

# Digital Temperature Controller

# E5EC/E5EC-B/E5AC

(48 × 96 mm/96 × 96 mm)

**Large White PV Display That's Easier to Read.  
Easy to Use, from Model Selection to  
Setup and Operation.**

**Models with Push-In Plus Terminal  
Blocks Added to 48 × 96-mm Lineup.**

- A white LCD PV display with a height of approx. 18 mm for the E5EC/E5EC-B and 25 mm for the E5AC improves visibility.
- High-speed sampling at 50 ms.
- With 48 x 96-mm Controllers, you can select between screw terminal blocks or Push-In Plus terminal blocks to save wiring work.
- Short body with depth of only 60 mm. (Screw Terminal Blocks)
- Easy connections to a PLC with programless communications. Use component communications to link Temperature Controllers to each other.
- Tool ports are provided both on the top panel and the front panel. Set up the Controller without wiring the power supply by connecting to the computer with a Communications Conversion Cable (sold separately). Setup is easy with the CX-Thermo (sold separately).



\* CSA conformance evaluation by UL.



48 × 96 mm  
Screw Terminal  
Blocks  
E5EC

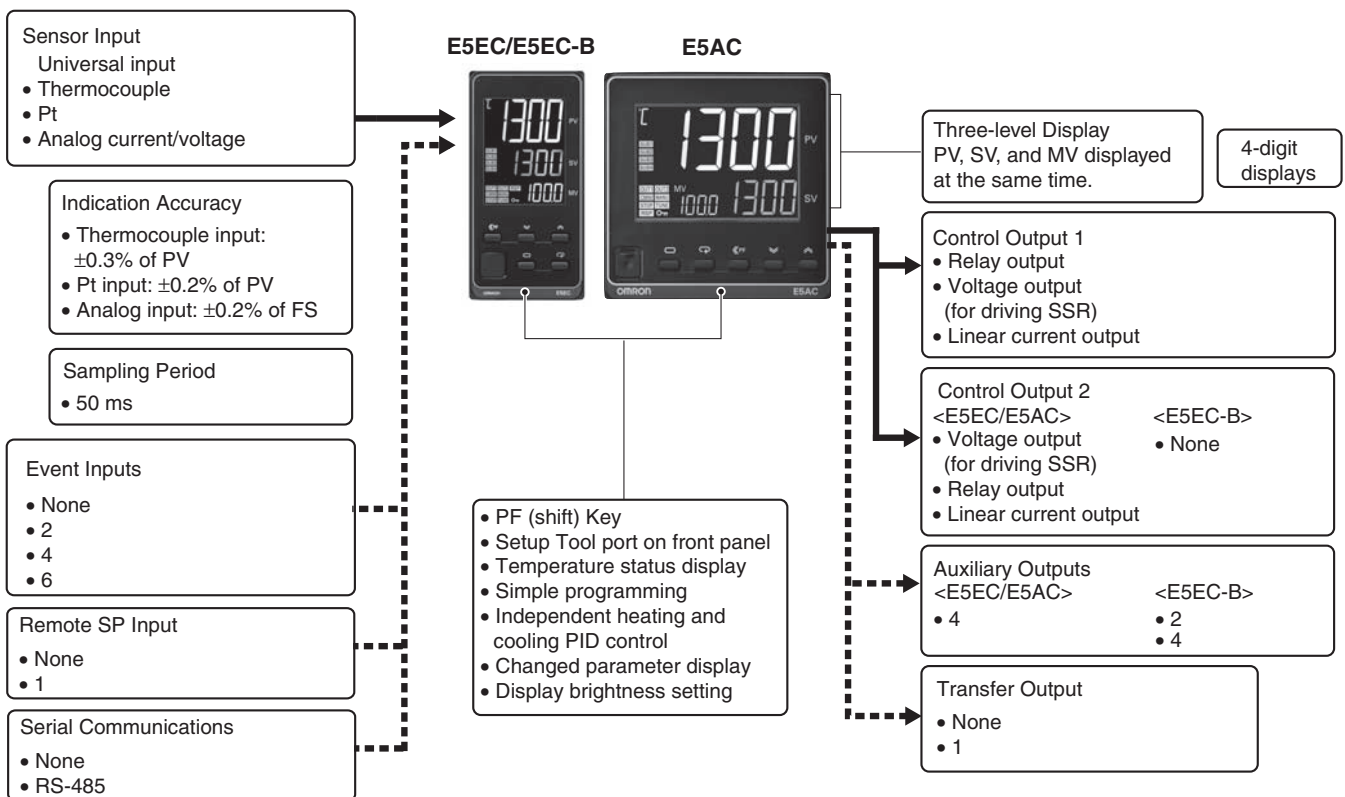
48 × 96 mm  
Push-In Plus  
Terminal  
Blocks  
E5EC-B

96 × 96 mm  
Screw Terminal Blocks  
E5AC

Refer to your OMRON website for the most recent information on applicable safety standards.

**Refer to Safety Precautions on page 122.**

## Main I/O Functions



This datasheet is provided as a guideline for selecting products.

Be sure to refer to the following manuals for application precautions and other information required for operation before attempting to use the product.

E5□C Digital Temperature Controllers User's Manual (Cat. No. H174)

E5□C Digital Temperature Controllers Communications Manual (Cat. No. H175)

## Model Number Legend and Standard Models

### Model Number Legend

Models with Screw Terminal Blocks

E5EC-□□ 4 □ 5 M-□□□□ (Example: E5EC-RX4A5M-000)

① ② ③ ④ ⑤ ⑥

E5AC-□□ 4 □ 5 M-□□□□ (Example: E5AC-RX4A5M-000)

① ② ③ ④ ⑤ ⑥

Model	①	②	③	④	⑤	⑥	Meaning	
	Control outputs 1 and 2	No. of auxiliary outputs	Power supply voltage	Terminal type	Input type	Options	Control output 1	Control output 2
E5EC							48 × 96 mm	
E5AC							96 × 96 mm	
*2	RX						Relay output	None
	QX						Voltage output (for driving SSR)	None
	CX						Linear current output	None
	QQ						Voltage output (for driving SSR)	Voltage output (for driving SSR)
	QR						Voltage output (for driving SSR)	Relay output
	RR						Relay output	Relay output
	*2 CC						Linear current output	Linear current output
	*2 CQ						Linear current output	Voltage output (for driving SSR)
	PR						Position-proportional relay output	Position-proportional relay output
			*3 4					4 (auxiliary outputs 1 and 2 with same common and auxiliary outputs 3 and 4 with same common)
			A				100 to 240 VAC	
			D				24 VAC/DC	
				5			Screw terminal blocks (with cover)	
					M		Universal input	

Option selection conditions *1	Control outputs 1 and 2				HB alarm and HS alarm	Communications	Event inputs	Remote SP Input	Transfer output
	For RX, QX, QQ, QR, RR, or CQ	For CX or CC	For PR						
	Selectable	Selectable	Selectable	000	---	---	---	---	---
		Selectable	Selectable	004	---	RS-485	2	---	---
		Selectable		005	---	---	4	---	---
	Selectable			009	2 (for 3-phase heaters)	RS-485	2	---	---
	Selectable			010	1	---	4	---	---
	Selectable			011	1	---	6	Provided.	Provided.
		Selectable		013	---	---	6	Provided.	Provided.
		Selectable	Selectable	014	---	RS-485	4	Provided.	Provided.

\*1. The options that can be selected depend on the type of control output.

\*2. The control output cannot be used as a transfer output.

\*3. A model with four auxiliary outputs must be selected.

Note: Draw-out-type models of the E5EC and E5AC are available. Ask your OMRON representative for details.

## Heating and Cooling Control

### Using Heating and Cooling Control

#### ① Control Output Assignment

If there is no control output 2, an auxiliary output is used as the cooling control output.

If there is a control output 2, the two control outputs are used for heating and cooling.

(It does not matter which output is used for heating and which output is used for cooling.)

#### ② Control

If PID control is used, you can set PID control separately for heating and cooling.

This allows you to handle control systems with different heating and cooling response characteristics.

