

# Digital Temperature Controller

## E5CC/E5EC/E5AC

The new standard in temperature control is  
higher in every respect

E5CC (48 × 48 mm) / E5EC (48 × 96 mm) / E5AC (96 × 96 mm)

Large White PV Display That's Easier to Read.  
Easy to Use, from Model Selection to  
Setup and Operation.  
A Complete Range of I/O Capacities,  
Functions, and Performance.  
Handles More Applications.



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**E5CC**

48 × 96 mm  
**E5EC**

96 × 96 mm  
**E5AC**

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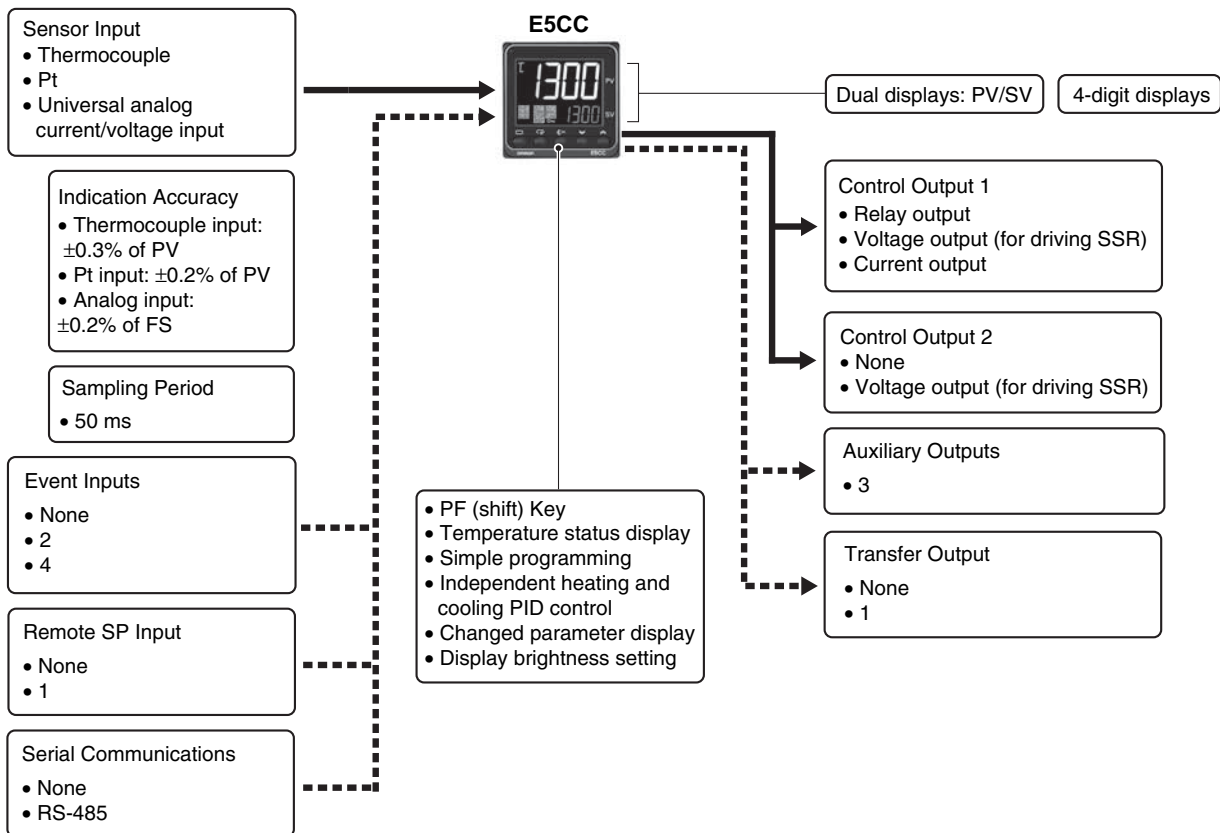
- The white PV display with a height of 15.2 mm improves visibility.
- High-speed sampling at 50 ms.
- Models are available with up to 3 auxiliary outputs, up to 4 event inputs, a transfer output, and a remote SP input to cover a wide range of applications.
- Short body with depth of only 60 mm.
- Set 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).
- Easy connections to a PLC with programless communications. Use component communications to link Temperature Controllers to each other.



48 × 48 mm  
E5CC

Refer to Safety Precautions on page 34.

## 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 Controllers User's Manual (Cat. No. H174)

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

## Model Number Legend and Standard Models

### Model Number Legend

E5CC-□□ □□□□-□□□□ (Example: E5CC-RX3A5M-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							
E5CC							48 × 48 mm						
							Control output 1			Control output 2			
	RX						Relay output			None			
	QX						Voltage output (for driving SSR)			None			
*1 *3	CX						Linear current output *2			None			
	QQ						Voltage output (for driving SSR)			Voltage output (for driving SSR)			
	CQ						Linear current output *2			Voltage output (for driving SSR)			
		3					3 (one common)						
			A				100 to 240 VAC						
			D				24 VAC/DC						
				5			Screw terminals (with cover)						
					M		Universal input						
							HB alarm and HS alarm	Communications	Event inputs	Remote SP Input	Transfer output		
						*1	000	---	---	---	---		
						*1	001	1	---	2	---		
						*1	003	2 (for 3-phase heaters)	RS-485	---	---		
						*3	004	---	RS-485	2	---		
							005	---	---	4	---		
							006	---	---	2		Provided.	
							007	---	---	2	Provided.	---	

\*1. Options with HB and HS alarms (001 and 003) cannot be selected if a current output is selected for the control output.

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

\*3. Option 004 can be selected only when "CX" is selected for the control outputs.

## 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.

## Optional Products (Order Separately)

### USB-Serial Conversion Cable

Model
E58-CIFQ2

### Terminal Covers

Model
E53-COV17
E53-COV23

**Note:** The E53-COV10 cannot be used.  
Refer to page 11 for the mounted dimensions.

### Waterproof Packing

Model
Y92S-P8

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

### Current Transformers (CTs)

Hole diameter	Model
5.8 mm	E54-CT1
12.0 mm	E54-CT3

### Adapter

Model
Y92F-45

**Note:** Use this Adapter when the panel has already been prepared for an E5B□ Controller.

### Waterproof Cover

Model
Y92A-48N

### Mounting Adapter

Model
Y92F-49

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

### DIN Track Mounting Adapter

Model
Y92F-52

### Front Covers

Type	Model
Hard Front Cover	Y92A-48H
Soft Front Cover	Y92A-48D

### CX-Thermo Support Software

Model
EST2-2C-MV4

**Note:** CX-Thermo version 4.5 or higher is required for the E5CC.  
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)).

## Specifications

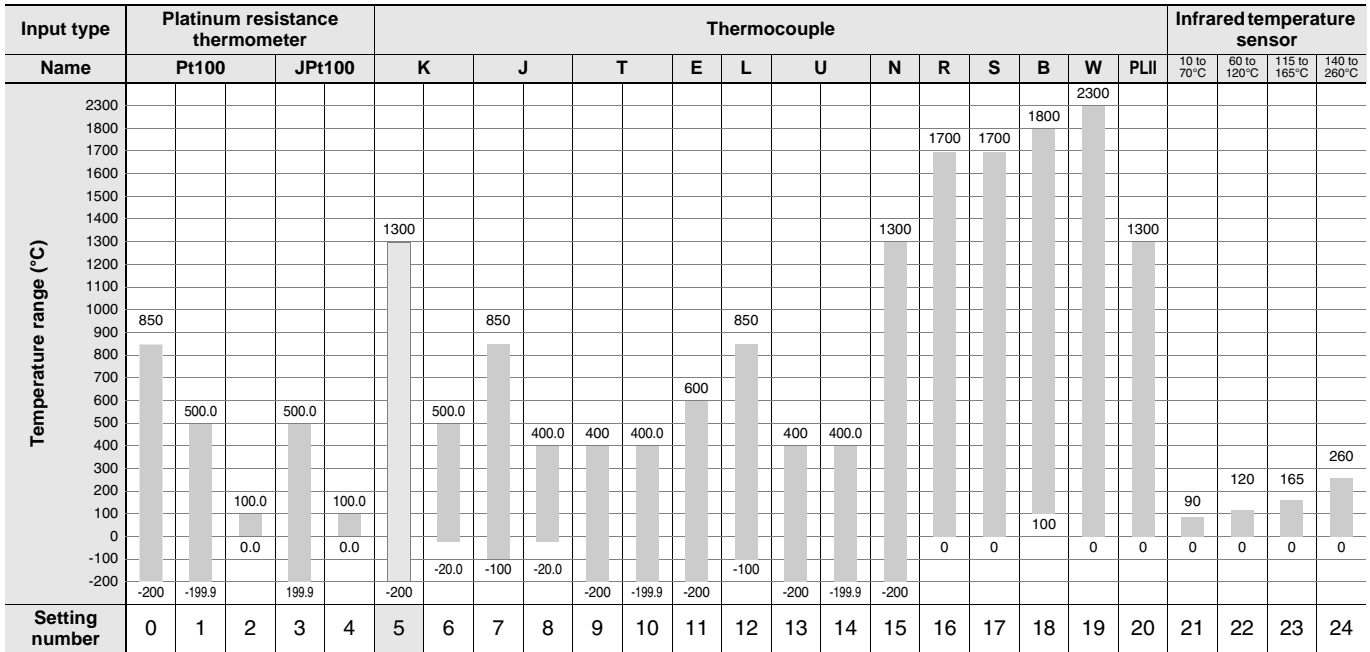
### Ratings

<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>	Models with option selection of 000: 5.2 VA max. at 100 to 240 VAC, and 3.1 VA max. at 24 VAC or 1.6 W max. at 24 VDC All other models: 6.5 VA max. at 100 to 240 VAC, and 4.1 VA max. at 24 VAC or 2.3 W max. at 24 VDC	
<b>Sensor input</b>	Models with temperature inputs Thermocouple: K, J, T, E, L, U, N, R, S, B, W, or PL II Platinum resistance thermometer: Pt100 or JPt100 Infrared temperature sensor (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/THB.)	
<b>Control method</b>	ON/OFF control or 2-PID control (with auto-tuning)	
<b>Control output</b>	<b>Relay output</b>	SPST-NO, 250 VAC, 3 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 5 V, 10 mA *
	<b>Voltage output (for driving SSR)</b>	Output voltage: 12 VDC ±20% (PNP), max. load current: 21 mA, with short-circuit protection circuit
	<b>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>	3
	<b>Output specifications</b>	N.O. relay outputs, 250 VAC, Models with 3 outputs: 2 A (resistive load), Electrical life: 100,000 operations, Minimum applicable load: 10 mA at 5 V
<b>Event input</b>	<b>Number of inputs</b>	2 or 4 (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>	Contact output: 4 to 20 mA DC, load: 500 Ω max., resolution: approx. 10,000 Linear voltage output: 1 to 5 VDC, load: 1 kΩ max, resolution: Approx. 10,000
<b>Setting method</b>	Digital setting using front panel keys	
<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>Indication method</b>	11-segment digital display and individual indicators Character height: PV: 15.2 mm, SV: 7.1 mm	
<b>Multi SP</b>	Up to eight set points (SP0 to SP7) can be saved and selected using event inputs, key operations, or serial communications.	
<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, simple calculations, 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 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)	

\* You cannot select a relay output or current output for control output 2.

## Input Ranges

### ● Thermocouple/Platinum Resistance Thermometer (Universal inputs)



Shaded settings are the default settings.

The applicable standards for the input types are as follows:

K, J, T, E, N, R, S, B: JIS C 1602-1995, IEC 60584-1

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

L: Fe-CuNi, DIN 43710-1985

Pt100: JIS C 1604-1997, IEC 60751

U: Cu-CuNi, DIN 43710-1985

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

W: W5Re/W26Re, ASTM E988-1990

### ● Analog input

Input type	Current		Voltage		
Input specification	4 to 20 mA	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	25	26	27	28	29

## Alarm Outputs

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

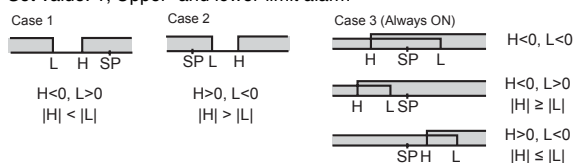
Auxiliary outputs are allocated for alarms. ON delays and OFF delays (0 to 999 s) can also be specified.

**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.

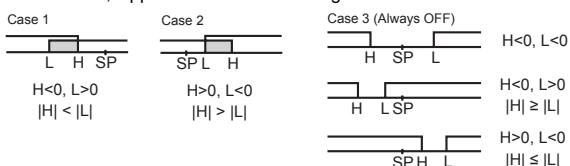
Set value	Alarm type	Alarm output operation		Description of function
		When alarm value X is positive	When alarm value X is negative	
0	Alarm function OFF	Output OFF		No alarm
1	Upper- and lower-limit *1		*2	Set the deviation in the set point by setting the alarm upper limit (H) and alarm lower limit (L). The alarm is ON when the PV is outside this deviation range.
2	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 deviation in the set point by setting the alarm upper limit (H) and 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		*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			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			This alarm type turns ON the alarm when the set point (SP) is smaller than the alarm value (X).
16	MV absolute value upper limit *9			This alarm type turns ON the alarm when the manipulated variable (MV) is higher than the alarm value (X).
17	MV absolute value lower limit *9			This alarm type turns ON the alarm when the manipulated variable (MV) is smaller than the alarm value (X).
18	RSP absolute value upper limit *10			The alarm will turn ON when the remote SP (RSP) is larger than the alarm value (X).
19	RSP absolute value lower limit *10			The alarm will turn ON when the remote SP (RSP) is smaller 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 E5CC Digital Controllers User's Manual (Cat. No. H174) for information on the operation of the standby sequence.

