250 VAC, 2 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 5 V, 10 mA	
Event input	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.	
		Outflow current: Approx. 7 mA per point	
Control method		ON/OFF control or 2-PID control (with auto-tuning)	
Setting method		Digital setting using front panel keys	
Indication method		11-segment digital display and individual indicators (7-segments displays also possible) Character height: E5AZ: PV: 15 mm, SV: 9.5 mm E5EZ: PV: 14 mm, SV: 9.5 mm	
Other functions		Manual output, heating/cooling control, transfer output (on some models), loop break alarm, multi SP, MV limiter, input digital filter, self-tuning, temperature input shift, run/stop, protection functions, etc.	
Ambient operating temperature		–10 to 55°C (with no icing or condensation)	
Ambient operating humidity		25% to 85%	
Storage temperature		–25 to 65°C (with no icing or condensation)	

Input Ranges
Thermocouples/Platinum Resistance Thermometers (Universal Inputs)



The applicable standards for the input types are as follows:
K, J, T, E, N, R, S, B: IEC 584-1
L: Fe-CuNi, DIN 43710-1985
U: Cu-CuNi, DIN 43710-1985
Pt100: IEC 751
JPt100: JIS C 1604-1989, JIS C 1606-1989

Shaded settings are the default settings.

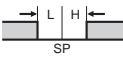
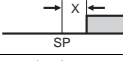
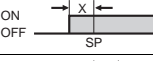
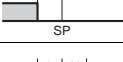
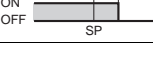
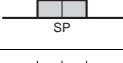
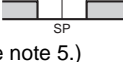


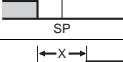
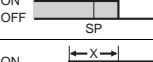
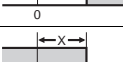
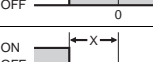
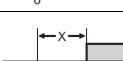
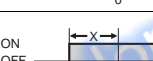
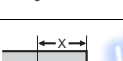
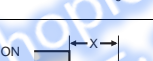
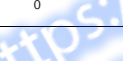

Models with Analog Inputs

Input Type	Current		Voltage		
Input specification	4 to 20mA	0 to 20 mA	1 to 5 V	0 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	4

Shaded settings are the default settings.

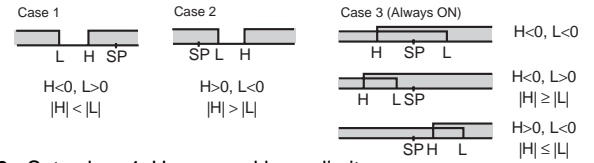
Alarm Types

Select alarm types out of the 12 alarm types listed in the following table.

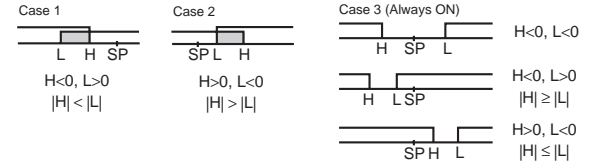
Set value	Alarm type	Alarm output operation	
		When X is positive	When X is negative
0	Alarm function OFF	Output OFF	
1 (See note 1.)	Upper- and lower-limit	ON OFF 	(See note 2.)
2	Upper limit	ON OFF 	ON OFF 
3	Lower limit	ON OFF 	ON OFF 
4 (See note 1.)	Upper- and lower-limit range	ON OFF 	(See note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

Note: 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. Set value: 12, LBA (loop break alarm) can be set only for alarm 1 type.

Set the alarm types for alarms 1 to 3 independently in the initial setting level. The default setting is 2 (upper limit).