## Model Number Legend

Models with Push-In Plus Terminal Blocks

E5EC-□□ □□ B M -□□□ (Example: E5EC-RX4ABM-000)

① ② ③ ④ ⑤ ⑥

Model	①	②	③	④	⑤	⑥	Meaning					
	Control outputs 1 and 2	No. of auxiliary outputs	Power supply voltage	Terminal type	Input type	Options						
E5EC							48 × 96 mm					
							Control output 1			Control output 2		
*1	RX						Relay output			None		
*2	QX						Voltage output (for driving SSR)			None		
*2	CX						Linear current output *3			None		
		2					2 independent points					
		4					4 (auxiliary outputs 1 and 2 with same common and auxiliary outputs 3 and 4 with same common)					
			A				100 to 240 VAC					
			D				24 VAC/DC					
				B			Push-in plus terminal blocks					
					M		Universal input					
								HB alarm and HS alarm	Communications	Event inputs	Remote SP Input	Transfer output
							000	---	---	---	---	---
*1							004	---	RS-485	2	---	---
*2							008	1	RS-485	2	---	---
*2							010	1	---	4	---	---
*2							011	1	---	6	Provided.	Provided.
*1							014	---	RS-485	4	Provided.	Provided.

\*1. Option 004 and 014 cannot be selected if RX or QX is selected for the control output.

\*2. Option 008, 010 and 011 cannot be selected if CX is selected for the control output.

\*3. The control output cannot be used as a simple transfer output.

## Heating and Cooling Control

### Using Heating and Cooling Control

① Control Output Assignment

An auxiliary output is used as the cooling control output.

② Control

If PID control is used, you can set PID control separately for heating and cooling.

This allows you to handle control systems with different heating and cooling response characteristics.

## Optional Products (Order Separately)

### USB-Serial Conversion Cable

Model
E58-CIFQ2

### Communications Conversion Cable

Model
E58-CIFQ2-E

**Note:** Always use this product together with the E58-CIFQ2. This Cable is used to connect to the front-panel Setup Tool port.

### Terminal Covers (for E5EC/E5AC)

Model
E53-COV24 (3pcs)

**Note:** The Terminal Covers E53-COV24 are provided with the Digital Temperature Controller.

### Waterproof Packing

Applicable Controller	Model
E5EC/E5EC-B	Y92S-P9
E5AC	Y92S-P10

**Note:** This Waterproof Packing is provided with the Digital Temperature Controller.

### Waterproof Cover

Applicable Controller	Model
E5EC/E5EC-B	Y92A-49N
E5AC	Y92A-96N

### Front Port Cover

Model
Y92S-P7

**Note:** This Front Port Cover is provided with the Digital Temperature Controller.

### Mounting Adapter

Model
Y92F-51 (2pcs)

**Note:** This Mounting Adapter is provided with the Digital Temperature Controller.

### Current Transformers (CTs)

Hole diameter	Model
5.8 mm	E54-CT1
5.8 mm	E54-CT1L *
12.0 mm	E54-CT3
12.0 mm	E54-CT3L *

\* Lead wires are included with these CTs. If UL certification is required, use these CTs.

### CX-Thermo Support Software

Model
EST2-2C-MV4

**Note:** CX-Thermo version 4.5 or higher is required for the E5EC/E5AC.

CX-Thermo version 4.65 or higher is required for the E5EC-B. CX-Thermo version 4.67 or higher is required for the E5CC-B linear current output type.

For the system requirements for the CX-Thermo, refer to information on the EST2-2C-MV4 on the OMRON website ([www.ia.omron.com](http://www.ia.omron.com)).

# E5EC/E5EC-B/E5AC

## Specifications

### Ratings

<b>Power supply voltage</b>		A 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>E5EC/ E5EC-B</b>	Models with option selection of 000: 6.6 VA max. at 100 to 240 VAC, and 4.1 VA max. at 24 VAC or 2.3 W max. at 24 VDC All other models: 8.3 VA max. at 100 to 240 VAC, and 5.5 VA max. at 24 VAC or 3.2 W max. at 24 VDC
	<b>E5AC</b>	Models with option selection of 000: 7.0 VA max. at 100 to 240 VAC, and 4.2 VA max. at 24 VAC or 2.4 W max. at 24 VDC All other models: 9.0 VA max. at 100 to 240 VAC, and 5.6 VA max. at 24 VAC or 3.4 W max. at 24 VDC
<b>Sensor input</b>		Temperature input Thermocouple: K, J, T, E, L, U, N, R, S, B, C/W, or PL II Platinum resistance thermometer: Pt100 or JPt100 Infrared temperature sensor (ES1B): 10 to 70°C, 60 to 120°C, 115 to 165°C, or 140 to 260°C Analog input 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-N/THB-N.)
<b>Control method</b>		ON/OFF or 2-PID control (with auto-tuning)
<b>Control output</b>	<b>Relay output</b>	SPST-NO, 250 VAC, 5 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 5 V, 10 mA (reference value)
	<b>Voltage output (for driving SSR)</b>	Output voltage: 12 VDC ±20% (PNP), max. load current: 40 mA, with short-circuit protection circuit (The maximum load current is 21 mA for models with two control outputs.)
	<b>Linear current output</b>	4 to 20 mA DC/0 to 20 mA DC, load: 500 Ω max., resolution: approx. 10,000
<b>Auxiliary output</b>	<b>Number of outputs</b>	E5EC/E5AC: 4 E5EC-B: 2 or 4 (depends on model)
	<b>Output specifications</b>	SPST-NO. relay outputs, 250 VAC, Models with 2 outputs: 3 A (resistive load), Models with 4 outputs: 2 A (resistive load), Electrical life: 100,000 operations, Minimum applicable load: 10 mA at 5 V (reference value)
<b>Event input</b>	<b>Number of inputs</b>	2, 4 or 6 (depends on model)
	<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>Transfer output</b>	<b>Number of outputs</b>	1 (only on models with a transfer output)
	<b>Output specifications</b>	Current output: 4 to 20 mA DC, Load: 500 Ω max., Resolution: Approx. 10,000 Linear voltage output: 1 to 5 VDC, load: 1 kΩ min., Resolution: Approx. 10,000
<b>Remote SP input</b>		Current input: 4 to 20 mA DC or 0 to 20 mA DC (input impedance: 150 Ω max.) Voltage input: 1 to 5 V, 0 to 5 V, or 0 to 10 V (input impedance: 1 MΩ min.)
<b>Potentiometer input *</b>		100 Ω to 10 kΩ
<b>Setting method</b>		Digital setting using front panel keys
<b>Indication method</b>		11-segment digital display and individual indicators Character height: E5EC/E5EC-B: PV: 18.0 mm, SV: 11.0 mm, MV: 7.8 mm E5AC: PV: 25.0 mm, SV: 15.0 mm, MV: 9.5 mm Three displays Contents: PV/SV/MV, PV/SV/Multi-SP, or PV/SV/Remaining soak time, etc Numbers of digits: 4 digits each for PM, SV, and MV displays
<b>Multi SP</b>		Up to eight set points (SP0 to SP7) can be saved and selected using the event inputs, key operations, or serial communications.
<b>Bank switching</b>		None
<b>Other functions</b>		Manual output, heating/cooling control, loop burnout alarm, SP ramp, other alarm functions, heater burnout (HB) alarm (including SSR failure (HS) alarm), 40% AT, 100% AT, MV limiter, input digital filter, self tuning, robust tuning, PV input shift, run/stop, protection functions, extraction of square root, MV change rate limit, logic operations, temperature status display, simple programming, moving average of input value, and display brightness setting
<b>Ambient operating temperature</b>		-10 to 55°C (with no condensation or icing), For 3-year warranty: -10 to 50°C with standard mounting (with no condensation or icing)
<b>Ambient operating humidity</b>		25 to 85%
<b>Storage temperature</b>		-25 to 65°C (with no condensation or icing)
<b>Altitude</b>		2,000 m max.
<b>Recommended fuse</b>		T2A, 250 VAC, time-lag, low-breaking capacity
<b>Installation environment</b>		Overvoltage category II, Pollution Degree 2 (EN/IEC/UL 61010-1)

\* This function is not supported by the E5EC-B. Refer to *Model Number Legend* on page 42.



## Alarm Types

Each alarm can be independently set to one of the following 19 alarm types. The default is 2: Upper limit. (see note.)

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

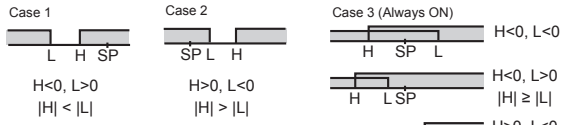
**Note:** In the default settings for models with HB or HS alarms, alarm 1 is set to a heater alarm (HA) and the Alarm Type 1 parameter is not displayed.

To use alarm 1, set the output assignment to alarm 1.