\*7 Refer to the E5CC Digital Controllers User's Manual (Cat. No. H174) for information on the loop burnout alarm (LBA).

\*8 Refer to the E5CC Digital 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: ( $\pm 0.3\%$ of indicated value or $\pm 1^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max. *1 Platinum resistance thermometer: ( $\pm 0.2\%$ of indicated value or $\pm 0.8^\circ\text{C}$ , whichever is greater) $\pm 1$ digit Analog input: $\pm 0.2\%$ FS $\pm 1$ digit max. CT input: $\pm 5\%$ FS $\pm 1$ digit max.
<b>Transfer output accuracy</b>		$\pm 0.3\%$ FS max.
<b>Remote SP Input Type</b>		$\pm 0.2\%$ FS $\pm 1$ digit max.
<b>Influence of temperature *2</b>		Thermocouple input (R, S, B, W, PL II): ( $\pm 1\%$ of PV or $\pm 10^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max. Other thermocouple input: ( $\pm 1\%$ of PV or $\pm 4^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max. *3 Platinum resistance thermometer: ( $\pm 1\%$ of PV or $\pm 2^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max. Analog input: ( $\pm 1\%$ FS) $\pm 1$ digit max. CT input: ( $\pm 5\%$ FS) $\pm 1$ digit max. Remote SP input: ( $\pm 1\%$ FS) $\pm 1$ digit max.
<b>Influence of voltage *2</b>		
<b>Input sampling period</b>		50 ms
<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>		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)</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>Affect of signal source resistance</b>		Thermocouple: $0.1^\circ\text{C}/\Omega$ max. (100 $\Omega$ max.) Platinum resistance thermometer: $0.1^\circ\text{C}/\Omega$ max. (10 $\Omega$ max.)
<b>Insulation resistance</b>		20 M $\Omega$ min. (at 500 VDC)
<b>Dielectric strength</b>		2,300 VAC, 50 or 60 Hz for 1 min (between terminals with different charge)
<b>Vibration</b>	<b>resistance</b>	10 to 55 Hz, 20 m/s <sup>2</sup> for 10 min each in X, Y, and Z directions
	<b>Malfunction</b>	10 to 55 Hz, 20 m/s <sup>2</sup> for 2 hrs each in X, Y, and Z directions
<b>Destruction</b>	<b>Shock resistance</b>	100 m/s <sup>2</sup> , 3 times each in X, Y, and Z directions
	<b>Malfunction</b>	300 m/s <sup>2</sup> , 3 times each in X, Y, and Z directions
<b>Weight</b>		Controller: Approx. 120 g, Mounting Bracket: Approx. 10 g
<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>		CX-Thermo version 4.5 or higher
<b>Setup Tool port</b>		E5CC top panel: An E58-CIFQ2 USB-Serial Conversion Cable is used to connect to a USB port on the computer. *5
<b>Standards</b>	<b>Approved standards</b>	UL 61010-1, CSA C22.2 No. 611010-1 (evaluated by UL), KOSHA certified (some models) *6, Korean Radio Waves Act (Act 10564)
	<b>Conformed standards</b>	EN 61010-1 (IEC 61010-1): Pollution level 2, overcurrent category II, Lloyd's standards *7
<b>EMC</b>		EMI: EN61326 Radiated Interference Electromagnetic Field Strength: EN 55011 Group 1, class A Noise Terminal Voltage: EN 55011 Group 1, class A EMS: EN 61326 ESD Immunity: EN 61000-4-2 Electromagnetic Field Immunity: EN 61000-4-3 Burst Noise Immunity: EN 61000-4-4 Conducted Disturbance Immunity: EN 61000-4-6 Surge Immunity: EN 61000-4-5 Voltage Dip/Interrupting Immunity: EN 61000-4-11

\*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 temperatures is  $\pm 2^\circ\text{C} \pm 1$  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 in the 400 to 800°C range is  $\pm 3^\circ\text{C}$  max. The indication accuracy of the R and S thermocouples at a temperature of 200°C max. is  $\pm 3^\circ\text{C} \pm 1$  digit max. The indication accuracy of W thermocouples is  $\pm 0.3$  of PV or  $\pm 3^\circ\text{C}$ , whichever is greater,  $\pm 1$  digit max. The indication accuracy of PL II thermocouples is  $\pm 0.3$  of PV or  $\pm 2^\circ\text{C}$ , whichever is greater,  $\pm 1$  digit max.

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

\*3 K thermocouple at -100°C max.:  $\pm 10^\circ\text{C}$  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 Access the following website for information on certified models. <http://www.ia.omron.com/support/models/index.html>

\*7 Refer to information on maritime standards in *Shipping Standards* on page 36 for compliance with Lloyd's Standards.



## USB-Serial Conversion Cable

Applicable OS	Windows 2000, XP, Vista, or 7
Applicable software	CX-Thermo version 4.5 or higher
Applicable models	E5CC/E5EC/E5AC and E5CB
USB interface standard	Conforms to USB Specification 1.1.
DTE speed	38400 bps
Connector specifications	Computer: USB (type A plug) Digital Temperature Controller: Setup Tool port
Power supply	Bus power (Supplied from USB host controller.)*
Power supply voltage	5 VDC
Current consumption	450 mA max.
Output voltage	4.7±0.2 VDC (Supplied from USB-Serial Conversion Cable to the Digital Temperature Controller.)
Output current	250 mA max. (Supplied from USB-Serial Conversion Cable to the Digital Temperature Controller.)
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. 120 g

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

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

**Note:** A driver must be installed in the personal computer. Refer to installation information in the operation manual for the Conversion Cable.

## Communications Specifications

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

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

## Communications Functions

Programless communications*	<ul style="list-style-type: none"> <li>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 Temperature Controllers: 16 max.</li> </ul> <p>Applicable PLCs</p> <ul style="list-style-type: none"> <li>OMRON PLCs SYSMAC CS Series, CJ Series, or CP Series</li> <li>Mitsubishi Electric PLCs MELSEC Q Series or L Series</li> </ul>
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Communications between components*	<ul style="list-style-type: none"> <li>When Temperature Controllers are connected, the parameters can be copied from the Temperature Controller that is set as the master to Temperature Controllers that are set as slaves. Number of connected Temperature Controllers: 16 max. (including master)</li> <li>When Temperature Controllers are connected, set points and RUN/STOP commands can be sent from the Temperature Controller that is set as the master to Temperature Controllers that are set as slaves. Slope and offsets can be set for the set point. Number of connected Temperature Controllers: 16 max. (including master)</li> </ul>
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\* A Temperature Controller with version 1.1 or higher is required.

## Current Transformer (Order Separately) Ratings

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

## Heater Burnout Alarms and SSR Failure Alarms

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

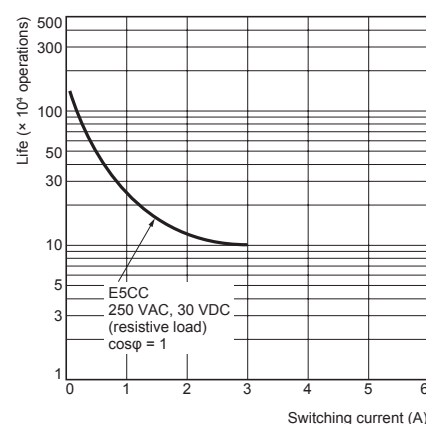
\*1 For heater burnout alarms, the heater current will be measured when the control output is ON, and the output will turn ON if the heater current is lower than the set value (i.e., heater burnout detection current value).

\*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.

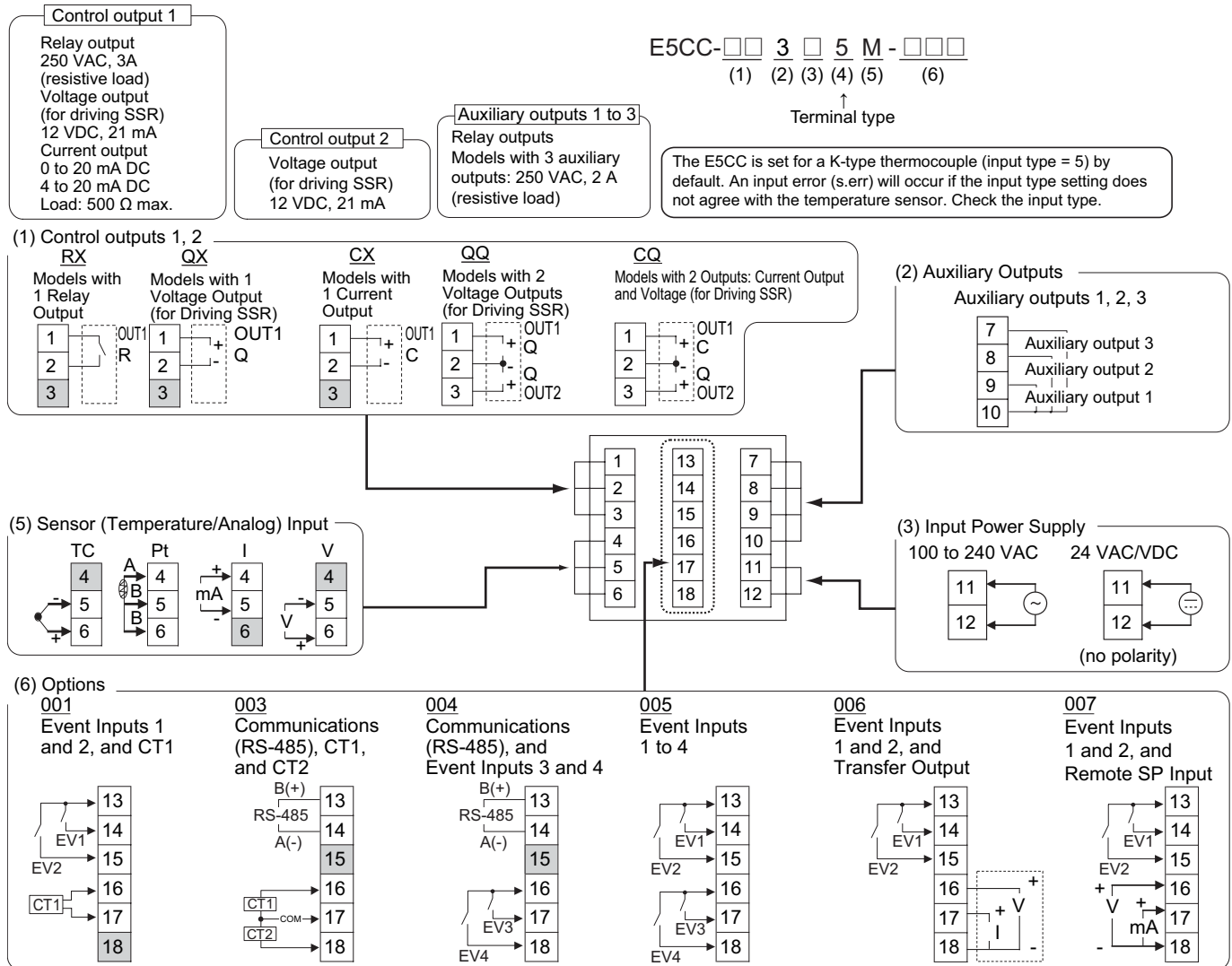
## Electrical Life Expectancy Curve for Relays (Reference Values)



# E5CC

## External Connections

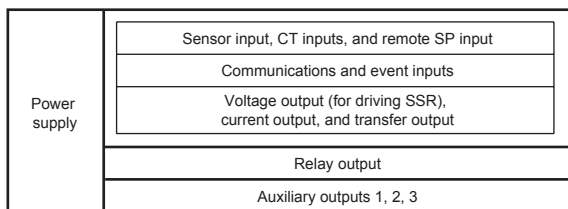
### E5CC



- 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.
  - Connect M3 crimped terminals.