Characteristics

Indication accuracy	Thermocouple: (See note 1.) (±0.5% of indicated value or ±1°C, whichever is greater) ±1 digit max. Platinum resistance thermometer: (±0.5% of indicated value or ±1°C, whichever is greater) ±1 digit max. Analog input: ±0.5% FS ±1 digit max. CT input: ±5% FS ±1 digit max.
Influence of temperature (See note 2.)	R, S, and B thermocouple inputs: (±1% of PV or ±10°C, whichever is greater) ±1 digit max. Other thermocouple inputs: (±1% of PV or ±4°C, whichever is greater) ±1 digit max. *±10°C for -100°C or less for K sensors Platinum resistance thermometer inputs: (±1% of PV or ±2°C, whichever is greater) ±1 digit max. Analog inputs: (±1% of FS) ±1 digit max.
Influence of voltage (See note 2.)	
Hysteresis	Models with thermocouple/platinum resistance thermometer input (universal input): 0.1 to 999.9 EU (in units of 0.1 EU) (See note 3.) Models with analog input: 0.01 to 99.99% FS (in units of 0.01% FS)
Proportional band (P)	Models with thermocouple/platinum resistance thermometer input (universal input): 0.1 to 999.9 EU (in units of 0.1 EU) (See note 3.) Models with analog input: 0.1 to 999.9% FS (in units of 0.1% FS)
Integral time (I)	0 to 3999 s (in units of 1 s)
Derivative time (D)	0 to 3999 s (in units of 1 s)
Control period	0.5, 1 to 99 s (in units of 1 s)
Manual reset value	0.0 to 100.0% (in units of 0.1%)
Alarm setting range	-1999 to 9999 (decimal point position depends on input type)
Sampling period	250 ms
Affect of signal source resistance	Thermocouple: 0.1°C/Ω max. (100 Ω max.) (See note 4.) Platinum resistance thermometer: 0.4°C/Ω max. (10 Ω max.)
Insulation resistance	20 MΩ min. (at 500 VDC)
Dielectric strength	2,000 VAC, 50 or 60 Hz for 1 min (between terminals with different charge)
Vibration resistance	Malfunction 10 to 55 Hz, 20 m/s² for 10 min each in X, Y, and Z directions
	Destruction 10 to 55 Hz, 0.75-mm single amplitude for 2 hrs each in X, Y, and Z directions
Shock resistance	Malfunction 100 m/s² min., 3 times each in X, Y, and Z directions
	Destruction 300 m/s² min., 3 times each in X, Y, and Z directions
Weight	E5AZ Controller: Approx. 300 g, Mounting Bracket: Approx. 100 g
	E5EZ Controller: Approx. 250 g, Mounting Bracket: Approx. 100 g
Degree of protection	Front panel: IP66 (indoor use). Rear case: IP20, Terminals: IP00
Memory protection	Non-volatile memory (number of writes: 1,000,000 times)
EMC	Emission Enclosure: EN55011 Group1 Class A Emission AC Mains: EN55011 Group1 Class A Immunity ESD: EN61000-4-2 4 kV contact discharge (level 2) 8 kV air discharge (level 3) Immunity RF-interference: EN61000-4-3 10 V/m (80-1000 MHz, 1.4-2.0 GHz amplitude modulated) (level 3) 10 V/m (900 MHz pulse modulated) Immunity Conducted Disturbance: EN61000-4-6 3 V (0.15 to 80 MHz) (level 2) Immunity Burst: EN61000-4-4 2 kV Power-line (level 3) 1 kV I/O signal-line (level 3) (See note 5.) Immunity Surge: EN61000-4-5 1kV line to line Power line, output line (relay output) 2 kV line to ground Power line, output line (relay output) 1 kV line to ground Input line (communication) Dip/Interrupting: Immunity Voltage EN61000-4-11 0.5 cycle, 100% (rated voltage)
Approved standards	UL 61010C-1 CSA C22.2 No.1010.1
Conformed standards	EN61326, EN61010-1, IEC61010-1 VDE0106 Part 100 (Finger protection), when the terminal cover is mounted.