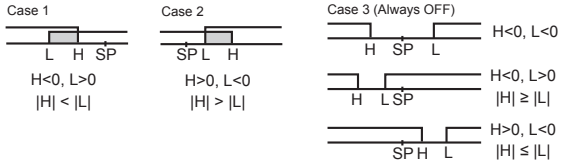
Set value	Alarm type	Alarm output operation		Description of function
		When alarm value X is positive	When alarm value X is negative	
0	Alarm function OFF	Output OFF		No alarm
1	Upper- and lower-limit *1		*2	Set the upward deviation in the set point for the alarm upper limit (H) and the lower deviation in the set point for the alarm lower limit (L). The alarm is ON when the PV is outside this deviation range.
2 (default)	Upper-limit			Set the upward deviation in the set point by setting the alarm value (X). The alarm is ON when the PV is higher than the SP by the deviation or more.
3	Lower-limit			Set the downward deviation in the set point by setting the alarm value (X). The alarm is ON when the PV is lower than the SP by the deviation or more.
4	Upper- and lower-limit range *1		*3	Set the upward deviation in the set point for the alarm upper limit (H) and the lower deviation in the set point for the alarm lower limit (L). The alarm is ON when the PV is inside this deviation range.
5	Upper- and lower-limit with standby sequence *1	*5	*4	A standby sequence is added to the upper- and lower-limit alarm (1). *6
6	Upper-limit with standby sequence			A standby sequence is added to the upper-limit alarm (2). *6
7	Lower-limit with standby sequence			A standby sequence is added to the lower-limit alarm (3). *6
8	Absolute-value upper-limit			The alarm will turn ON if the process value is larger than the alarm value (X) regardless of the set point.
9	Absolute-value lower-limit			The alarm will turn ON if the process value is smaller than the alarm value (X) regardless of the set point.
10	Absolute-value upper-limit with standby sequence			A standby sequence is added to the absolute-value upper-limit alarm (8). *6
11	Absolute-value lower-limit with standby sequence			A standby sequence is added to the absolute-value lower-limit alarm (9). *6
12	LBA (alarm 1 type only)	-		*7
13	PV change rate alarm	-		*8
14	SP absolute-value upper-limit alarm			This alarm type turns ON the alarm when the set point (SP) is higher than the alarm value (X).
15	SP absolute-value lower-limit alarm			This alarm type turns ON the alarm when the set point (SP) is lower than the alarm value (X).
16	MV absolute-value upper-limit alarm *9	Standard Control 	Standard Control 	This alarm type turns ON the alarm when the manipulated variable (MV) is higher than the alarm value (X).
		Heating/Cooling Control (Heating MV) 	Heating/Cooling Control (Heating MV) 	
		Always ON		
17	MV absolute-value lower-limit alarm *9	Standard Control 	Standard Control 	This alarm type turns ON the alarm when the manipulated variable (MV) is lower than the alarm value (X).
		Heating/Cooling Control (Cooling MV) 	Heating/Cooling Control (Cooling MV) 	
		Always ON		
18	RSP absolute-value upper-limit alarm *10			This alarm type turns ON the alarm when the remote SP (RSP) is higher than the alarm value (X).
19	RSP absolute-value lower-limit alarm *10			This alarm type turns ON the alarm when the remote SP (RSP) is lower than the alarm value (X).

\*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 \*2

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

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

\*6. Refer to the *E5□C Digital Temperature Controllers User's Manual* (Cat. No. H174) for information on the operation of the standby sequence.

\*7. Refer to the *E5□C Digital Temperature Controllers User's Manual* (Cat. No. H174) for information on the loop burnout alarm (LBA). This setting cannot be used with a position-proportional model.

\*8. Refer to the *E5□C Digital Temperature Controllers User's Manual* (Cat. No. H174) for information on the PV change rate alarm.

\*9. When heating/cooling control is performed, the MV absolute upper limit alarm functions only for the heating operation and the MV absolute lower limit alarm functions only for the cooling operation.

\*10. This value is displayed only when a remote SP input is used. It functions in both Local SP Mode and Remote SP Mode.



Characteristics

<b>Indication accuracy (at the ambient temperature of 23°C)</b>	Thermocouple: (±0.3% of indication value or ±1°C, whichever is greater) ±1 digit max. *1 Platinum resistance thermometer: (±0.2% of indication value or ±0.8°C, whichever is greater) ±1 digit max. Analog input: ±0.2% FS ±1 digit max. CT input: ±5% FS ±1 digit max. Potentiometer input: ±5% FS ±1 digit max.	
<b>Transfer output accuracy</b>	±0.3% FS max.	
<b>Remote SP Input Type</b>	±0.2% FS ±1 digit max.	
<b>Influence of temperature *2</b>	Thermocouple input (R, S, B, C/W, PL II): (±1% of indication value or ±10°C, whichever is greater) ±1 digit max. Other thermocouple input: (±1% of indication value or ±4°C, whichever is greater) ±1 digit max. *3	
<b>Influence of voltage *2</b>	Platinum resistance thermometer: (±1% of indication value or ±2°C, whichever is greater) ±1 digit max. Analog input: ±1%FS ±1 digit max.	
<b>Influence of EMS. (at EN 61326-1)</b>	CT input: ±5% FS ±1 digit max. Remote SP input: ±1% FS ±1 digit max.	
<b>Input sampling period</b>	50ms	
<b>Hysteresis</b>	Temperature input: 0.1 to 999.9°C or °F (in units of 0.1°C or °F) Analog input: 0.01% to 99.99% FS (in units of 0.01% FS)	
<b>Proportional band (P)</b>	Temperature input: 0.1 to 999.9°C or °F (in units of 0.1°C or °F) Analog input: 0.1 to 999.9% FS (in units of 0.1% FS)	
<b>Integral time (I)</b>	Standard, heating/cooling, or Position-proportional (Close): 0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) Position-proportional (Floating): 1 to 9999 s (in units of 1 s), 0.1 to 999.9 s (in units of 0.1 s)*4	
<b>Derivative time (D)</b>	0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *4	
<b>Proportional band (P) for cooling</b>	Temperature input: 0.1 to 999.9°C or °F (in units of 0.1°C or °F) Analog input: 0.1 to 999.9% FS (in units of 0.1% FS)	
<b>Integral time (I) for cooling</b>	0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *4	
<b>Derivative time (D) for cooling</b>	0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *4	
<b>Control period</b>	0.1, 0.2, 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>Influence of signal source resistance</b>	Thermocouple: 0.1°C/Ω max. (100 Ω max.) Platinum resistance thermometer: 0.1°C/Ω max. (10 Ω max.)	
<b>Insulation resistance</b>	20 MΩ min. (at 500 VDC)	
<b>Dielectric strength</b>	3,000 VAC, 50/60 Hz for 1 min between terminals of different charge	
<b>Vibration</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>Resistance</b>	10 to 55 Hz, 20 m/s <sup>2</sup> for 2 hrs each in X, Y, and Z directions
<b>Shock</b>	<b>Malfunction</b>	100 m/s <sup>2</sup> , 3 times each in X, Y, and Z directions
	<b>Resistance</b>	300 m/s <sup>2</sup> , 3 times each in X, Y, and Z directions
<b>Weight</b>	E5EC/E5EC-B: Controller: Approx. 210 g, Mounting Adapter: Approx. 4 g × 2 E5AC: Controller: Approx. 250 g, Mounting Adapter: Approx. 4 g × 2	
<b>Degree of protection</b>	Front panel: IP66, Rear case: IP20, Terminals: IP00	
<b>Memory protection</b>	Non-volatile memory (number of writes: 1,000,000 times)	
<b>Setup Tool</b>	E5EC/E5AC: CX-Thermo version 4.5 or higher E5EC-B: CX-Thermo version 4.65 or higher *9	
<b>Setup Tool port</b>	E5EC/E5EC-B/E5AC top panel: An E58-CIFQ2 USB-Serial Conversion Cable is used to connect to a USB port on the computer.*5 E5EC/E5EC-B/E5AC front panel: An E58-CIFQ2 USB-Serial Conversion Cable and E58-CIFQ2-E Conversion Cable are used together to connect to a USB port on the computer.*5	
<b>Standards</b>	<b>Approved standards</b>	cULus: UL 61010-1/CSA C22.2 No.61010-1, Korean wireless regulations (Radio law: KC Mark) (Some models only.) *6, Lloyd's standards *7, EAC
	<b>Conformed standards</b>	EN 61010-1 (IEC 61010-1), RCM
<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 61326-1 *8 Electromagnetic Field Immunity: EN 61000-4-2 Burst Noise Immunity: EN 61000-4-3 Conducted Disturbance Immunity: EN 61000-4-4 Surge Immunity: EN 61000-4-6 Voltage Dip/Interrupting Immunity: EN 61000-4-5 EN 61000-4-11	

\*1. The indication accuracy of K thermocouples in the -200 to 1,300°C range, T and N thermocouples at a temperature of -100°C max., and U and L thermocouples at any temperatures is ±2°C ±1 digit max. The indication accuracy of the B thermocouple at a temperature of 400°C max. is not specified. The indication accuracy of B thermocouples at a temperature of 400 to 800°C is ±3°C max. The indication accuracy of the R and S thermocouples at a temperature of 200°C max. is ±3°C ±1 digit max. The indication accuracy of C/W thermocouples is (±0.3% of PV or ±3°C, whichever is greater) ±1 digit max. The indication accuracy of PL II thermocouples is (±0.3% of PV or ±2°C, whichever is greater) ±1 digit max.