## Isolation/Insulation Block Diagrams

### Models with 3 Auxiliary Outputs

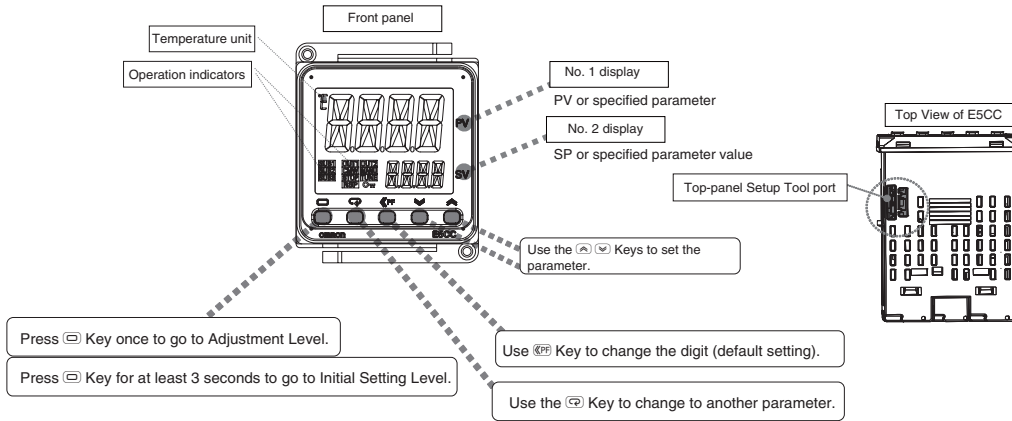


- : Reinforced insulation  
 : Functional isolation

**Note:** Auxiliary outputs 1 to 3 are not isolated.

Nomenclature

E5CC

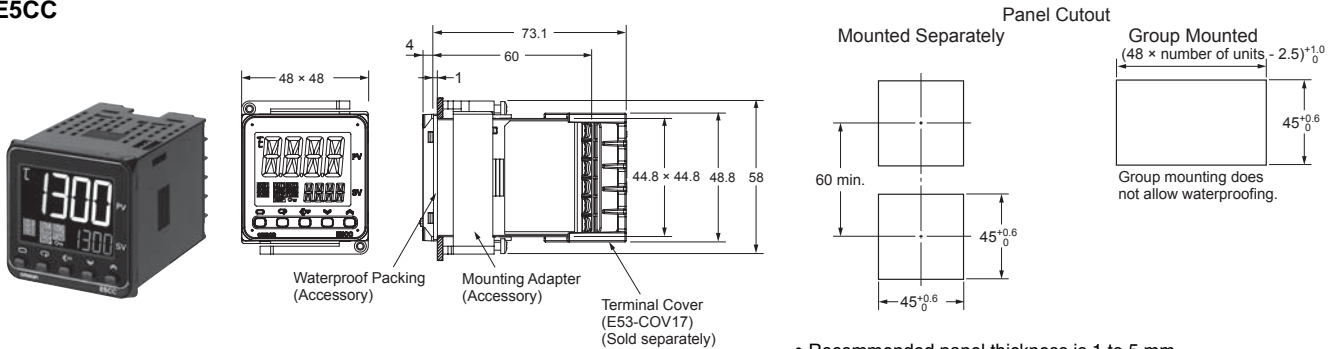


Dimensions

(Unit: mm)

Controllers

E5CC



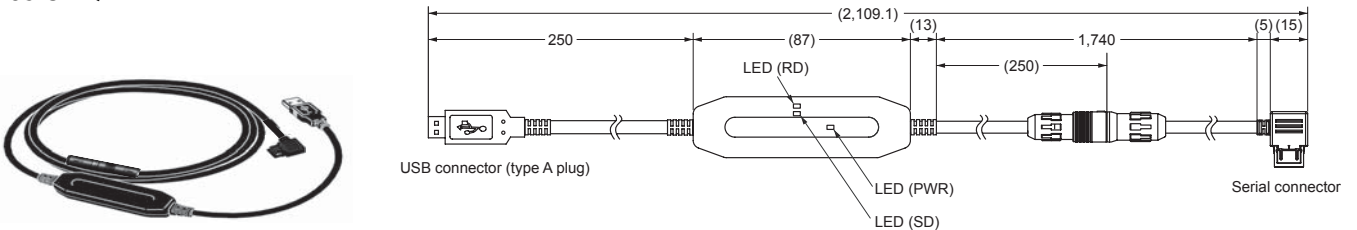
The Setup Tool port is on the top of the Temperature Controller. It is used to connect the Temperature Controller to the computer to use the Setup Tool. The E58-CIFQ2 USB-Serial Conversion Cable is required to make the connection. Refer to the instructions that are provided with the USB-Serial Conversion Cable for the connection procedure.

**Note:** Do not leave the USB-Serial Conversion Cable connected when you use the Temperature Controller.

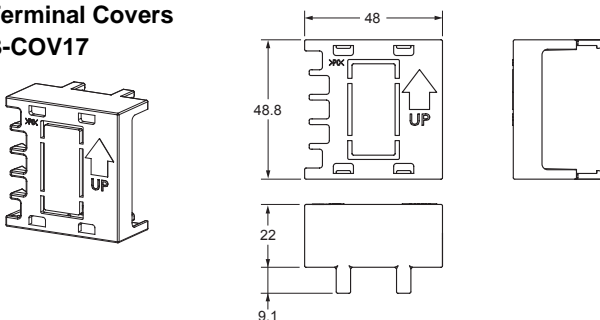
- Recommended panel thickness is 1 to 5 mm.
- Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers.)
- To mount the Controller so that it is waterproof, insert the waterproof packing onto the Controller.
- When two or more Controllers are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature specified in the specifications.
- To attach the USB-Serial Conversion Cable to the control panel, use a panel thickness of 1 to 2.5 mm.

Accessories (Order Separately)

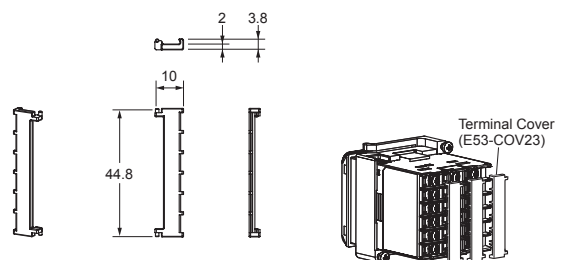
● USB-Serial Conversion Cable  
E58-CIFQ2



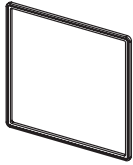
● Terminal Covers  
E53-COV17



● Terminal Covers  
E53-COV23 (Three Covers provided.)



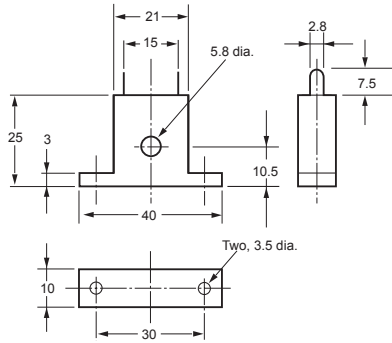
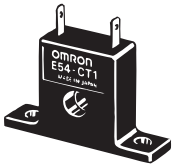
● Waterproof Packing  
Y92S-P8 (for DIN 48 × 48)



The Waterproof Packing is provided with the Temperature Controller.  
Order the Waterproof Packing separately if it becomes lost or damaged.  
The Waterproof Packing can be used to achieve an IP66 degree of protection.  
(Deterioration, shrinking, or hardening of the waterproof packing may occur depending on the operating environment. Therefore, periodic replacement is recommended to ensure the level of waterproofing specified in IP66. The time for periodic replacement depends on the operating environment. Be sure to confirm this point at your site.  
Consider three years a rough standard.)  
The Waterproof Packing does not need to be attached if a waterproof structure is not required.

● Current Transformers

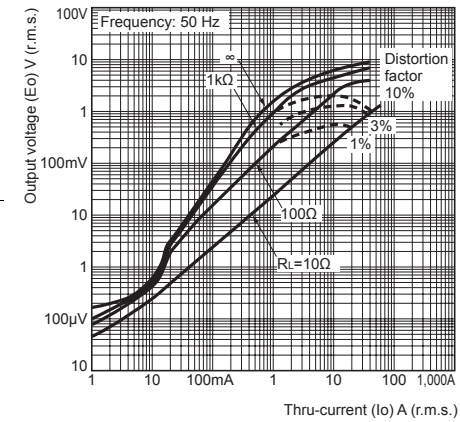
E54-CT1



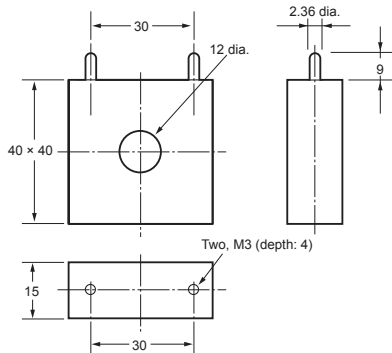
Thru-current (Io) vs. Output Voltage (Eo)  
(Reference Values)

E54-CT1

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



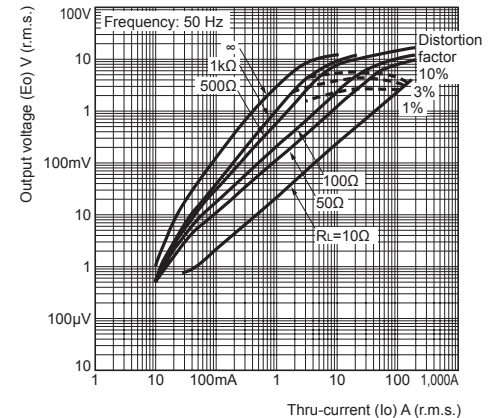
E54-CT3



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

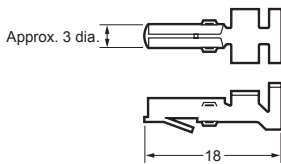
E54-CT3

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

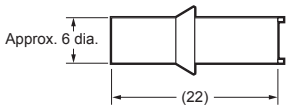


E54-CT3 Accessory

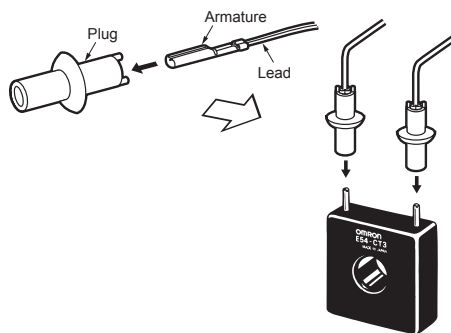
• Armature



• Plug



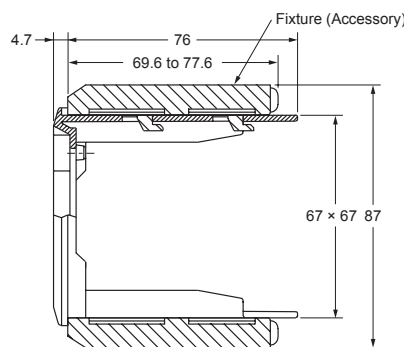
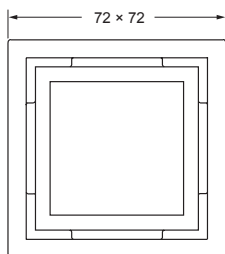
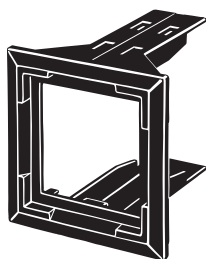
Connection Example



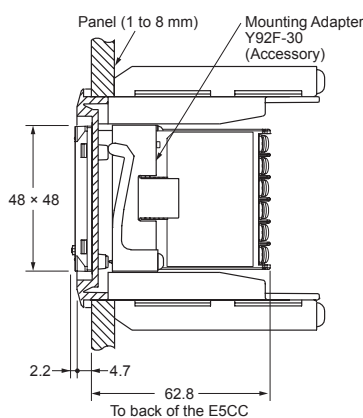
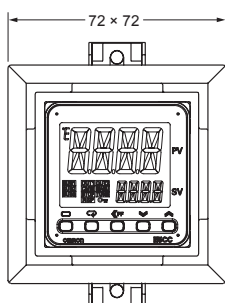
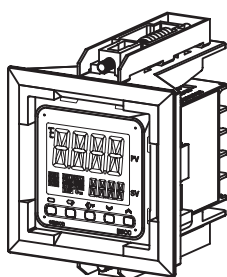
● Adapter

Y92F-45

- Note:** 1. Use this Adapter when the Front Panel has already been prepared for the E5B□.  
 2. Only black is available.  
 3. You cannot use the E58-CIFQ2 USB-Serial Conversion Cable if you use the Y92F-45 Adapter. To use the USB-Serial Conversion Cable to make the settings, do so before you mount the Temperature Controller in the panel.



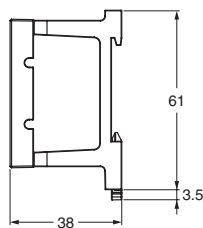
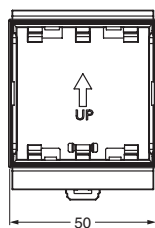
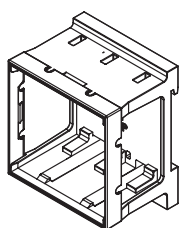
Mounted to E5CC



● DIN Track Mounting Adapter

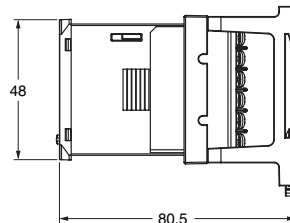
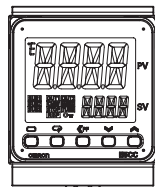
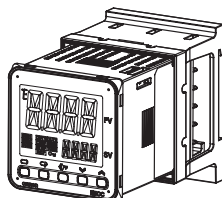
Y92F-52

- Note:** This Adapter cannot be used together with the Terminal Cover. Remove the Terminal Cover to use the Adapter.

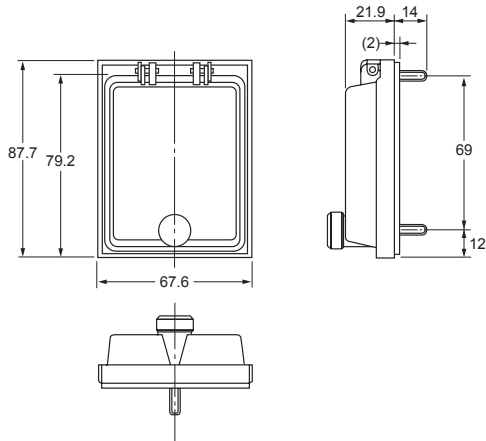


This Adapter is used to mount the E5CC to a DIN Track. If you use the Adapter, there is no need for a plate to mount in the panel or to drill mounting holes in the panel.

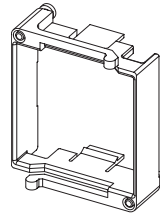
Mounted to E5CC



● **Watertight Cover**  
Y92A-48N



● **Mounting Adapter**  
Y92F-49

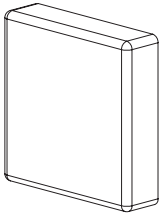


The Mounting Adapter is provided with the Temperature Controller. Order this Adapter separately if it becomes lost or damaged.

● **Protective Cover**  
Y92A-48D

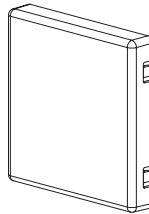
**Note:** This Protective Cover cannot be used if the Waterproof Packing is installed.

This Protective Cover is soft type. It is able to operate the controller with using this cover.