- Note: 1.** The indication accuracy of K thermocouples in the -200 to 1300°C range, T and N thermocouples at a temperature of -100°C max., and U and L thermocouples at any temperature is ±2°C ±1 digit maximum. The indication accuracy of the B thermocouple at a temperature of 400°C max. is not specified. The indication accuracy of the R and S thermocouples at a temperature of 200°C max. is ±3°C ±1 digit max.
- 2.** Conditions: Ambient temperature: -10°C to 23°C to 55°C, Voltage range: -15% to +10% of rated voltage
- 3.** "EU" stands for Engineering Unit and is used as the unit after scaling. For a temperature sensor, the EU is °C or °F.
- 4.** B, R, and S sensors: 0.2°C/Ω max. (100 Ω max.)

- 5.** When using the E53-AZB, E53-AZ01, or E53-AZ03 Option Unit with the E5AZ-□3□M□□ to satisfy the immunity burst requirements in the EN 61326 standard, always connect a ZCAT2035-0930 Clamp Filter (manufactured by TDK) to the cable for terminals 11, 12, and 13.

USB-Serial Conversion Cable

Applicable OS	Windows 2000/XP/Vista
Applicable software	Thermo Mini
Applicable models	E5CZ/E5CZ-U/E5AZ/E5EZ
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 RS-232C
Communications	RS-485 (two-wire, half duplex), RS-232C
Synchronization method	Start-stop synchronization
Baud rate	1200, 2400, 4800, 9600, 19200, or 38400 bps
Transmission code	ASCII
Data length (See note.)	7 or 8 bits
Stop bits (See note.)	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, RS-232C
Retry function	None
Communications buffer	40 bytes
Send data wait time	0 to 99 ms Default: 20 ms

Note: The baud rate, data length, stop bits, and vertical parity can be individually set using the Communications Setting Level.

Current Transformer (Order Separately)
Ratings

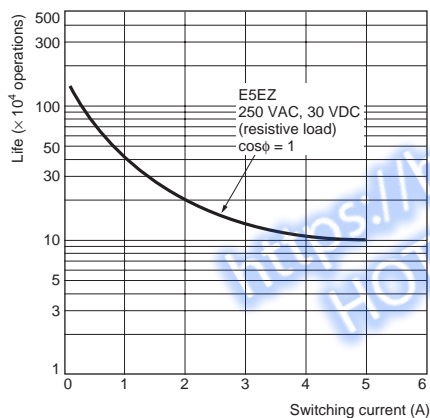
Dielectric strength	1,000 VAC for 1 min
Vibration resistance	50 Hz, 98 m/s²
Weight	E54-CT1: Approx. 11.5 g, E54-CT3: Approx. 50 g
Accessories (E54-CT3 only)	Armatures (2) Plugs (2)

Heater Burnout and Heater Short Alarms

Maximum heater current	50 A AC
Input current indication accuracy	±5% FS ±1 digit max.
Heater burn-out alarm setting range	0.1 to 49.9 A (in units of 0.1 A) 0.0 A: Heater burnout/Heater short alarm output turns OFF. 50.0 A: Heater burnout/Heater short alarm output turns ON. Minimum detection ON time: 190 ms (See note 1.)
Heater short alarm setting range	0.1 to 49.9 A (in units of 0.1 A) 0.0 A: Heater burnout/Heater short alarm output turns ON. 50.0 A: Heater burnout/Heater short alarm output turns OFF. Minimum detection OFF time: 190 ms (See note 2.)

Note: 1. If the ON time of control output 1 is less than 190 ms, heater burnout detection and the heater current will not be measured.
2. If the OFF time of control output 1 is less than 190 ms, heater short alarm and the heater current will not be measured.