\*2. Ambient temperature: -10°C to 23°C to 55°C, Voltage range: -15% to 10% of rated voltage

\*3. K thermocouple at -100°C max.: ±10°C max.

\*4. The unit is determined by the setting of the Integral/Derivative Time Unit parameter.

\*5. External communications (RS-485) and USB-serial conversion cable communications can be used at the same time.

\*6. Refer to your OMRON website for the most recent information on applicable models.

\*7. Refer to information on maritime standards in *Shipping Standards* on page 124 for compliance with Lloyd's Standards.

\*8. Industrial electromagnetic environment (EN/IEC 61326-1 Table 2)

\*9. CX-Thermo version 4.67 or higher is required for the E5CC-B linear current output type.

## USB-Serial Conversion Cable

<b>Applicable OS</b>	Windows XP/Vista/7/8/10 *1
<b>Applicable software</b>	E5EC/E5AC: CX-Thermo version 4.5 or higher E5EC-B: CX-Thermo version 4.65 or higher *3
<b>Applicable models</b>	E5□C-T Series, E5□C Series, and E5CB Series
<b>USB interface standard</b>	Conforms to USB Specification 2.0.
<b>DTE speed</b>	38,400 bps
<b>Connector specifications</b>	Computer: USB (type A plug) Digital Temperature Controller: Special serial connector
<b>Power supply</b>	Bus power (Supplied from USB host controller.) *2
<b>Power supply voltage</b>	5 VDC
<b>Current consumption</b>	450 mA max.
<b>Output voltage</b>	4.7±0.2 VDC (Supplied from USB-Serial Conversion Cable to the Digital Temperature Controller.)
<b>Output current</b>	250 mA max. (Supplied from USB-Serial Conversion Cable to the Digital Temperature Controller.)
<b>Ambient operating temperature</b>	0 to 55°C (with no condensation or icing)
<b>Ambient operating humidity</b>	10% to 80%
<b>Storage temperature</b>	-20 to 60°C (with no condensation or icing)
<b>Storage humidity</b>	10% to 80%
<b>Altitude</b>	2,000 m max.
<b>Weight</b>	Approx. 120 g

Windows is a registered trademark of Microsoft Corporation in the United States and/or other countries.

\*1. CX-Thermo version 4.65 or higher runs on Windows 10.

\*2. Use a high-power port for the USB port.

\*3. CX-Thermo version 4.67 or higher is required for the E5CC-B linear current output type.

**Note:** A driver must be installed on the computer. Refer to the *Instruction Manual* included with the Cable for the installation procedure.

## Communications Specifications

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

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

## Communications Functions

<b>Programless communications *1</b>	You can use the memory in the PLC to read and write E5□C parameters, start and stop operation, etc. The E5□C automatically performs communications with PLCs. No communications programming is required. Number of connected Digital Temperature Controllers: 32 max. (Up to 16 for the FX Series) Applicable PLCs OMRON PLCs CS Series, CJ Series, CP Series, NJ Series, or NX1P Mitsubishi Electric PLCs MELSEC Q Series, L Series, FX3 Series, or iQ-R Series KEYENCE PLCs KEYENCE KV Series
--------------------------------------	--

<b>Component Communications *1</b>	When Digital Temperature Controllers are connected, set points and RUN/STOP commands can be sent from the Digital Temperature Controller that is set as the master to the Digital Temperature Controllers that are set as slaves. Slope and offsets can be set for the set point. Number of connected Digital Temperature Controllers: 32 max. (including master)
<b>Copying *2</b>	When Digital Temperature Controllers are connected, the parameters can be copied from the Digital Temperature Controller that is set as the master to the Digital Temperature Controllers that are set as slaves.

MELSEC is a registered trademark of Mitsubishi Electric Corporation. KEYENCE is a registered trademark of Keyence Corporation.

\*1. A Temperature Controller with version 1.1 or higher is required. A Temperature Controller with version 2.1 or higher is required for the FX Series or the KV Series.

\*2. Both the programless communications and the component communications support the copying.

## Current Transformer (Order Separately) Ratings

	E54-CT1 E54-CT3	E54-CT1L E54-CT3L
<b>Dielectric strength</b>	1,000 VAC for 1 min	1,500 VAC for 1 min
<b>Vibration resistance</b>	50 Hz, 98 m/s <sup>2</sup>	
<b>Weight</b>	E54-CT1: Approx. 11.5 g E54-CT3: Approx. 50 g	E54-CT1L: Approx. 14 g E54-CT3L: Approx. 57 g
<b>Accessories</b>	E54-CT3 Only Armatures (2) Plugs (2)	None

## Heater Burnout Alarms and SSR Failure Alarms

<b>CT input (for heater current detection)</b>	Models with detection for singlephase heaters: One input Models with detection for singlephase or three-phase heaters: Two inputs
<b>Maximum heater current</b>	50 A AC
<b>Input current indication accuracy</b>	±5% FS ±1 digit max.
<b>Heater burnout alarm setting range *1</b>	0.1 to 49.9 A (in units of 0.1 A) Minimum detection ON time: 100 ms *3
<b>SSR failure alarm setting range *2</b>	0.1 to 49.9 A (in units of 0.1 A) Minimum detection OFF time: 100 ms *4

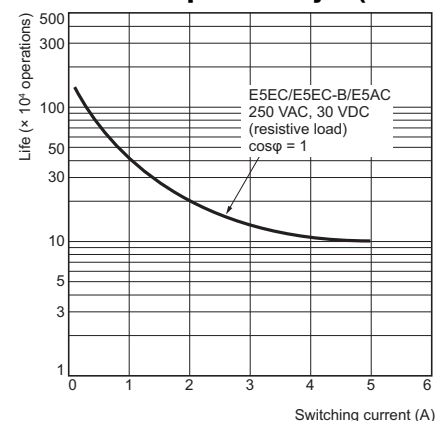
\*1. For heater burnout alarms, the heater current will be measured when the control output is ON, and the output will turn ON if the heater current is lower than the set value (i.e., heater burnout detection current value).

\*2. For SSR failure alarms, the heater current will be measured when the control output is OFF, and the output will turn ON if the heater current is higher than the set value (i.e., SSR failure detection current value).

\*3. The value is 30 ms for a control period of 0.1 s or 0.2 s.

\*4. The value is 35 ms for a control period of 0.1 s or 0.2 s.

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



# E5EC/E5EC-B/E5AC

## External Connections

### E5EC/E5AC (Screw Terminal Blocks)

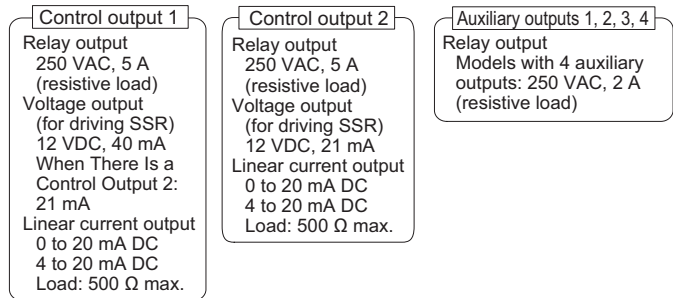
E5EC-□□ 4 □ 5 M - □□□□  
 (1) (2) (3) (4) (5) (6)

E5AC-□□ 4 □ 5 M - □□□□  
 (1) (2) (3) (4) (5) (6)