● **Protective Cover**  
Y92A-48H

This Protective Cover is hard type. Please use it for the mis-operation prevention etc.





# Digital Temperature Controller

# E5EC/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.**

**A Complete Range of I/O Capacities,  
Functions, and Performance.  
Handles More Applications.**

- A white LCD PV display with a height of approx. 18 mm for the E5EC and 25 mm for the E5AC improves visibility.
- 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).
- High-speed sampling at 50 ms.
- Models are available with up to 4 auxiliary outputs, up to 6 event inputs, a transfer output, and a remote SP input to cover a wide range of applications.
- Short body with depth of only 60 mm.
- Easy connections to a PLC with programless communications. Use component communications to link Temperature Controllers to each other.
- The new position-proportional control models allow you to control valves as well.

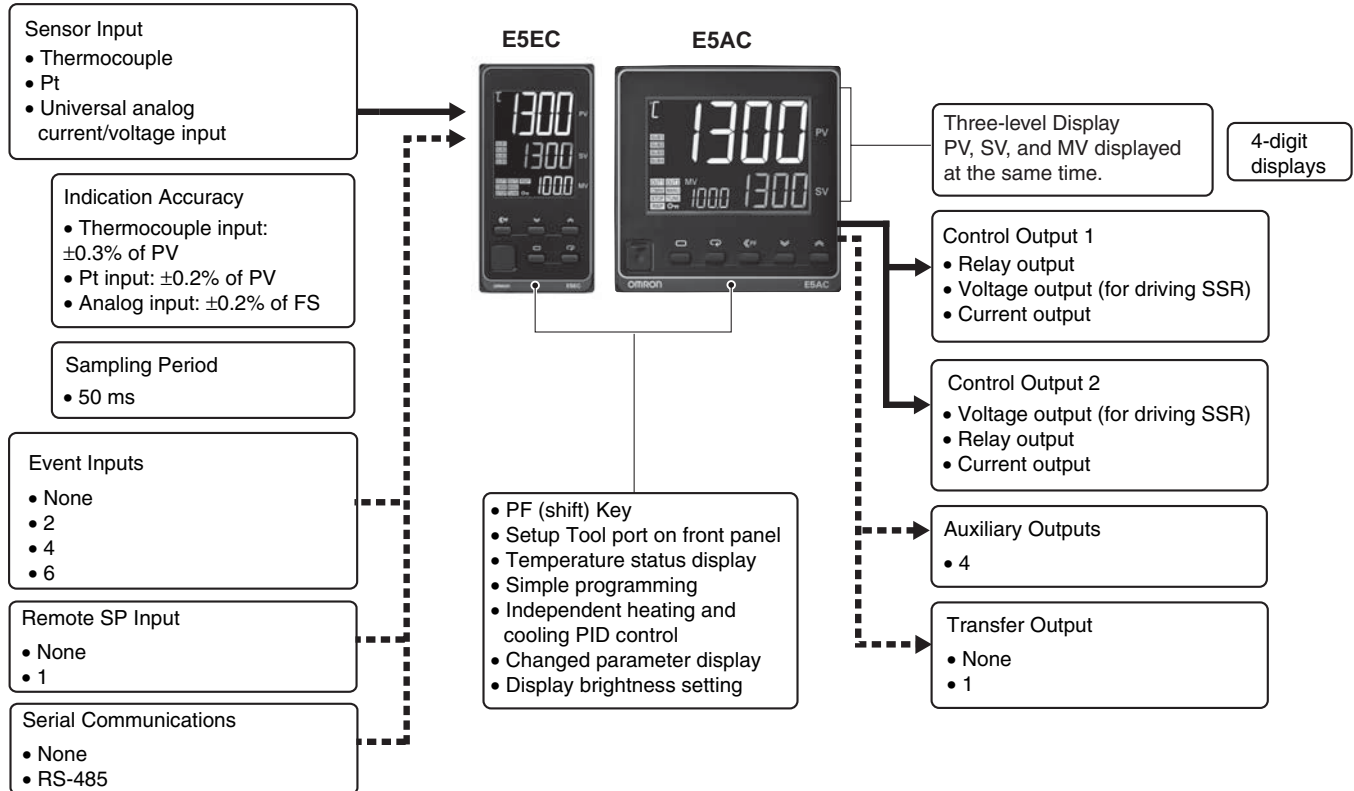


48 × 96 mm  
E5EC

96 × 96 mm  
E5AC

Refer to Safety Precautions on page 34.

## 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 Controllers User's Manual (Cat. No. H174)

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



## Model Number Legend and Standard Models

### Model Number Legend

E5EC-□□ □ □ □ □ -□□□□ (Example: E5EC-RX4A5M-000)

① ② ③ ④ ⑤ ⑥

E5AC-□□ □ □ □ □ -□□□□ (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					
E5EC								48 × 96 mm				
E5AC								96 × 96 mm				
								<b>Control output 1</b>	<b>Control output 2</b>			
	RX							Relay output	None			
	QX							Voltage output (for driving SSR)	None			
*2	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			
	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				
	<b>Control outputs 1 and 2</b>				5			Screw terminals (with cover)				
						M		Universal input				
Option selection conditions *1	For RX, QX, QQ, QR, RR, or CQ	For CX or CC	For PR					<b>HB alarm and HS alarm</b>	<b>Communications</b>	<b>Event inputs</b>	<b>Remote SP Input</b>	<b>Transfer output</b>
	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.

## Heating and Cooling Control

### I 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.

## 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

Model
E53-COV24

### Waterproof Packing

Applicable Controller	Model
E5EC	Y92S-P9
E5AC	Y92S-P10

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

### Waterproof Cover

Applicable Controller	Model
E5EC	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

**(Two Adapters are included.)**

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

### Current Transformers (CTs)

Hole diameter	Model
5.8 mm	E54-CT1
12.0 mm	E54-CT3

### CX-Thermo Support Software

Model
EST2-2C-MV4

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

## 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</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>		Models with temperature inputs Thermocouple: K, J, T, E, L, U, N, R, S, B, W, or PL II Platinum resistance thermometer: Pt100 or JPt100 Infrared temperature sensor (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/THB.)
<b>Control method</b>		ON/OFF or 2-PID control (with autotuning)
<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
	<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>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>	4
	<b>Output specifications</b>	N.O. relay outputs, 250 VAC, Models with 4 outputs: 2 A (resistive load), Electrical life: 100,000 operations, Minimum applicable load: 10 mA at 5 V
<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 max, 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: 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 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 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, simple calculations, 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 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)

## Input Ranges

### ● Thermocouple/Platinum Resistance Thermometer (Universal inputs)

Input type	Platinum resistance thermometer				Thermocouple														Infrared temperature sensor							
	Pt100		JPt100		K	J		T		E		L		U		N	R	S	B	W	PLI	10 to 70°C	60 to 120°C	115 to 165°C	140 to 260°C	
Temperature range (°C)	850																									
	1800																									
	1700																									
	1600																									
	1500																									
	1400																									
	1300				1300																					
	1200																									
	1100																									
	1000																									
	900	850																								
	800																									
	700																									
	600																									
	500																									
	400	500.0																								
	300																									
	200																									
	100																									
	0																									
	-100																									
	-200																									
	Setting range	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

Shaded settings are the default settings.

The applicable standards for the input types are as follows:

K, J, T, E, N, R, S, B: JIS C 1602-1995, IEC 60584-1

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

L: Fe-CuNi, DIN 43710-1985

Pt100: JIS C 1604-1997, IEC 60751

U: Cu-CuNi, DIN 43710-1985

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

W: W5Re/W26Re, ASTM E988-1990

### ● Analog input

Input type	Current		Voltage		
Input specification	4 to 20 mA	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	25	26	27	28	29

## Alarm type

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

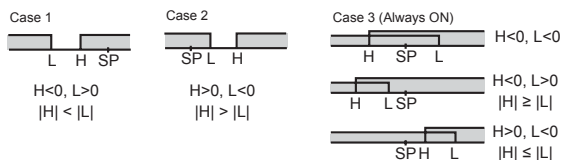
Auxiliary outputs are allocated for alarms. ON delays and OFF delays (0 to 999 s) can also be specified.

**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.

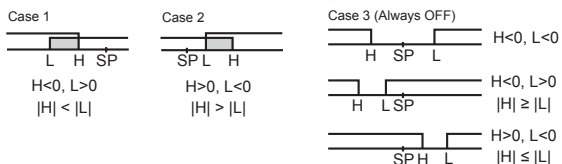
Set value	Alarm type	Alarm output operation		Description of function
		When alarm value X is positive	When alarm value X is negative	
0	Alarm function OFF	Output OFF		No alarm
1	Upper- and lower-limit *1		*2	Set the deviation in the set point by setting the alarm upper limit (H) and alarm lower limit (L). The alarm is ON when the PV is outside this deviation range.
2	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 deviation in the set point by setting the alarm upper limit (H) and 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		*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			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			This alarm type turns ON the alarm when the set point (SP) is smaller than the alarm value (X).
16	MV absolute value upper limit *9			This alarm type turns ON the alarm when the manipulated variable (MV) is higher than the alarm value (X).
17	MV absolute value lower limit *9			This alarm type turns ON the alarm when the manipulated variable (MV) is smaller than the alarm value (X).
18	RSP absolute value upper limit *10			The alarm will turn ON when the remote SP (RSP) is larger than the alarm value (X).
19	RSP absolute value lower limit *10			The alarm will turn ON when the remote SP (RSP) is smaller 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 Controllers User's Manual (Cat. No. H174) for information on the operation of the standby sequence.

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

\*8. Refer to the E5□C Digital 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: ( $\pm 0.3\%$ of indicated value or $\pm 1^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max. *1 Platinum resistance thermometer: ( $\pm 0.2\%$ of indicated value or $\pm 0.8^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max. Analog input: $\pm 0.2\%$ FS $\pm 1$ digit max. CT input: $\pm 5\%$ FS $\pm 1$ digit max. Potentiometer input: $\pm 5\%$ FS $\pm 1$ digit max.	
<b>Transfer output accuracy</b>	$\pm 0.3\%$ FS max.	
<b>Remote SP Input Type</b>	$\pm 0.2\%$ FS $\pm 1$ digit max.	
<b>Influence of temperature *2</b>	Thermocouple input (R, S, B, W, PL II): ( $\pm 1\%$ of PV or $\pm 10^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max. Other thermocouple input: ( $\pm 1\%$ of PV or $\pm 4^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max. *3 Platinum resistance thermometer: ( $\pm 1\%$ of PV or $\pm 2^\circ\text{C}$ , whichever is greater) $\pm 1$ digit max.	
<b>Influence of voltage *2</b>	Analog input: ( $\pm 1\%$ FS) $\pm 1$ digit max. CT input: ( $\pm 5\%$ FS) $\pm 1$ digit max. Remote SP input: ( $\pm 1\%$ FS) $\pm 1$ 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>Affect of signal source resistance</b>	Thermocouple: 0.1°C/ $\Omega$ max. (100 $\Omega$ max.) Platinum resistance thermometer: 0.1°C/ $\Omega$ max. (10 $\Omega$ max.)	
<b>Insulation resistance</b>	20 M $\Omega$ min. (at 500 VDC)	
<b>Dielectric strength</b>	2,300 VAC, 50 or 60 Hz for 1 min (between terminals with different charge)	
<b>Vibration</b>	<b>resistance</b>	10 to 55 Hz, 20 m/s <sup>2</sup> for 10 min each in X, Y, and Z directions
	<b>Malfunction</b>	10 to 55 Hz, 20 m/s <sup>2</sup> for 2 hrs each in X, Y, and Z directions
<b>Destruction</b>	<b>resistance</b>	100 m/s <sup>2</sup> , 3 times each in X, Y, and Z directions
	<b>Malfunction</b>	300 m/s <sup>2</sup> , 3 times each in X, Y, and Z directions
<b>Weight</b>	<b>E5EC</b>	Controller: Approx. 210 g, Mounting Brackets: Approx. 4 g $\times$ 2
	<b>E5AC</b>	Controller: Approx. 250 g, Mounting Brackets: Approx. 4 g $\times$ 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>	CX-Thermo version 4.5 or higher	
<b>Setup Tool port</b>	E5EC/E5AC top panel:	An E58-CIFQ2 USB-Serial Conversion Cable is used to connect to a USB port on the computer.*5
	E5EC/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>	UL 61010-1, CSA C22.2 No. 611010-1 (evaluated by UL), Korean Radio Waves Act (Act 10564)
	<b>Conformed standards</b>	EN 61010-1 (IEC 61010-1): Pollution level 2, overcurrent category II, Lloyd's standards *6
<b>EMC</b>	EMI Radiated Interference Electromagnetic Field Strength: Noise Terminal Voltage: EMS: ESD Immunity: Electromagnetic Field Immunity: Burst Noise Immunity: Conducted Disturbance Immunity: Surge Immunity: Voltage Dip/Interrupting Immunity:	EN61326 EN 55011 Group 1, class A EN 55011 Group 1, class A EN 61326 EN 61000-4-2 EN 61000-4-3 EN 61000-4-4 EN 61000-4-6 EN 61000-4-5 EN 61000-4-11

\*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 temperatures is  $\pm 2^\circ\text{C}$   $\pm 1$  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 in the 400 to 800°C range is  $\pm 3^\circ\text{C}$  max. The indication accuracy of the R and S thermocouples at a temperature of 200°C max. is  $\pm 3^\circ\text{C}$   $\pm 1$  digit max. The indication accuracy of W thermocouples is  $\pm 0.3$  of PV or  $\pm 3^\circ\text{C}$ , whichever is greater,  $\pm 1$  digit max. The indication accuracy of PL II thermocouples is  $\pm 0.3$  of PV or  $\pm 2^\circ\text{C}$ , whichever is greater,  $\pm 1$  digit max.