Electrical Life Expectancy Curve for Relays (Reference Values)



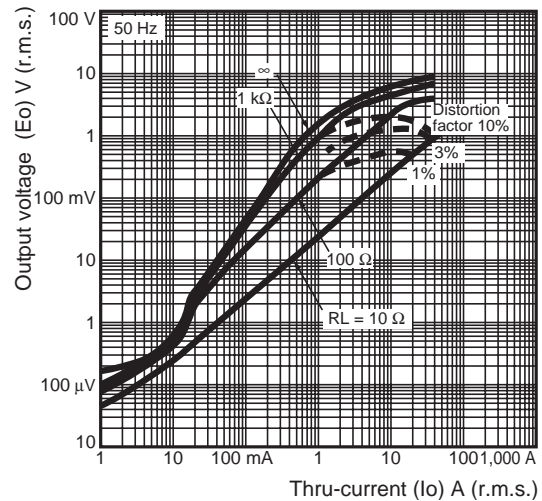
E54-CT1

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

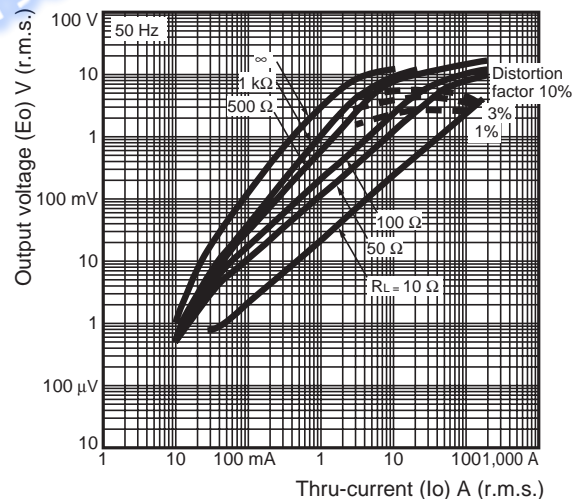
Thru-current (Io) vs. Output Voltage (Eo) (Reference Values)

Maximum continuous heater current: 120 A (50/60 Hz)

(Maximum continuous heater current for an OMRON Temperature Controller is 50 A.)