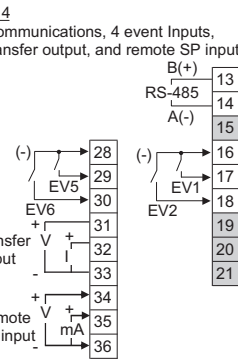
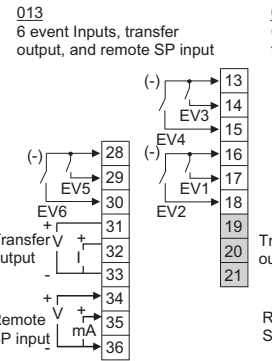
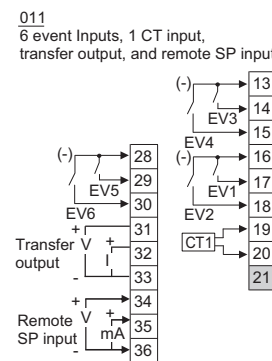
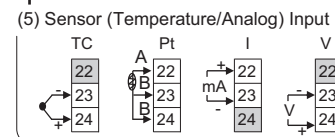
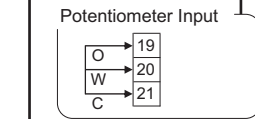
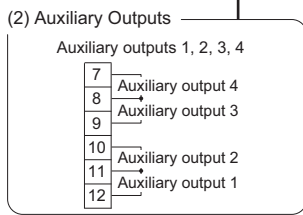
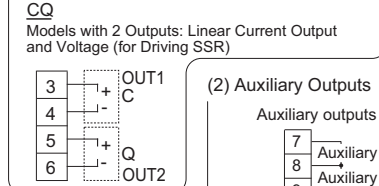
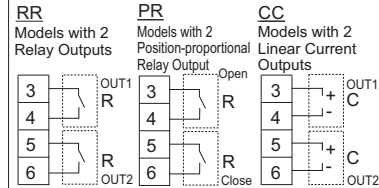
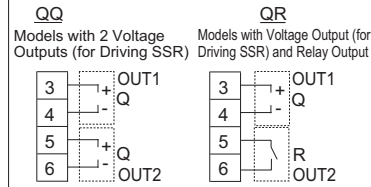
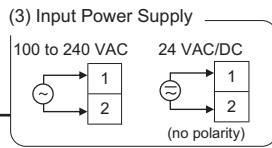
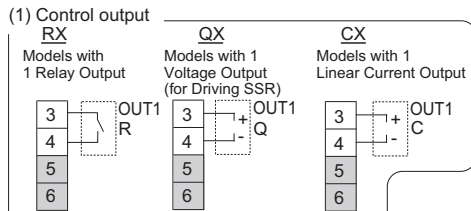
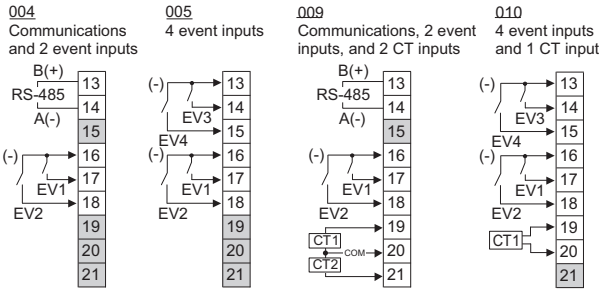
Terminal type

Terminal type

The E5EC is set for a K-type thermocouple (input type = 5) by default. An input error (5ERR) will occur if the input type setting does not agree with the temperature sensor. Check the input type.



#### (6) Options



Use no-voltage inputs for the event inputs. The polarity for non-contact inputs is given in parentheses.

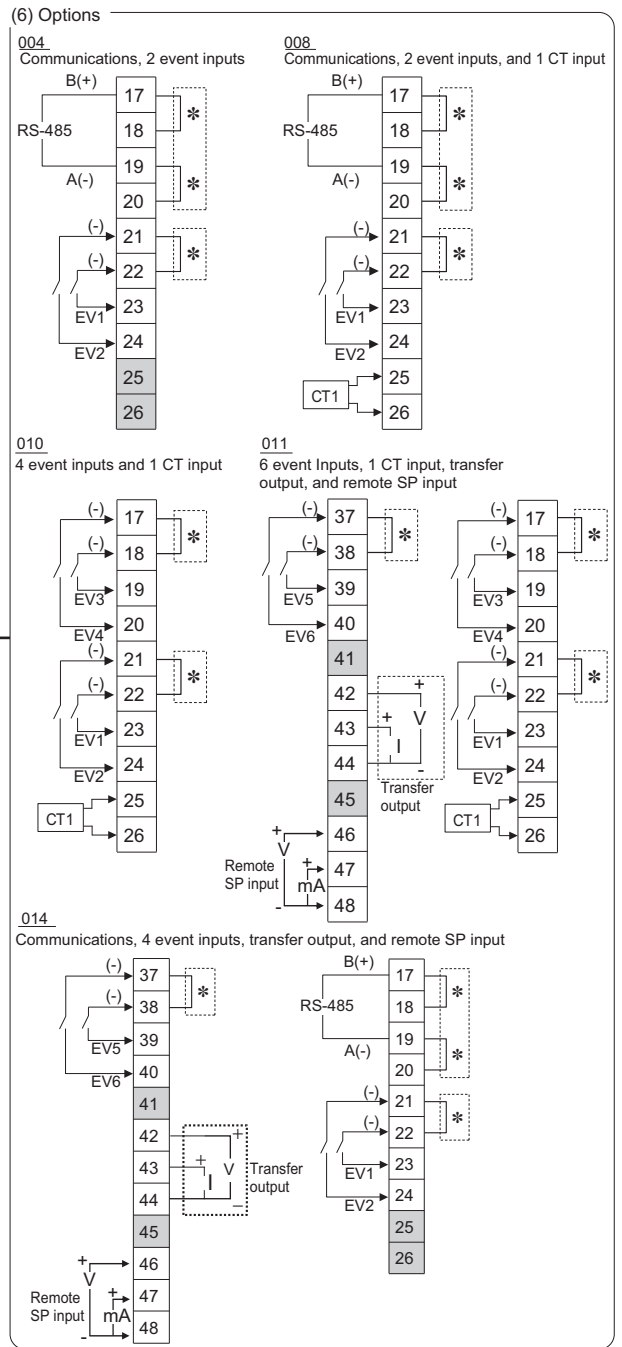
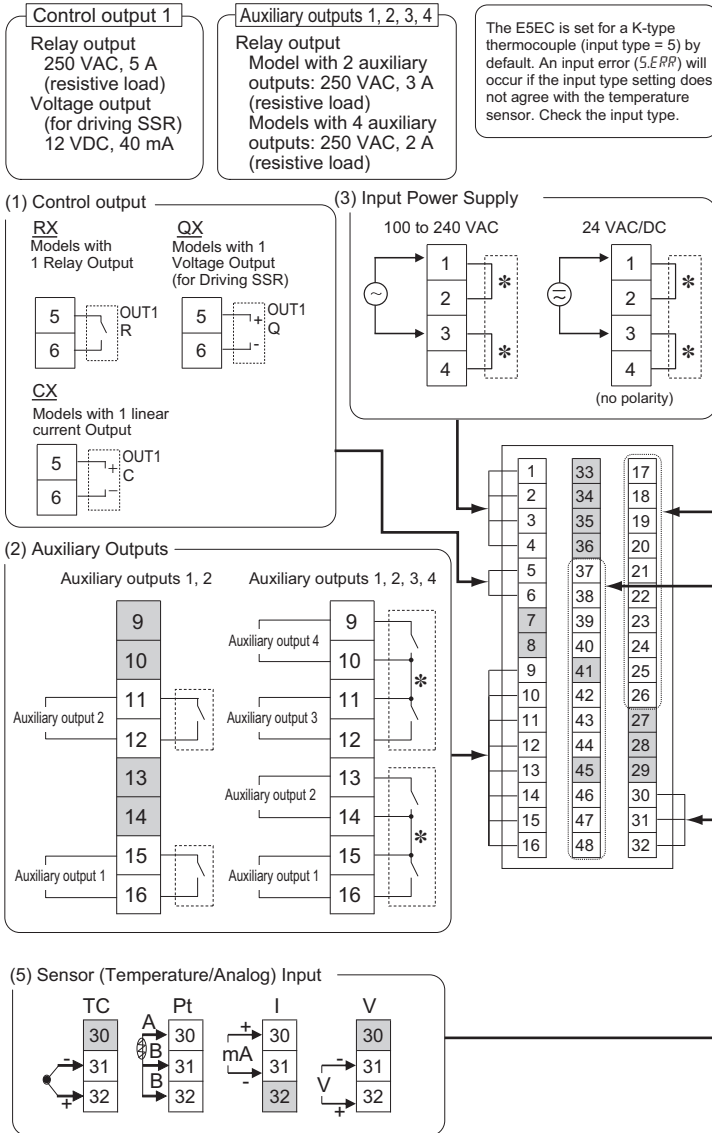
- Note:**
1. The application of the terminals depends on the model.
  2. Do not wire the terminals that are shown with a gray background.
  3. When complying with EMC standards, the cable that connects the sensor must be 30 m or less. If the cable length exceeds 30 m, compliance with EMC standards will not be possible.
  4. Connect M3 crimped terminals.
  5. Due to UL Listing requirements, use the E54-CT1L or E54-CT3L Current Transformer with the factory wiring (internal wiring). Use a UL category X0BA or X0BA7 current transformer that is UL Listed for field wiring (external wiring) and not the factory wiring (internal wiring).