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

\*3 K thermocouple at -100°C max.:  $\pm 10^\circ\text{C}$  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 information on maritime standards in *Shipping Standards* on page 36 for compliance with Lloyd's Standards.

## USB-Serial Conversion Cable

Applicable OS	Windows 2000, XP, Vista, or 7
Applicable software	CX-Thermo version 4.5 or higher
Applicable models	E5CC/E5EC/E5AC and E5CB
USB interface standard	Conforms to USB Specification 1.1.
DTE speed	38,400 bps
Connector specifications	Computer: USB (type A plug) Digital Temperature Controller: Setup Tool port
Power supply	Bus power (Supplied from USB host controller.)*
Power supply voltage	5 VDC
Current consumption	450 mA max.
Output voltage	4.7±0.2 VDC (Supplied from USB-Serial Conversion Cable to the Digital Temperature Controller.)
Output current	250 mA max. (Supplied from USB-Serial Conversion Cable to the Digital Temperature Controller.)
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. 120 g

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

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

**Note:** A driver must be installed in the personal computer. Refer to installation information in the operation manual for the Conversion Cable.

## Communications Specifications

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

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

## Communications Functions

Programless communications*	<ul style="list-style-type: none"> <li>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 Temperature Controllers: 16 max.</li> </ul> <p>Applicable PLCs</p> <ul style="list-style-type: none"> <li>OMRON PLCs             <ul style="list-style-type: none"> <li>SYSMAC CS Series, CJ Series, or CP Series</li> </ul> </li> <li>Mitsubishi Electric PLCs             <ul style="list-style-type: none"> <li>MELSEC Q Series or L Series</li> </ul> </li> </ul>
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Communications between components*	<ul style="list-style-type: none"> <li>When Temperature Controllers are connected, the parameters can be copied from the Temperature Controller that is set as the master to Temperature Controllers that are set as slaves. Number of connected Temperature Controllers: 16 max. (including master)</li> <li>When Temperature Controllers are connected, set points and RUN/STOP commands can be sent from the Temperature Controller that is set as the master to Temperature Controllers that are set as slaves. Slope and offsets can be set for the set point. Number of connected Temperature Controllers: 16 max. (including master)</li> </ul>
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\* A Temperature Controller with version 1.1 or higher is required.

## Current Transformer (Order Separately) Ratings

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

## Heater Burnout Alarms and SSR Failure Alarms

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

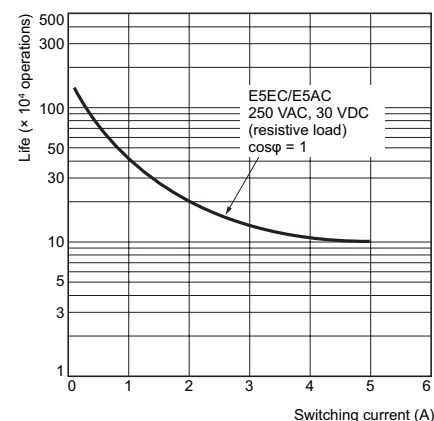
\*1. For heater burnout alarms, the heater current will be measured when the control output is ON, and the output will turn ON if the heater current is lower than the set value (i.e., heater burnout detection current value).

\*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 Relays (Reference Values)



# E5EC/E5AC

## External Connections

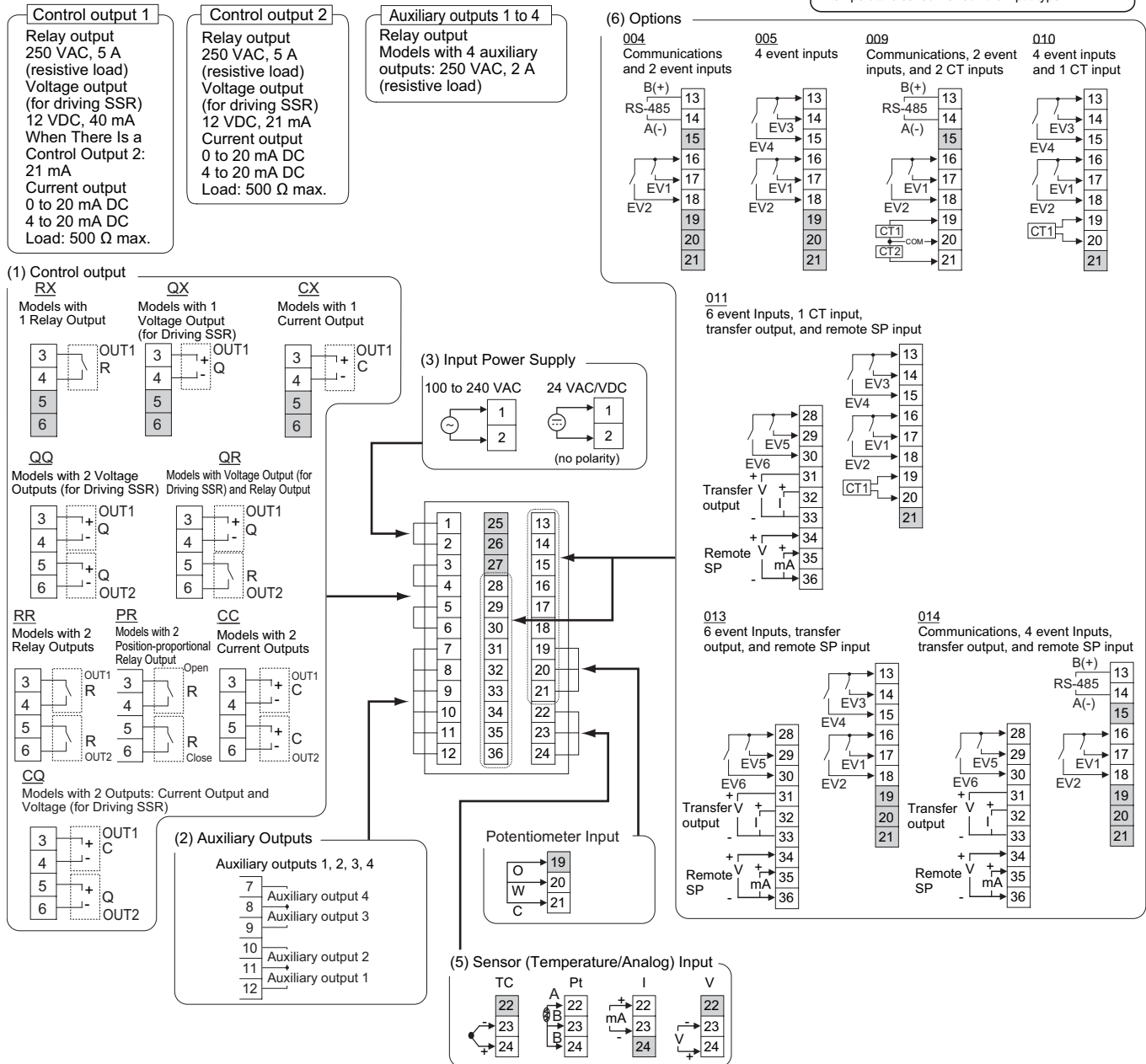
### E5EC/E5AC

E5EC-□□ 4 □ 5 M - □□□□      E5AC-□□ 4 □ 5 M - □□□□  
 (1) (2) (3) (4) (5) (6)      (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 (s.err) will occur if the input type setting does not agree with the temperature sensor. Check the input type.




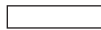
- Note:**
- The application of the terminals depends on the model.
  - Do not wire the terminals that are shown with a gray background.
  - When complying with EMC standards, the cable that connects the sensor must be 30 m or less. If the cable length exceeds 30 m, compliance with EMC standards will not be possible.
  - Connect M3 crimped terminals.



# Isolation/Insulation Block Diagrams

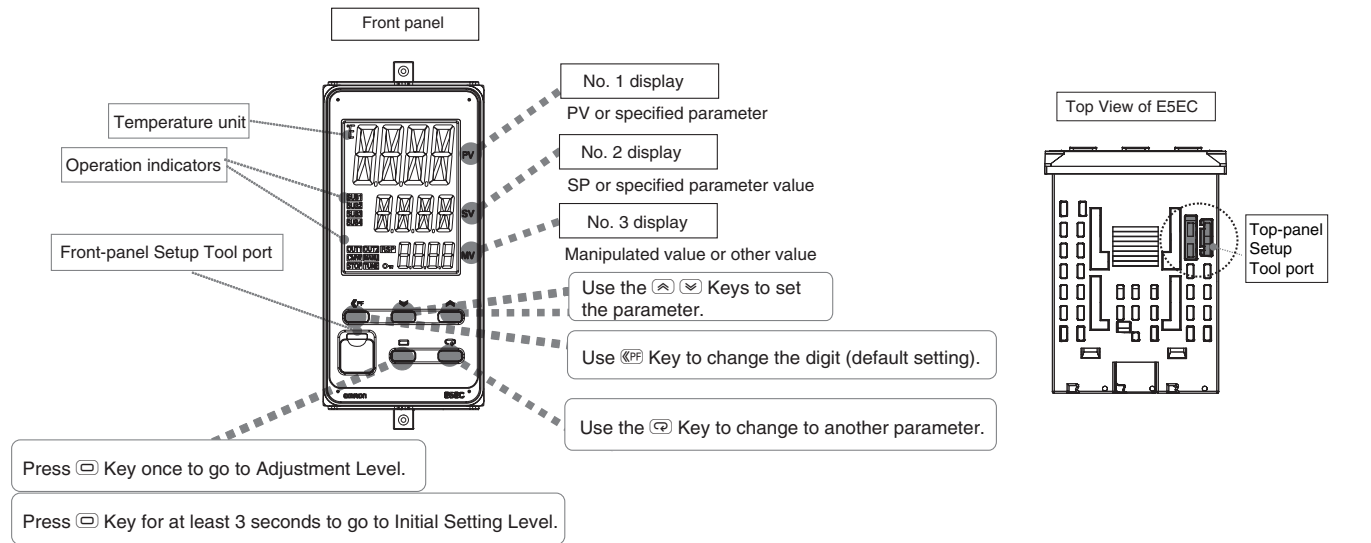
## Models with 4 Auxiliary Outputs

Power Supply	Sensor input, CT inputs, potentiometer input, and remote SP input
	Communications and event inputs
	Voltage output (for driving SSR), current output, and transfer output
	Relay output
	Auxiliary outputs 1, 2
	Auxiliary outputs 3, 4

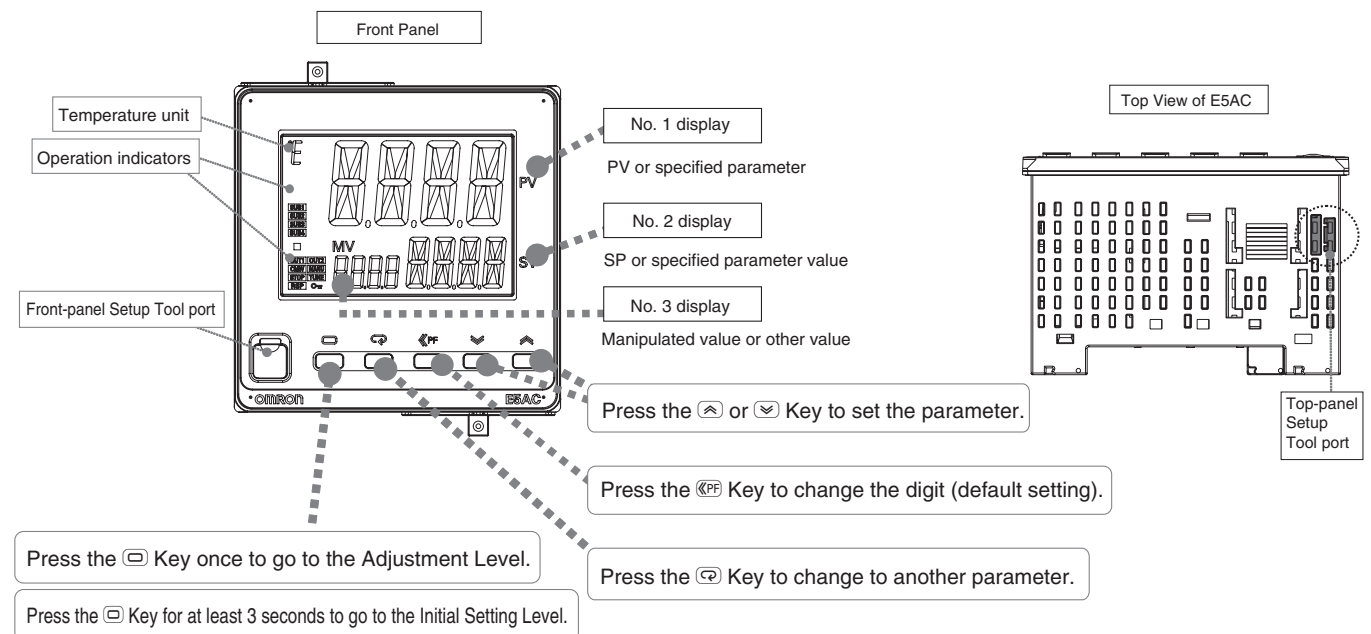
-  : Reinforced insulation
-  : Functional isolation

## Nomenclature

### E5EC

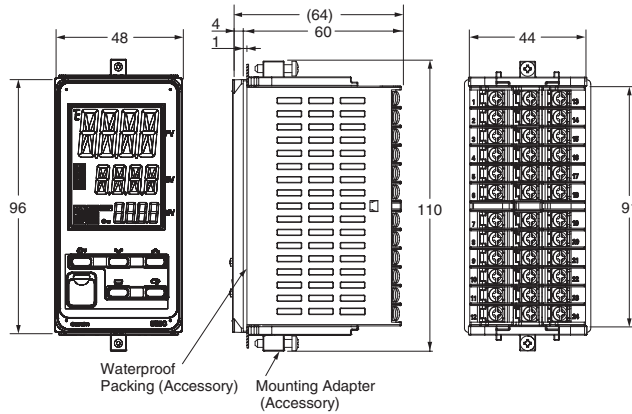


### E5AC



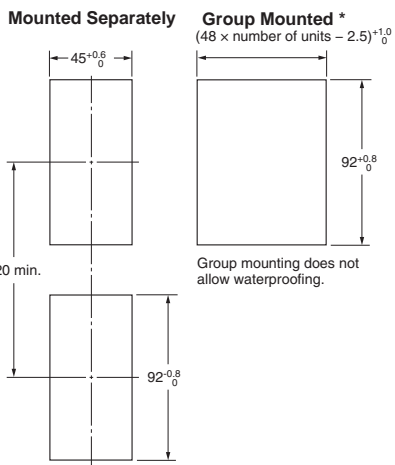
### Controllers

#### E5EC

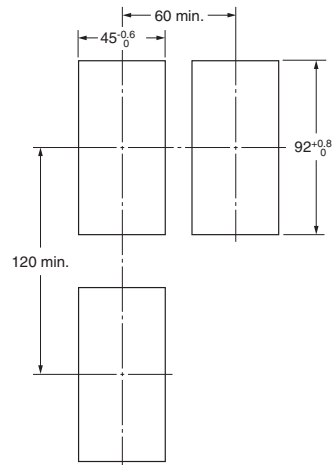


The Setup Tool port is on the top of the Temperature Controller. It is used to connect the Temperature Controller to the computer to use the Setup Tool. The E58-CIFQ2 USB-Serial Conversion Cable is required to make the connection. Refer to the instructions that are provided with the USB-Serial Conversion Cable for the connection procedure.