Number of windings: 400±2

Winding resistance: 8±0.8 Ω

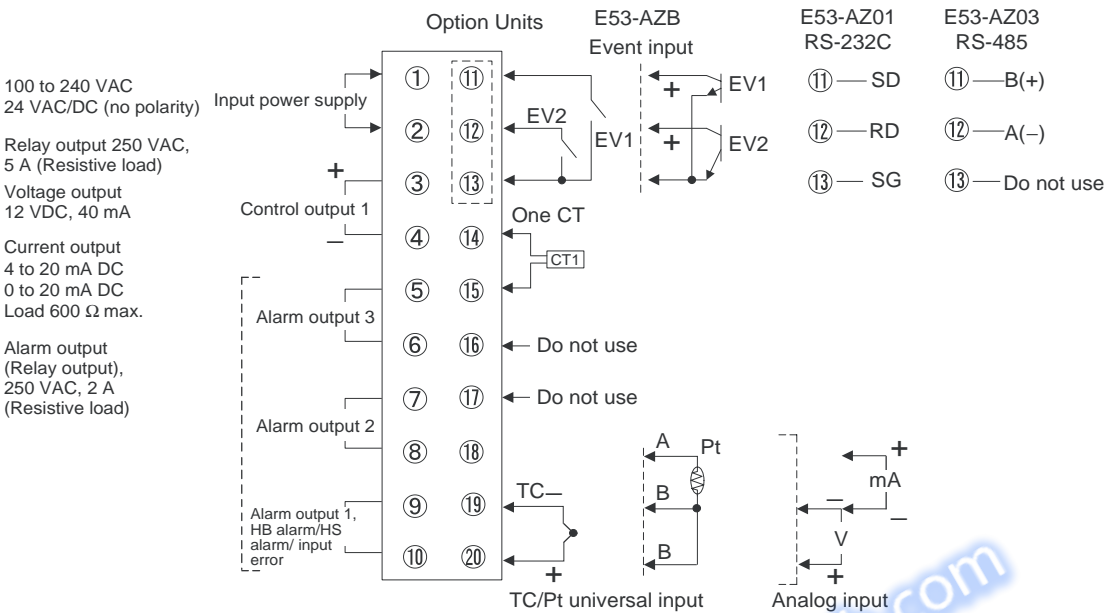


E5AZ/E5EZ

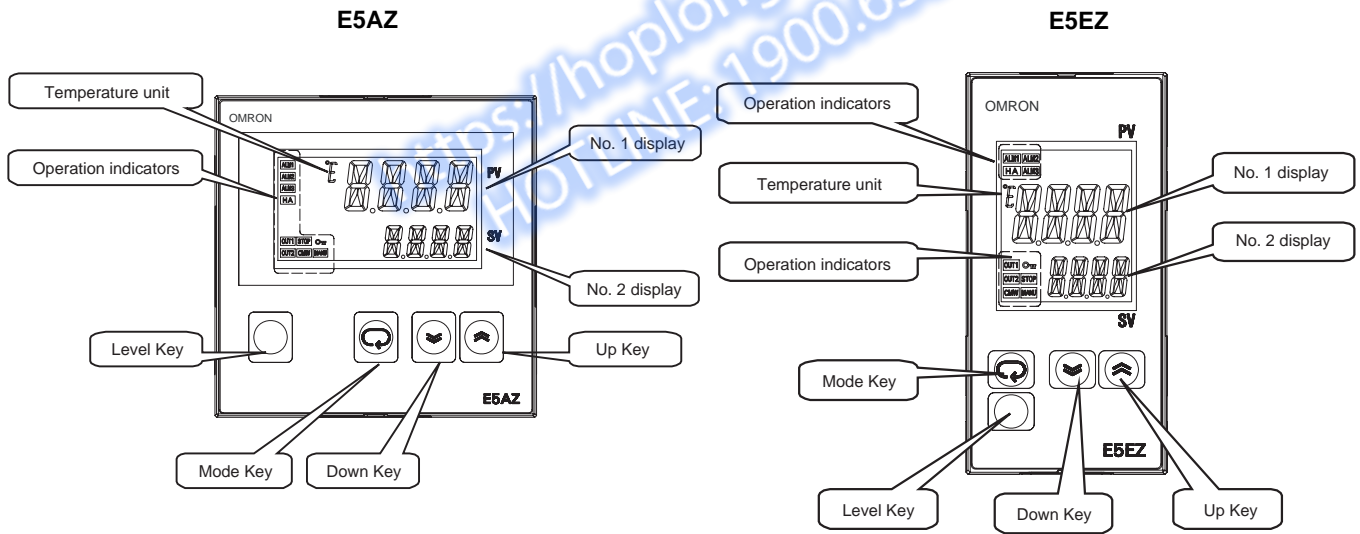
External Connections

- The voltage output for control output 1 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.