E5EC-B (Push-In Plus Terminal Blocks)

E5EC-□□□□ B M - □□□□

(1) (2) (3) (4) (5) (6)

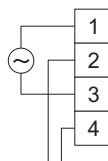
Terminal type



Use no-voltage inputs for the event inputs. The polarity for non-contact inputs is given in parentheses.

- Note:**
- The application of the terminals depends on the model.
  - Do not wire the terminals that are shown with a gray background.
  - When complying with EMC standards, the cable that connects the sensor must be 30 m or less. If the cable length exceeds 30 m, compliance with EMC standards will not be possible.
  - Refer to *Wiring Precautions for E5□C-B (Controllers with Push-In Plus Terminal Blocks)* on page 133 for wire specifications and wiring methods.
  - Common terminals are indicated with asterisks (\*). You can use the input power supply and communications common terminals for crossover wiring. Do not exceed the maximum number of Temperature Controllers given below if you use crossover wiring for the input power supply.  
100 to 240 VAC Controllers: 16 max.  
24 VAC/VDC Controllers: 8 max.

Wiring Example:



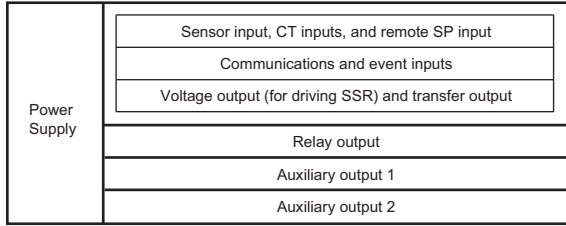
To another E5□C



- Due to UL Listing requirements, use the E54-CT1L or E54-CT3L Current Transformer with the factory wiring (internal wiring). Use a UL category X0BA or X0BA7 current transformer that is UL Listed for field wiring (external wiring) and not the factory wiring (internal wiring).

# E5EC/E5EC-B/E5AC

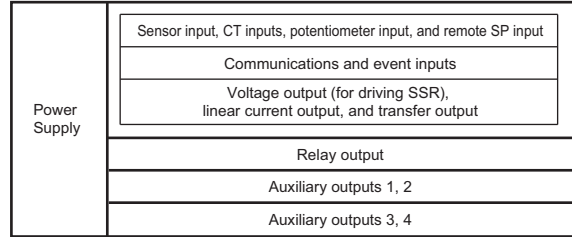
## Isolation/Insulation Block Diagrams



### Models with 2 Auxiliary Outputs



 : Reinforced insulation  
 : Functional isolation

### Models with 4 Auxiliary Outputs

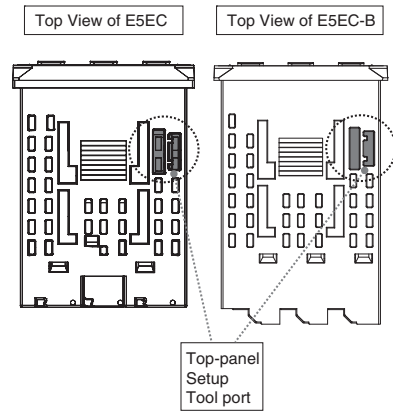
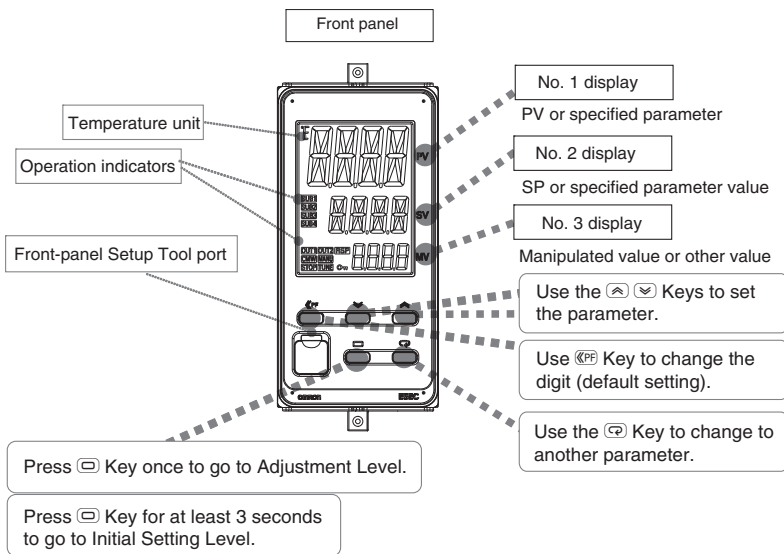


 : Reinforced insulation  
 : Functional isolation

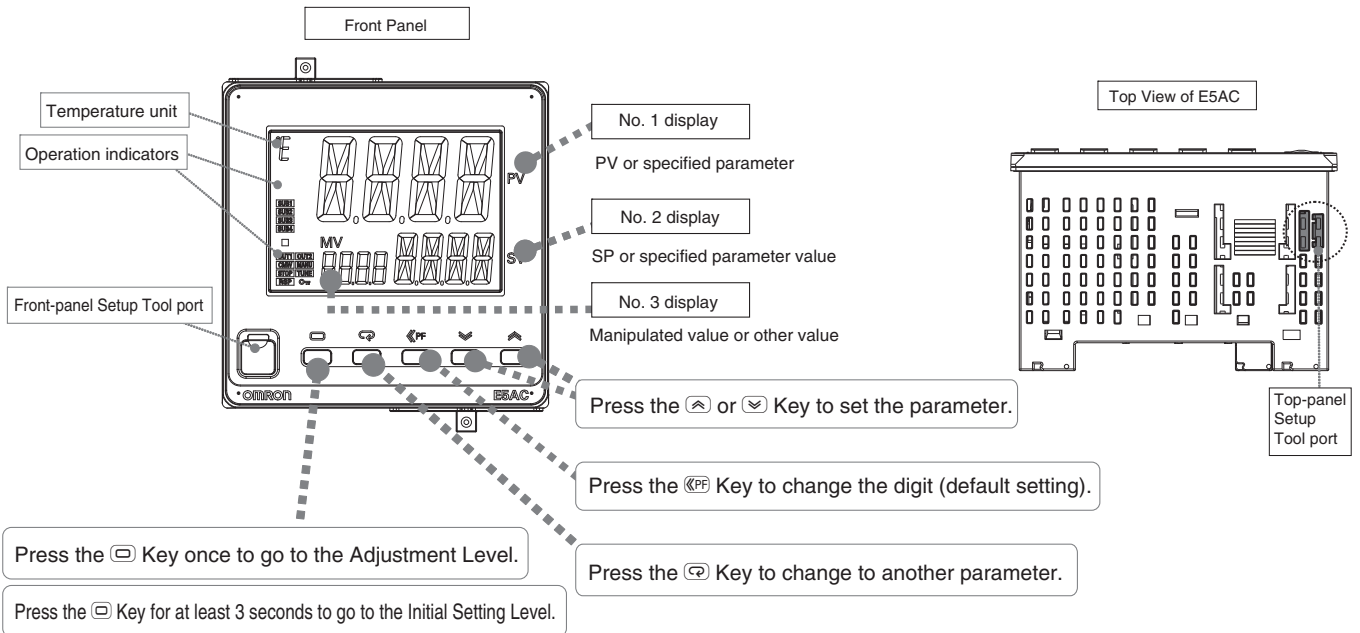
**Note:** Auxiliary outputs 1 to 2 and 3 to 4 are not insulated.