**Note:** Do not leave the USB-Serial Conversion Cable connected when you use the Temperature Controller.

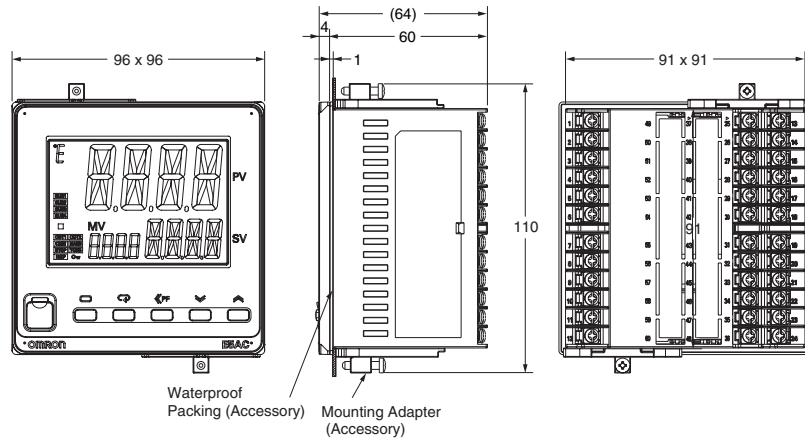


\* Selections for Control Outputs 1 and 2: QQ, QR, RR, CC, PR, or CQ. If you also specify 011, 013, or 014 for the option selection and use group mounting, the ambient temperature must be 45°C or less. If the ambient temperature is 55°C, maintain the following mounting spaces between Controllers.



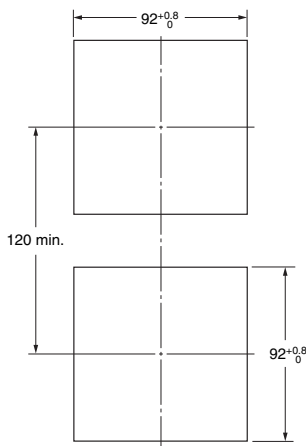
- Recommended panel thickness is 1 to 8 mm.
- Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers.)
- To mount the Controller so that it is waterproof, insert the waterproof packing onto the Controller.
- When two or more Controllers are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature specified in the specifications.
- To attach the USB-Serial Conversion Cable to the control panel, use a panel thickness of 1 to 2.5 mm.

E5AC



The Setup Tool port is on the top of the Temperature Controller. It is used to connect the Temperature Controller to the computer to use the Setup Tool. The E58-CIFQ2 USB-Serial Conversion Cable is required to make the connection. Refer to the instructions that are provided with the USB-Serial Conversion Cable for the connection procedure.  
**Note:** Do not leave the USB-Serial Conversion Cable connected when you use the Temperature Controller.

Mounted Separately



Group Mounted \*

$(96 \times \text{number of units} - 3.5)^{+1.0}_0$

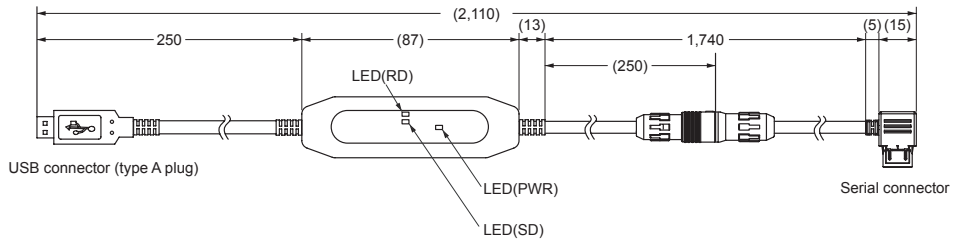


Group mounting does not allow waterproofing.

- 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.
- To attach the USB-Serial Conversion Cable to the control panel, use a panel thickness of 1 to 2.5 mm.

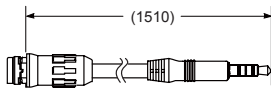
## Accessories (Order Separately)

### ● USB-Serial Conversion Cable E58-CIFQ2

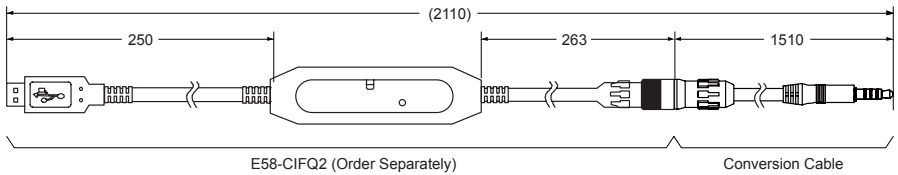


### ● Conversion Cable E58-CIFQ2-E

Conversion Cable

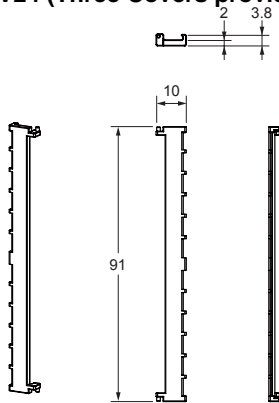


Connecting to the E58-CIFQ2 USB-Serial Conversion Cable

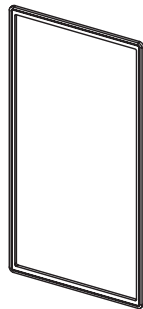


**Note:** Always use this product together with the E58-CIFQ2.

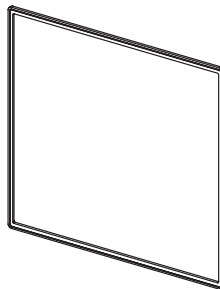
### ● Terminal Covers E53-COV24 (Three Covers provided.)



### ● Waterproof Packing Y92S-P9 (for DIN 48 × 96)



### Y92S-P10 (for DIN 96 × 96)



The Waterproof Packing is provided with the Temperature Controller.

The degree of protection when the Waterproof Packing is used is IP66.

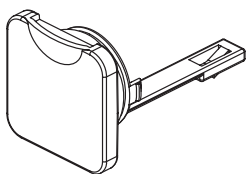
Also, keep the Port Cover on the front-panel Setup Tool port of the E5EC/E5AC securely closed.

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.

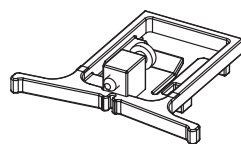
If a waterproof structure is not required, then the Waterproof Packing does not need to be installed.

### ● 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.

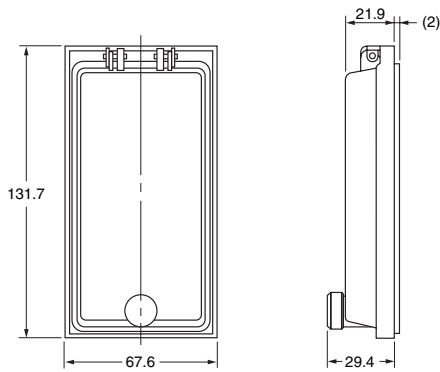
### ● Mounting Adapter Y92F-51 (for DIN 48 × 96)



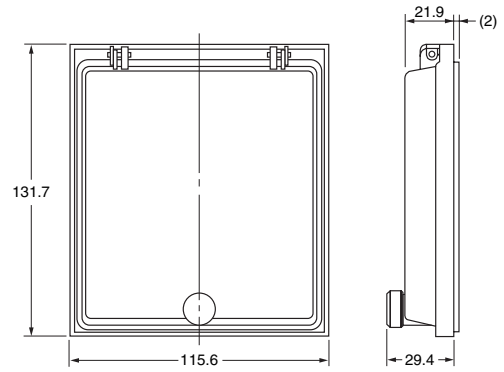
One pair is provided with the Controller.

Order this Adapter separately if it becomes lost or damaged.

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

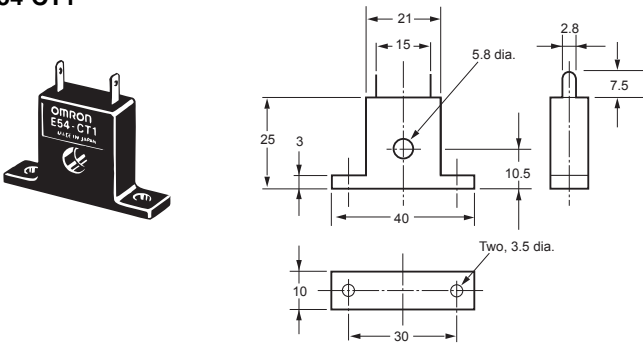


● Watertight Cover  
Y92A-96N (96 × 96)



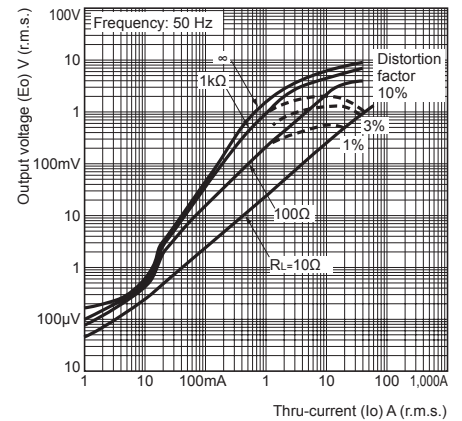
● Current Transformers

E54-CT1

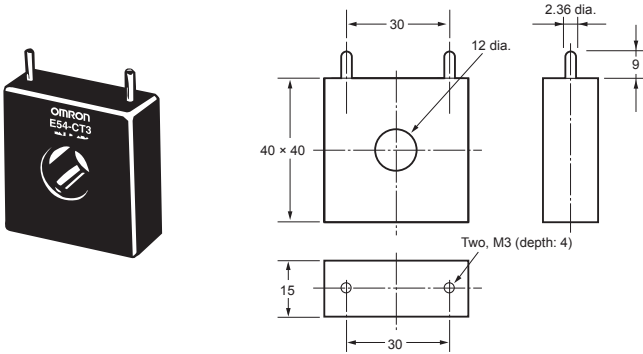


Thru-current (I<sub>o</sub>) vs. Output Voltage (E<sub>o</sub>)  
(Reference Values)  
E54-CT1

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

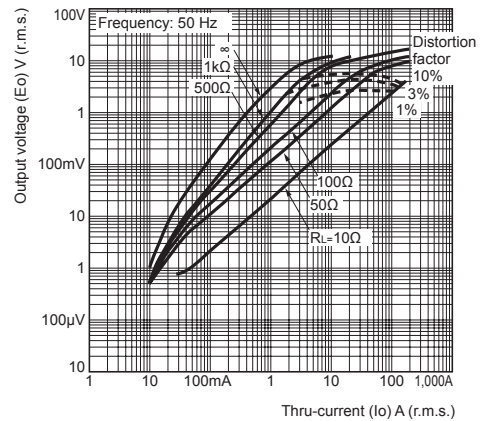


E54-CT3



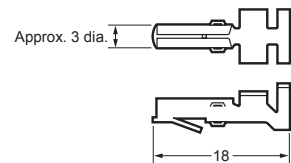
Thru-current (I<sub>o</sub>) vs. Output Voltage (E<sub>o</sub>)  
(Reference Values)  
E54-CT3