E5AZ/E5EZ

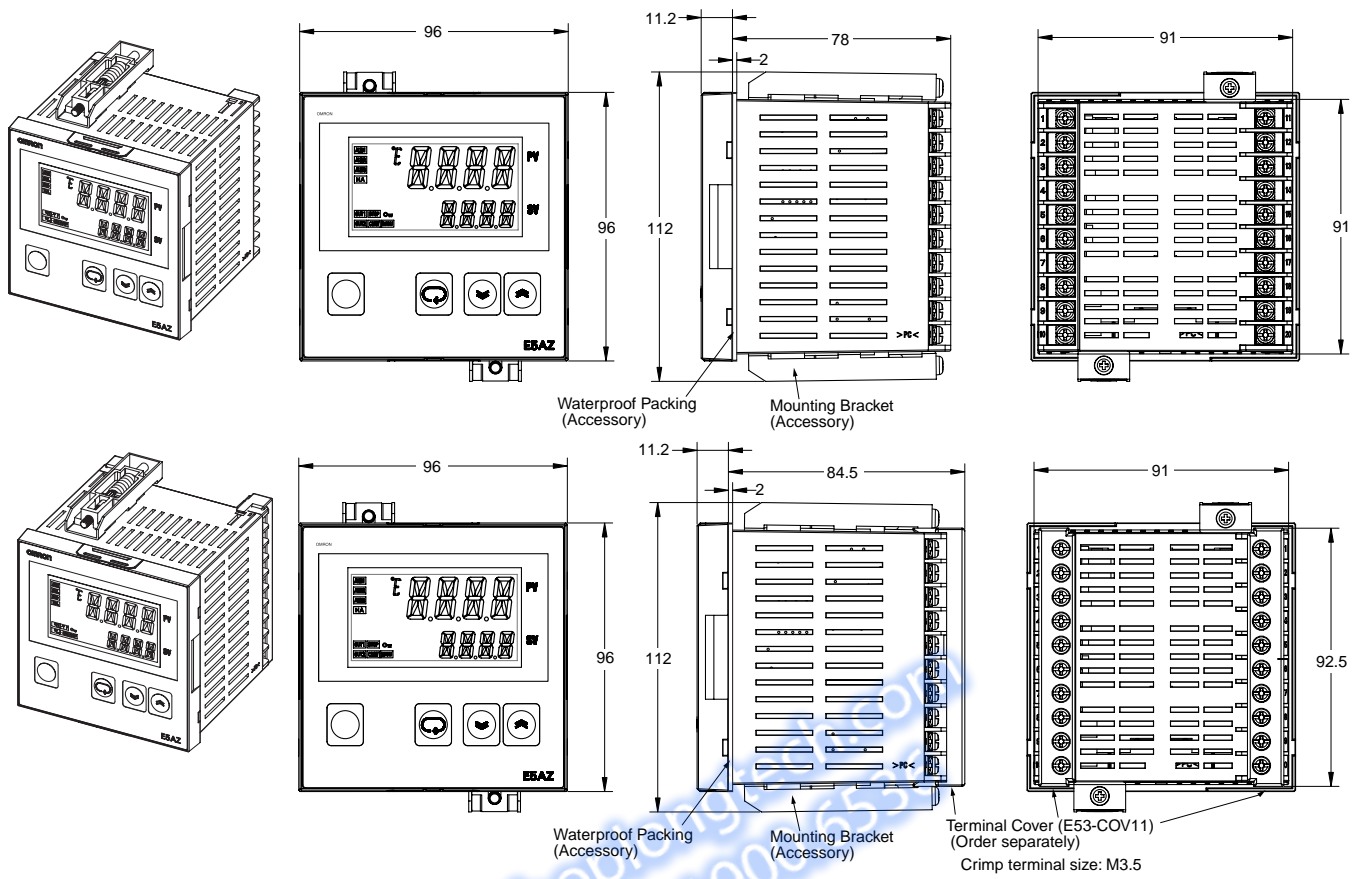


Nomenclature

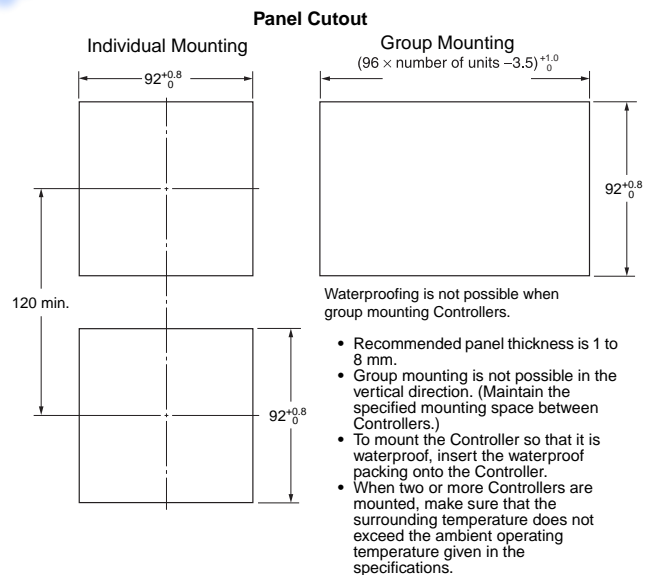


Dimensions

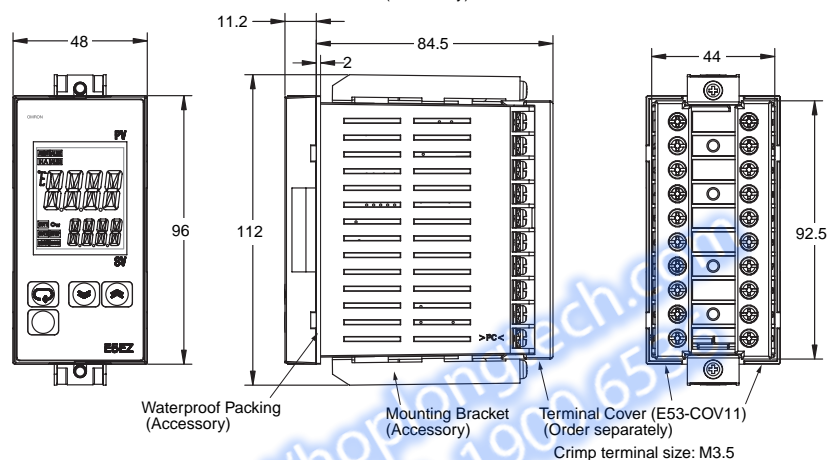
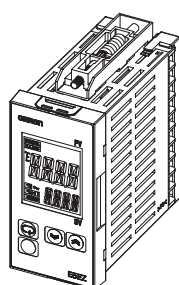
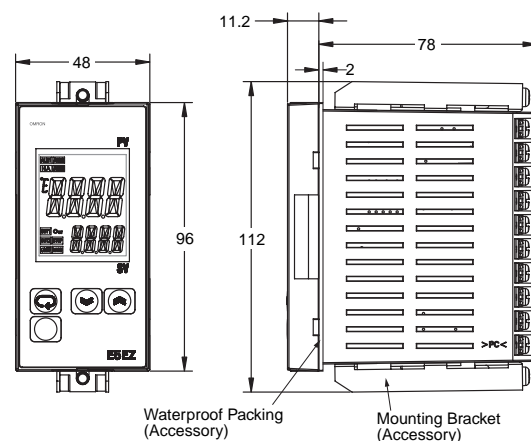
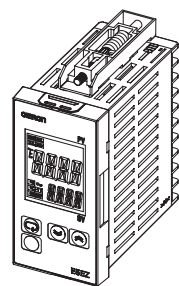
E5AZ



Note: To remove the Controller from the case, loosen the screw at the bottom of the front panel with a screwdriver while pressing down on the hook at the top of the front panel.

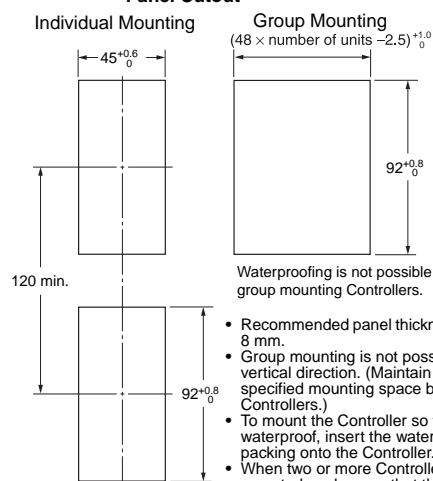


E5EZ Terminal Models



Note: To remove the Controller from the case, loosen the screw at the bottom of the front panel with a screwdriver while pressing down on the hook at the top of the front panel.