## Nomenclature

### E5EC/E5EC-B



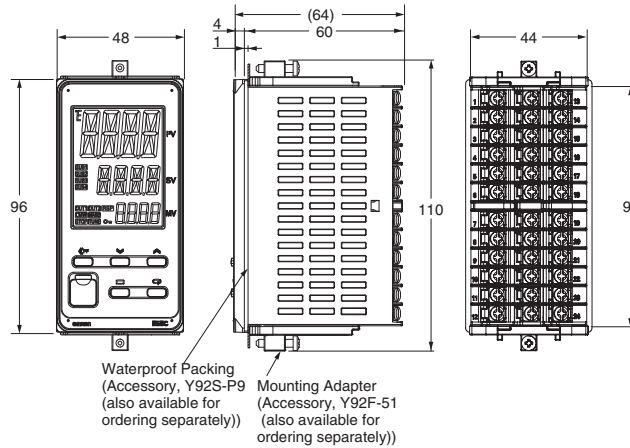
### E5AC



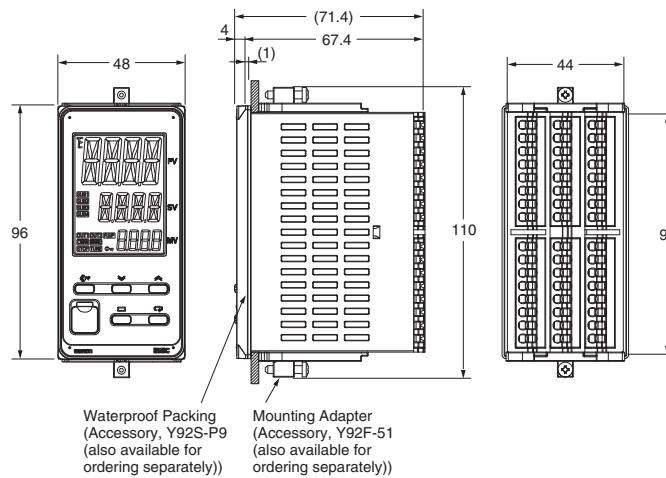
# Dimensions

## Controllers

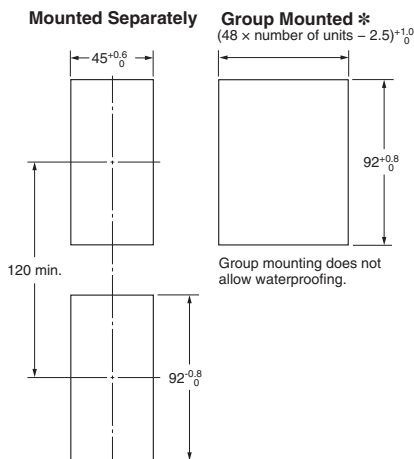
### E5EC



### E5EC-B

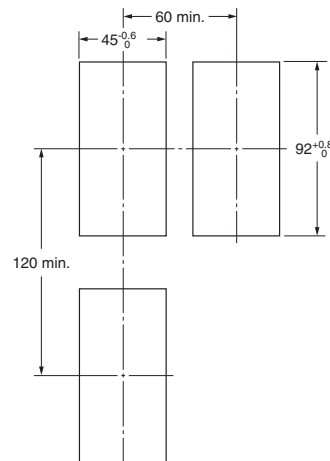


- Setup Tool ports are provided as standard feature. Use these ports to connect a computer to the Digital Temperature Controller. The E58-CIFQ2 USB-Serial Conversion Cable is required to connect to the port on the top panel. The E58-CIFQ2 USB-Serial Conversion Cable and E58-CIFQ2-E Communications Conversion Cable are required to connect to the port on the front panel. (You cannot leave either port connected constantly during operation.)



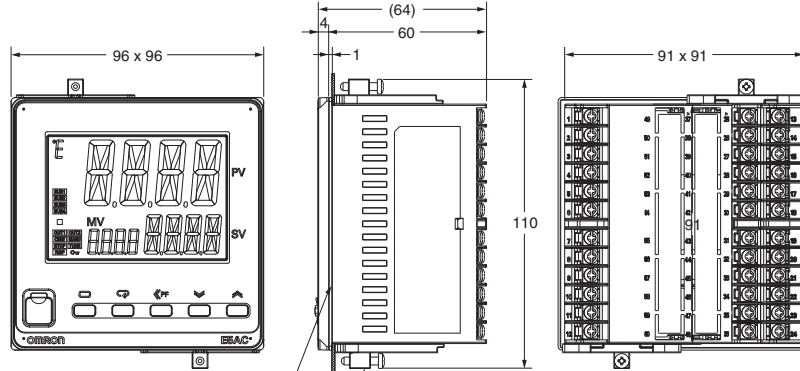
**\* E5EC:**

Selections for Control Outputs 1 and 2: QQ, QR, RR, CC, PR, or CQ  
 If you also specify 011, 013, or 014 for the option selection and use group mounting, the ambient temperature must be 45°C or less.  
 Maintain the following spacing when more than one Digital Controller is installed at an ambient temperature of 55°C.



- 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 allowable operating temperature specified in the specifications.

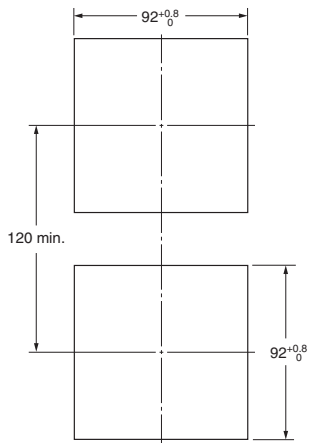
## E5AC



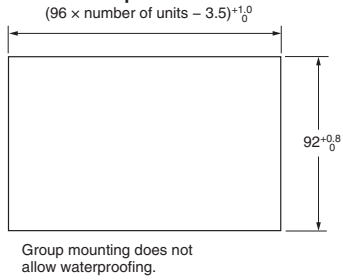
Waterproof Packing (Accessory, Y92S-P10 (also available for ordering separately))  
 Mounting Adapter (Accessory, Y92F-51 (also available for ordering separately))

- Setup Tool ports are provided as standard feature. Use these ports to connect a computer to the Digital Temperature Controller. The E58-CIFQ2 USB-Serial Conversion Cable is required to connect to the port on the top panel. The E58-CIFQ2 USB-Serial Conversion Cable and E58-CIFQ2-E Communications Conversion Cable are required to connect to the port on the front panel. (You cannot leave either port connected constantly during operation.)

### Mounted Separately



### Group Mounted

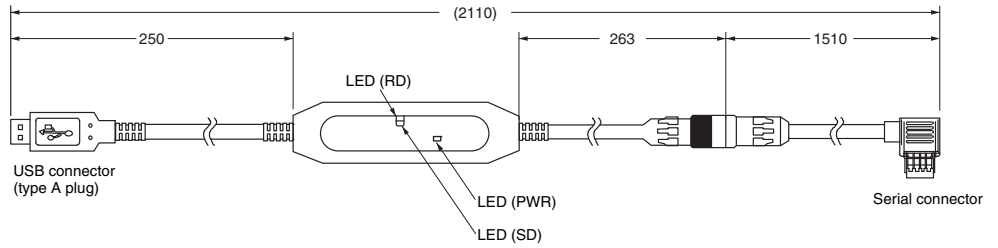


- Recommended panel thickness is 1 to 8 mm.
- Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers.)
- To mount the Controller so that it is waterproof, insert the waterproof packing onto the Controller.
- When two or more Controllers are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature specified in the specifications.

**Accessories (Order Separately)**

**USB-Serial Conversion Cable**

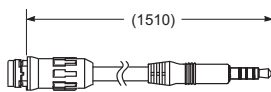
E58-CIFQ2



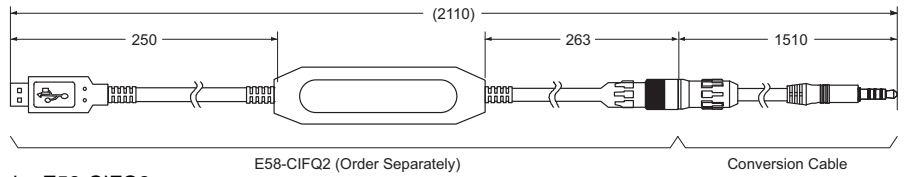
**Conversion Cable**

E58-CIFQ2-E

Conversion Cable



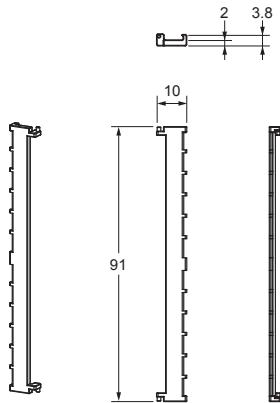
Connecting to the E58-CIFQ2 USB-Serial Conversion Cable



**Note:** Always use this product together with the E58-CIFQ2.

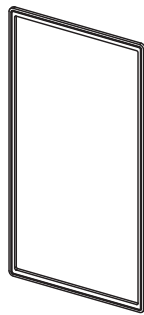
**Terminal Covers**

E53-COV24 (Three Covers provided.)