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

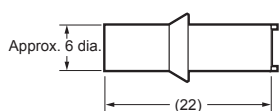


E54-CT3 Accessory

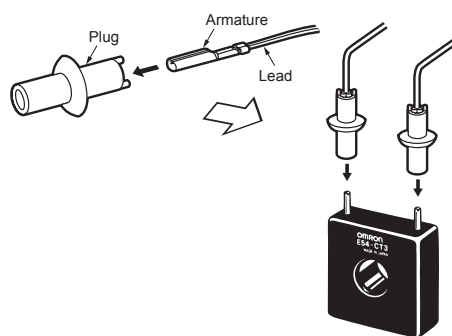
● Armature



● Plug



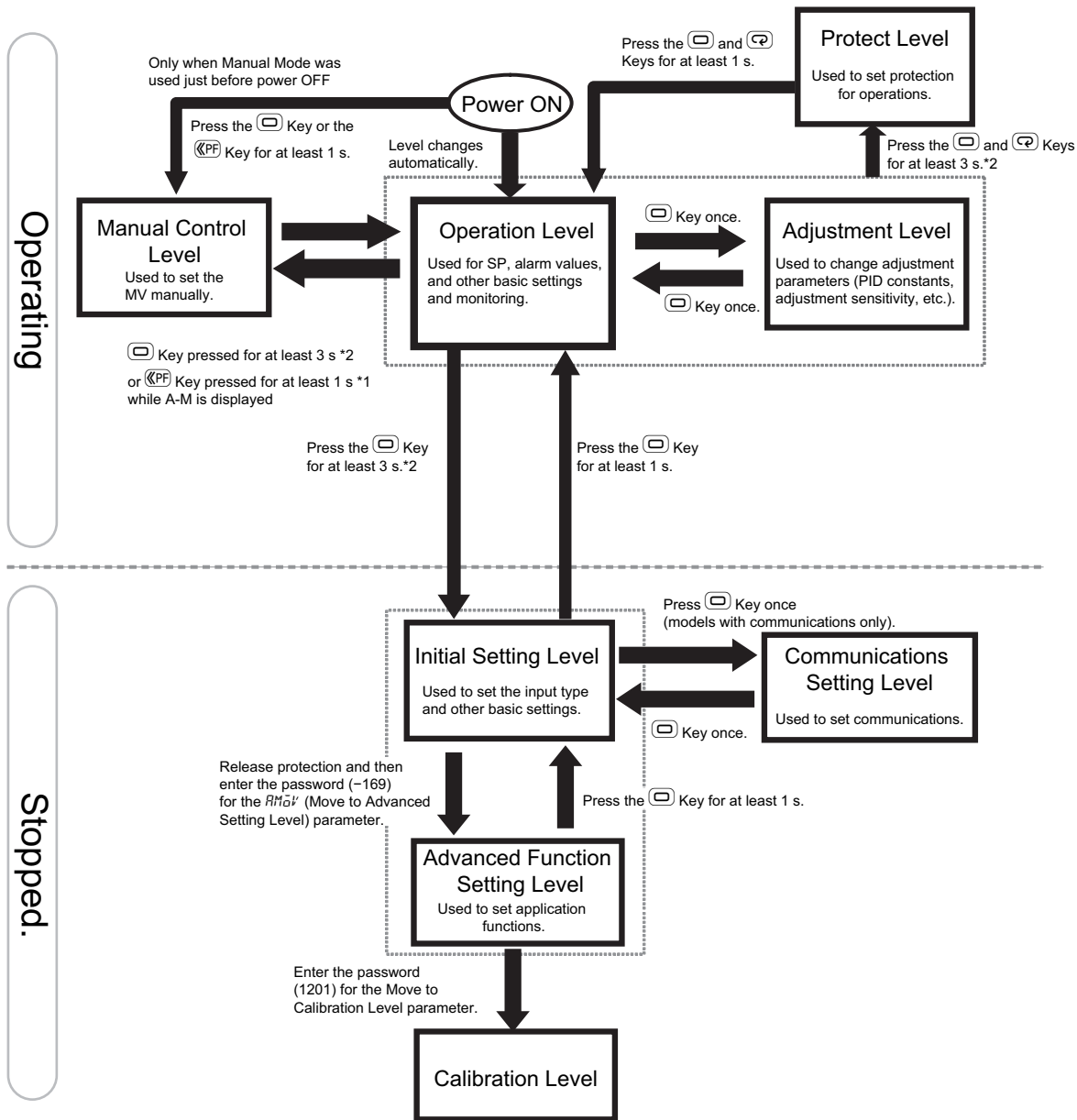
Connection Example



Operation

Setting Levels Diagram

This diagram shows all of the setting levels. To move to the advanced function setting level and calibration level, you must enter passwords. Some parameters are not displayed depending on the protect level setting and the conditions of use. Control stops when you move from the operation level to the initial setting level.



\*1. To use a key procedure to move to Manual Control Level, set the Auto/Manual Select Addition parameter to ON and set the PF Setting parameter to a-m (Auto/Manual).  
 \*2. The No. 1 display will flash in the middle when the keys are pressed for 1 s or longer.

## Error Displays (Troubleshooting)

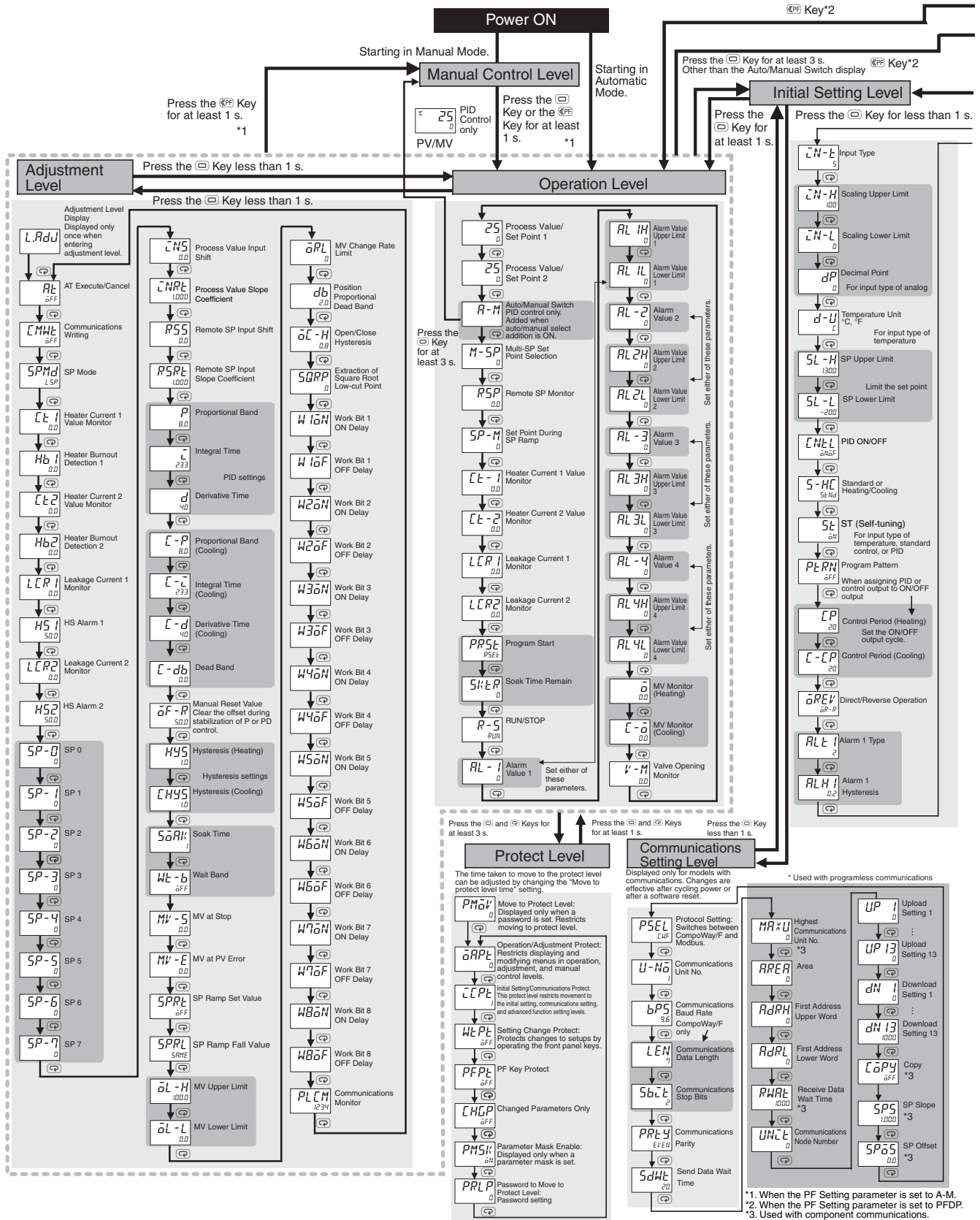
When an error occurs, the No. 1 display or No. 2 display shows the error code.  
Take necessary measure according to the error code, referring the following table.

Display	Name	Meaning	Action	Operation
<i>S.ERR</i>	Input error	The input value exceeded the control range.* The input type is not set correctly. The sensor is disconnected or short-circuited. The sensor is not wired correctly. The sensor is not wired.  * Control Range Temperature resistance thermometer or thermocouple input: SP Lower Limit - 20°C to SP Upper Limit + 20°C (SP Lower Limit - 40°F to SP Upper Limit + 40°F) ESIB input: Same as specified input range. Analog input: Scaling range -5% to 105%	Check the wiring for input to be sure it is wired correctly, not broken, and not shorted. Also check the input type. If there are no problems in the wiring or input type settings, cycle the power supply. If the display remains the same, replace the Digital Temperature Controller. If the display is restored to normal, then the probable cause is external noise affecting the control system. Check for external noise.  <b>Note:</b> For a temperature resistance thermometer, the input is considered disconnected if the A, B, or B' line is broken.	After the error occurs and it is displayed, the alarm output will operate as if the upper limit was exceeded. It will also operate as if transfer output exceeded the upper limit. If an input error is assigned to a control output or auxiliary output, the output will turn ON when the input error occurs. The error message will appear in the display for the PV.  <b>Note:</b> 1. The heating and cooling control outputs will turn OFF. 2. When the manual MV, MV at stop, or MV at error is set, the control output is determined by the set value.
<i>CCCC</i>	Display range exceeded	Below -1,999	This is not an error. It is displayed when the control range is wider than the display range and the PV exceeds the display range. The PV is displayed for the range that is given on the left (the number without the decimal point).	Control continues and operation is normal. The value will appear in the display for the PV. Refer to the E5□C Digital Controllers User's Manual (Cat. No. H174) for information on the controllable range.
<i>KKKK</i>		Above 9,999		
<i>E333</i>	A/D converter error	There is an error in the internal circuits.	First, cycle the power supply. If the display remains the same, the controller must be repaired. If the display is restored to normal, then a probable cause can be external noise affecting the control system. Check for external noise.	The control outputs, auxiliary outputs, and transfer outputs turn OFF. (A current output will be approx. 0 mA and a linear voltage output will be approx. 0V.)
<i>E111</i>	Memory error	There is an error in the internal memory operation.	First, cycle the power supply. If the display remains the same, the controller must be repaired. If the display is restored to normal, then a probable cause can be external noise affecting the control system. Check for external noise.	The control outputs, auxiliary outputs, and transfer outputs turn OFF. (A current output will be approx. 0 mA and a linear voltage output will be approx. 0V.)
<i>FFFF</i>	Overcurrent	This error is displayed when the peak current exceeds 55.0 A.	-	Control continues and operation is normal. The error message will appear for the following displays. Heater Current Value 1 Monitor Heater Current Value 2 Monitor Leakage Current Value 1 Monitor Leakage Current Value 2 Monitor
<i>[t1 [t2 LcR1 LcR2</i>	HB or HS alarm	If there is a HB or HS alarm, the No. 1 display will flash in the relevant setting level.	-	The No. 1 display for the following parameter flashes in Operation Level or Adjustment Level. Heater Current Value 1 Monitor Heater Current Value 2 Monitor Leakage Current Value 1 Monitor Leakage Current Value 2 Monitor However, control continues and operation is normal.
<i>----</i>	Potentiometer Input Error (Position-proportional Models Only)	"----" will be displayed for the Valve Opening Monitor parameter if any of the following error occurs. • Motor calibration has not been performed. • The wiring of the potentiometer is incorrect or broken. • The potentiometer input value is incorrect (e.g., the input is out of range or the potentiometer has failed).	Check for the above errors.	Close control: The control output is OFF or the value that is set for the MV at PV Error parameter is output. Floating control: Operation will be normal.