Panel Cutout



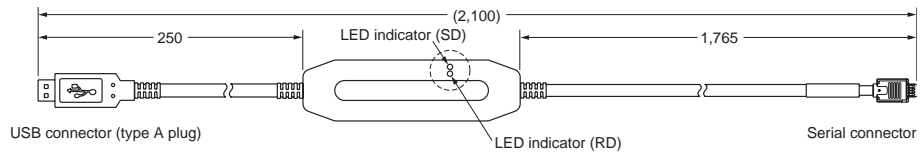
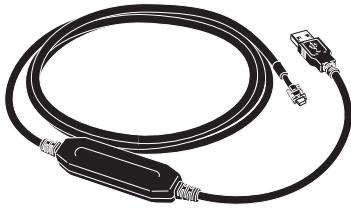
Waterproofing is not possible when group mounting Controllers.

- Recommended panel thickness is 1 to 8 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 ambient operating temperature given in the specifications.

Accessories

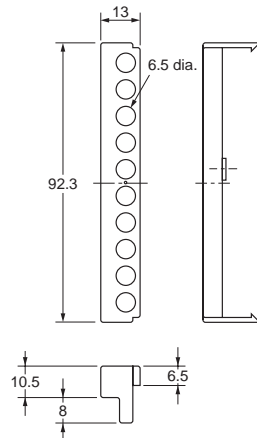
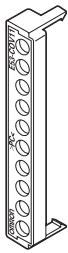
USB-Serial Conversion Cable (Order Separately)

E58-CIFQ1



Terminal Covers

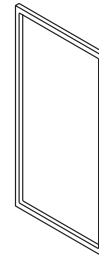
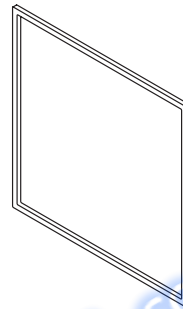
E53-COV11

(Two Covers provided.)
(Order Separately)

Waterproof Packing

Y92S-P4 (for DIN 96 × 96)

Y92S-P5 (for DIN 48 × 96)



Order the Waterproof Packing separately if it becomes lost or damaged. The Waterproof Packing can be used to achieve an IP66 (indoor use) 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 (indoor use). 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.

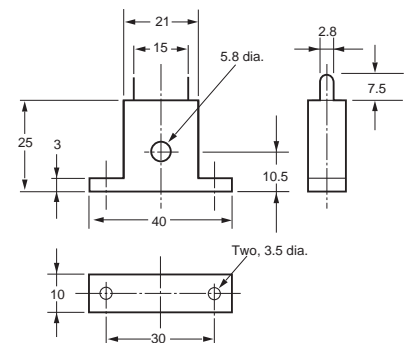
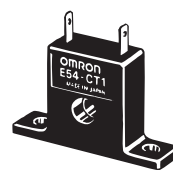
Unit Labels (Order Separately)

Y92S-L1 Type

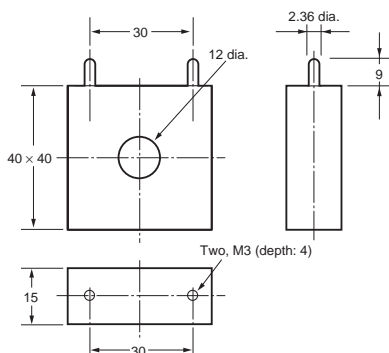
UNIT LABEL				
mV	V	mA	A	kW
mm	cm	m	km	g
kg	m ³	ℓ	°C	°F
K	%RH	%	ℓ/s	ℓ/min
ℓ/h	m ³ /s	m ³ /min	m ³ /h	kg/h
rpm	ppm	pH	kPa	mmHg
mmH ₂ O	mH ₂ O	bar	Torr	mmAq
kgf/cm ²	g/cm ²	kg/cm ²	kg/cm ² G	kgf/cm ² G
TAG No. TAG No.				

Current Transformers (Order Separately)

E54-CT1

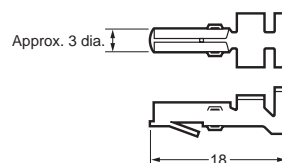


E54-CT3

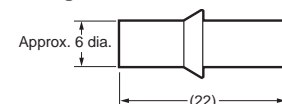


E54-CT3 Accessory

• Armature



• Plug



Connection Example