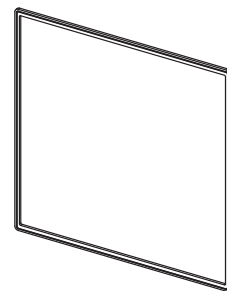


**Waterproof Packing**

Y92S-P9 (for DIN 48 × 96)



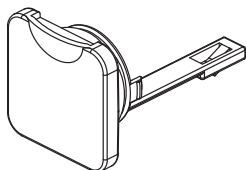
Y92S-P10 (for DIN 96 × 96)



The Waterproof Packing is provided with the Temperature Controller.  
 Order the Waterproof Packing separately if it becomes lost or damaged.  
 The degree of protection when the Waterproof Packing is used is IP66.  
 Also, keep the Port Cover on the front-panel Setup Tool port of the E5EC/E5EC-B/E5AC securely closed.  
 To maintain an IP66 degree of protection, the Waterproof Packing and the Port Cover for the front-panel Setup Tool port must be periodically replaced because they may deteriorate, shrink, or harden depending on the operating environment.  
 The replacement period will vary with the operating environment.  
 Check the required period in the actual application.  
 Use 3 years or sooner as a guideline.

**Setup Tool Port Cover for top panel**

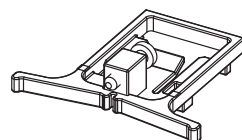
Y92S-P7



Order this Port Cover separately if the Port Cover on the front-panel Setup Tool port is lost or damaged. The Waterproof Packing must be periodically replaced because it may deteriorate, shrink, or harden depending on the operating environment.

**Mounting Adapter**

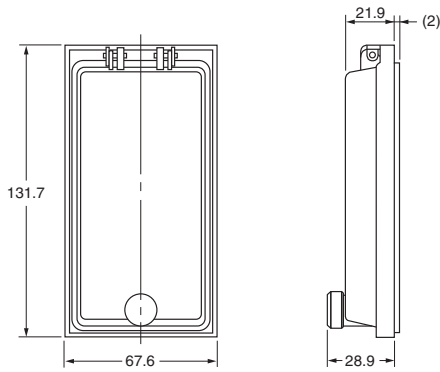
Y92F-51 (Two Adapters provided.)



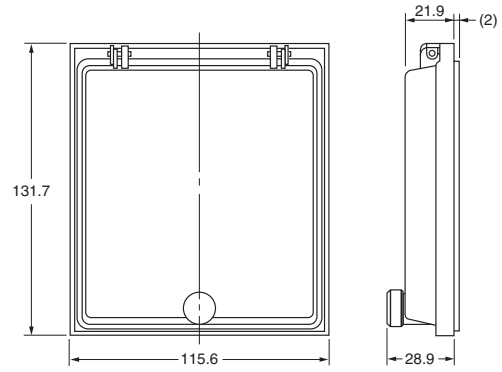
One pair is provided with the Controller.  
 Order the Mounting Adapter separately if it becomes lost or damaged.



## Watertight Cover Y92A-49N (48 × 96)

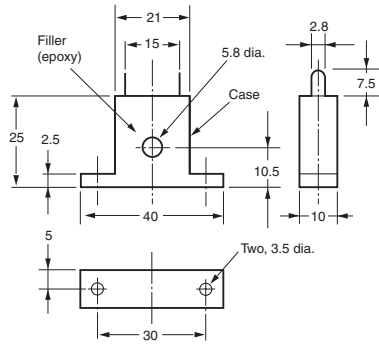
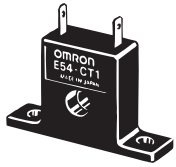


## Watertight Cover Y92A-96N (96 × 96)



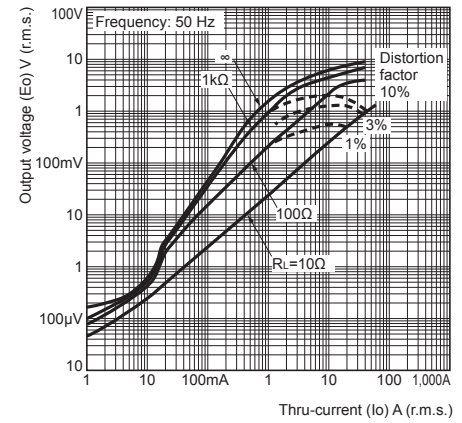
## Current Transformers

### E54-CT1

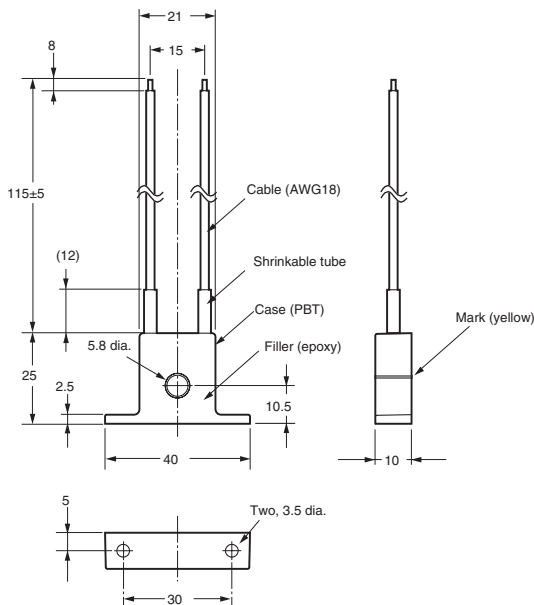
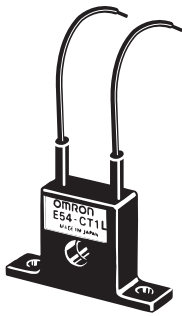


### Thru-current ( $I_o$ ) vs. Output Voltage ( $E_o$ ) (Reference Values) E54-CT1 or E54-CT1L

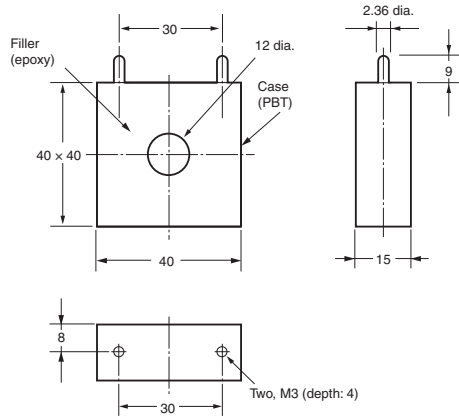
Maximum continuous heater current: 50 A (50/60 Hz)  
Number of windings: 400±2  
Winding resistance: 18±2 Ω



### E54-CT1L

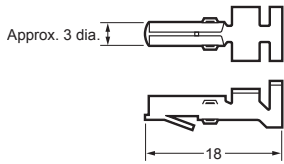


**E54-CT3**

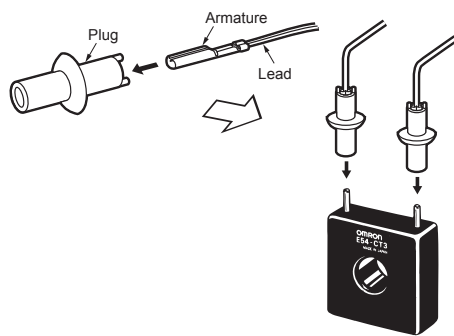


**E54-CT3 Accessories**

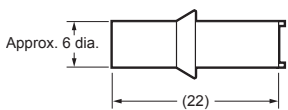
• **Armature**



**Connection Example**



• **Plug**



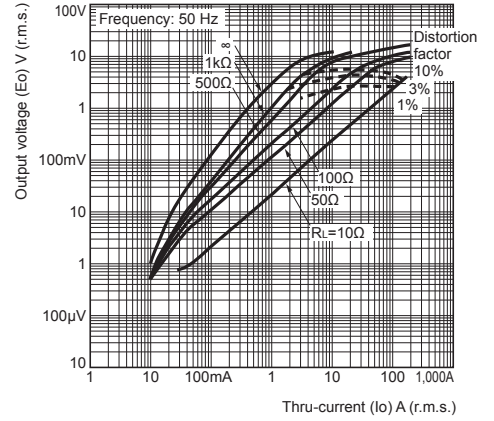
**Thru-current (Io) vs. Output Voltage (Eo)  
(Reference Values)  
E54-CT3 or E54-CT3L**

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

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

Number of windings: 400±2

Winding resistance: 8±0.8 Ω



**E54-CT3L**