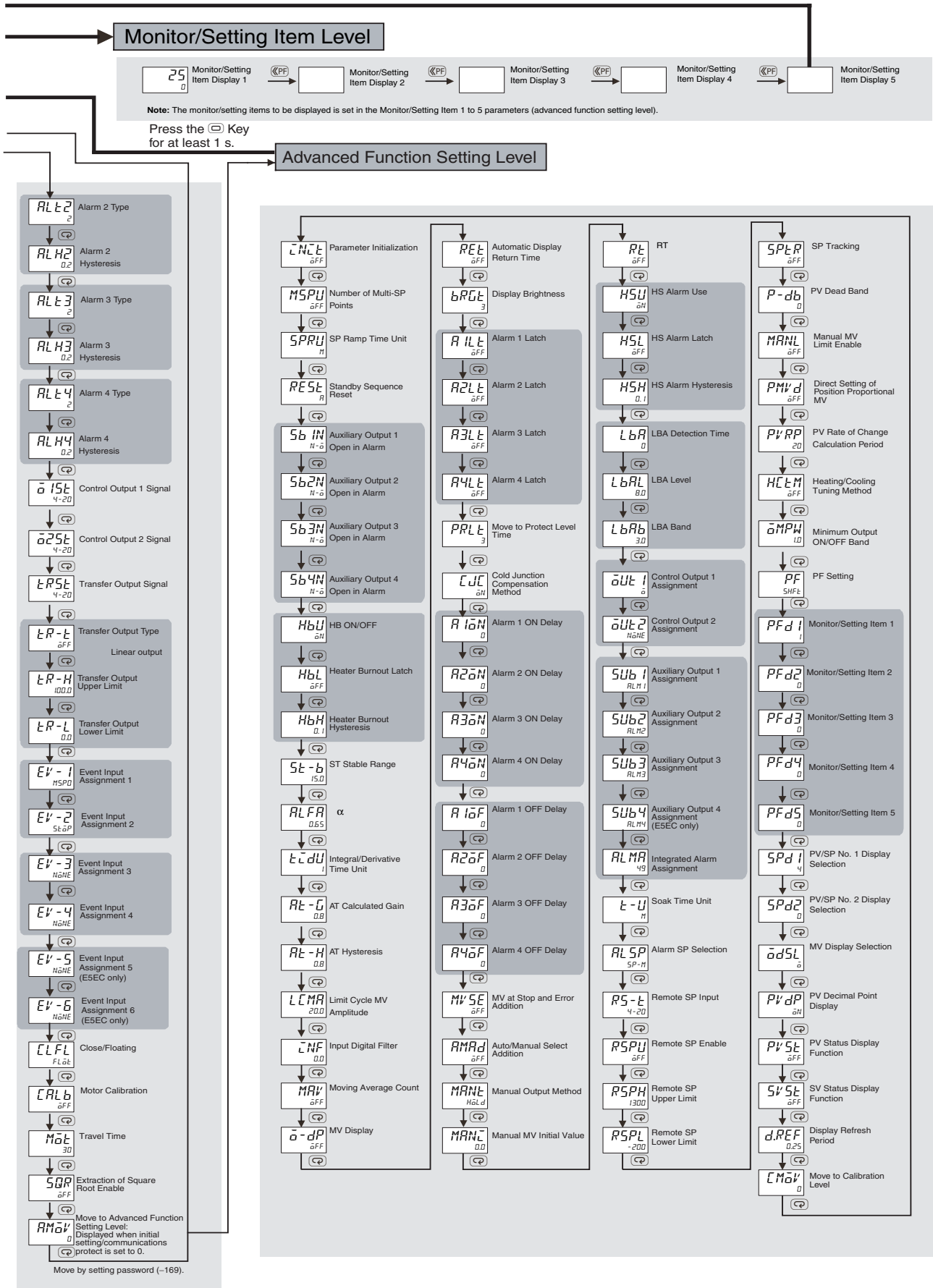
## Operation

### Parameters

The related setting items in each level are described below. If you press the Mode Key at the last setting item, the display will return to the first setting item in the same level.













## Safety Precautions

● Be sure to read the precautions for all E5CC/E5EC/E5AC models in the website at: <http://www.ia.omron.com/>.


### Warning Indications

 <b>CAUTION</b>	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.
<b>Precautions for Safe Use</b>	Supplementary comments on what to do or avoid doing, to use the product safely.
<b>Precautions for Correct Use</b>	Supplementary comments on what to do or avoid doing, to prevent failure to operate, malfunction or undesirable effect on product performance.


### Meaning of Product Safety Symbols


	Used to warn of the risk of electric shock under specific conditions.
	Used for general prohibitions for which there is no specific symbol.
	Use to indicate prohibition when there is a risk of minor injury from electrical shock or other source if the product is disassembled.
	Used for general CAUTION, WARNING, or DANGER precautions for which there is no specified symbol. (This symbol is also used as the alerting symbol, but shall not be used in this meaning on the product.)
	Used for general mandatory action precautions for which there is no specified symbol.


### CAUTION


Do not touch the terminals while power is being supplied. Doing so may occasionally result in minor injury due to electric shock. 


Electric shock may occur. Do not touch any cables or connectors with wet hands. 


Electric shock, fire, or malfunction may occasionally occur. Do not allow metal objects, conductors, cuttings from installation work, or moisture to enter the Digital Temperature Controller or the Setup Tool port or ports. Attach the cover to the front-panel Setup Tool port whenever you are not using it to prevent foreign objects from entering the port. 


Do not use the Digital Temperature Controller where subject to flammable or explosive gas. Otherwise, minor injury from explosion may occasionally occur. 


Not doing so may occasionally result in fire. Do not allow dirt or other foreign objects to enter the Setup Tool port or ports, or between the pins on the connectors on the Setup Tool cable. 


Minor electric shock or fire may occasionally occur. Do not use any cables that are damaged. 


Never disassemble, modify, or repair the product or touch any of the internal parts. Minor electric shock, fire, or malfunction may occasionally occur. 


**CAUTION - Risk of Fire and Electric Shock**  
 a. This product is UL recognised as Open Type Process Control Equipment. It must be mounted in an enclosure that does not allow fire to escape externally.   
 b. More than one disconnect switch may be required to de-energize the equipment before servicing the product.  
 c. Signal inputs are SELV, limited energy. \*1  
 d. Caution: To reduce the risk of fire or electric shock, do not interconnect the outputs of different Class 2 circuits. \*2

If the output relays are used past their life expectancy, contact fusing or burning may occasionally occur. Always consider the application conditions and use the output relays within their rated load and electrical life expectancy. The life expectancy of output relays varies considerably with the output load and switching conditions. 

Tighten the terminal screws to the rated torque of between 0.43 and 0.58 N·m. Loose screws may occasionally result in fire. 

Set the parameters of the product so that they are suitable for the system being controlled. If they are not suitable, unexpected operation may occasionally result in property damage or accidents. 

A malfunction in the product may occasionally make control operations impossible or prevent alarm outputs, resulting in property damage. To maintain safety in the event of malfunction of the product, take appropriate safety measures, such as installing a monitoring device on a separate line. 

Minor electric shock, fire, or malfunction may occasionally occur. Do not allow metal objects, or conductors to enter the connectors. 

\*1. An SELV circuit is one separated from the power supply with double insulation or reinforced insulation, that does not exceed 30 V r.m.s. and 42.4 V peak or 60 VDC.

\*2. A class 2 power supply is one tested and certified by UL as having the current and voltage of the secondary output restricted to specific levels.

## Precautions for Safe Use

Be sure to observe the following precautions to prevent malfunction or adverse affects on the performance or functionality of the product. Not doing so may occasionally result in faulty operation.

1. This product is specifically designed for indoor use only.
  - Do not use this product in the following places:
    - Places directly subject to heat radiated from heating equipment.
    - Places subject to splashing liquid or oil atmosphere.
    - Places subject to direct sunlight.
    - Places subject to dust or corrosive gas (in particular, sulfide gas and ammonia gas).
    - Places subject to intense temperature change.
    - Places subject to icing and condensation.
    - Places subject to vibration and large shocks.
2. Use and store the product within the rated ambient temperature and humidity.
 

Gang-mounting two or more Digital Temperature Controllers, or mounting Digital Temperature Controllers above each other may cause heat to build up inside the Digital Temperature Controllers, which will shorten their service life. In such a case, use forced cooling by fans or other means of air ventilation to cool down the Digital Temperature Controllers.
3. To allow heat to escape, do not block the area around the Digital Temperature Controller.
 

Do not block the ventilation holes on the Digital Temperature Controller.
4. Be sure to wire properly with correct polarity of terminals.
5. Use the specified size of crimp terminals for wiring (M3, width of 5.8 mm or less). For open-wired connections, use stranded or solid copper wires with a gauge of AWG24 to AWG18 (equal to a cross-sectional area of 0.205 to 0.823 mm<sup>2</sup>). (The stripping length is 6 to 8 mm.) Up to two wires of the same size and type or two crimp terminals can be connected to one terminal. Do not connect more than two wires or more than two crimp terminals to the same terminal.
6. Do not wire the terminals that are not used.
7. Use a commercial power supply for the power supply voltage input to a Digital Temperature Controller with AC input specifications. Do not use the output from an inverter as the power supply. Depending on the output characteristics of the inverter, temperature increases in the Digital Temperature Controller may cause smoke or fire damage even if the inverter has a specified output frequency of 50/60 Hz.
8. To avoid inductive noise, keep the wiring for the product's terminal block away from power cables carry high voltages or large currents. Also, do not wire power lines together with or parallel to product wiring. Using shielded cables and using separate conduits or ducts is recommended.
 

Attach a surge suppressor or noise filter to peripheral devices that generate noise (in particular, motors, transformers, solenoids, magnetic coils, or other equipment that have an inductance component).

When a noise filter is used at the power supply, first check the voltage or current, and attach the noise filter as close as possible to the product.

Allow as much space as possible between the product and devices that generate powerful high frequencies (high-frequency welders, high-frequency sewing machines, etc.) or surge.
9. Use this product within the rated load and power supply.
10. Make sure that the rated voltage is attained within two seconds of turning ON the power using a switch or relay contact. If the voltage is applied gradually, the power may not be reset or output malfunctions may occur.
11. Make sure that the Digital Temperature Controller has 30 minutes or more to warm up after turning ON the power before starting actual control operations to ensure the correct temperature display.
12. When executing self-tuning, turn ON power to the load (e.g., heater) at the same time as or before supplying power to the product. If power is turned ON to the product before turning ON power to the load, self-tuning will not be performed properly and optimum control will not be achieved.
13. A switch or circuit breaker must be provided close to the product. The switch or circuit breaker must be within easy reach of the operator, and must be marked as a disconnecting means for this unit.
14. Use a soft and dry cloth to clean the product carefully. Do not use organic solvent, such as paint thinner, benzine or alcohol to clean the product.
15. Design the system (e.g., control panel) considering the 2 seconds of delay that the product's output to be set after power ON.
16. The output may turn OFF when you move to the initial setting level. Take this into consideration when performing control operations.
17. The number of non-volatile memory write operations is limited. Therefore, use RAM write mode when frequently overwriting data during communications or other operations.
18. Use suitable tools when taking the Digital Temperature Temperature Controller apart for disposal. Sharp parts inside the Digital Temperature Controller may cause injury.
19. Do not connect cables to both the front-panel Setup Tool port and the top-panel Setup Tool port at the same time. The Digital Controller may be damaged or may malfunction.
20. Do not place heavy object on the Conversion Cable, bend the cable past its natural bending radius, or pull on the cable with undue force.
21. Do not disconnect the Communications Conversion Cable or the USB-Serial Conversion Cable while communications are in progress. Damage or malfunction may occur.
22. Do not touch the external power supply terminals or other metal parts on the Digital Temperature Controller.
23. Do not exceed the communications distance that is given in the specifications. Use the specified communications cable. Refer to the E5□C Digital Controllers User's Manual (Cat. No. H174) for information on the communications distances and cables.
24. Do not bend the communications cables past their natural bending radius. Do not pull on the communications cables.
25. Do not turn the power supply to the Digital Temperature Controller ON or OFF while the USB-Serial Conversion Cable is connected. The Digital Temperature Controller may malfunction.
26. Make sure that the indicators on the USB-Serial Conversion Cable are operating properly. Depending on the application conditions, deterioration in the connectors and cable may be accelerated, and normal communications may become impossible. Perform periodic inspection and replacement.
27. Connectors may be damaged if they are inserted with excessive force. When connecting a connector, always make sure that it is oriented correctly. Do not force the connector if it does not connect smoothly.
28. Noise may enter on the USB-Serial Conversion Cable, possibly causing equipment malfunctions. Do not leave the USB-Serial Conversion Cable connected constantly to the equipment.

## Shipping Standards

The E5CC, E5EC, and E5AC comply with Lloyd's standards. When applying the standards, the following installation and wiring requirements must be met in the application.

## Application Conditions

### ● Installation Location

The E5CC, E5EC, and E5AC comply with installation category ENV1 and ENV2 of Lloyd's standards. Therefore, they must be installed in a location equipped with air conditioning. They cannot be used on the bridge or decks, or in a location subject to strong vibration.

## Precautions for Correct Use

### ● Service Life

- Use the product within the following temperature and humidity ranges:  
 Temperature: -10 to 55°C (with no icing or condensation)  
 Humidity: 25% to 85%  
 If the product is installed inside a control board, the ambient temperature must be kept to under 55°C, including the temperature around the product.
- The service life of electronic devices like Digital Temperature Controllers is determined not only by the number of times the relay is switched but also by the service life of internal electronic components. Component service life is affected by the ambient temperature: the higher the temperature, the shorter the service life and, the lower the temperature, the longer the service life. Therefore, the service life can be extended by lowering the temperature of the Digital Temperature Controller.
- When two or more Digital Temperature Controllers are mounted horizontally close to each other or vertically next to one another, the internal temperature will increase due to heat radiated by the Digital Temperature Controllers and the service life will decrease. In such a case, use forced cooling by fans or other means of air ventilation to cool down the Digital Temperature Controllers. When providing forced cooling, however, be careful not to cool down the terminals sections alone to avoid measurement errors.

### ● Measurement Accuracy

- When extending or connecting the thermocouple lead wire, be sure to use compensating wires that match the thermocouple types.
- When extending or connecting the lead wire of the platinum resistance thermometer, be sure to use wires that have low resistance and keep the resistance of the three lead wires the same.
- Mount the product so that it is horizontally level.
- If the measurement accuracy is low, check to see if input shift has been set correctly.

### ● Waterproofing

The degree of protection is as shown below. Sections without any specification on their degree of protection or those with IP□0 are not waterproof.

Front panel: IP66, Rear case: IP20, Terminal section: IP00  
 When waterproofing is required, insert the Waterproof Packing on the backside of the front panel. Keep the Port Cover on the front-panel Setup Tool port of the E5EC securely closed. The degree of protection when the Waterproof Packing is used is IP66. 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. If the Waterproof Packing and Port Cover are not periodically replaced, waterproof performance may not be maintained. If a waterproof structure is not required, then the Waterproof Packing does not need to be installed.

### ● Operating Precautions

- It takes approximately two seconds for the outputs to turn ON from after the power supply is turned ON. Due consideration must be given to this time when incorporating Digital Temperature Controllers into a control panel or similar device.
- Make sure that the Digital Temperature Controller has 30 minutes or more to warm up after turning ON the power before starting actual control operations to ensure the correct temperature display.
- When using self-tuning, turn ON power for the load (e.g., heater)

- at the same time as or before supplying power to the Temperature Controller. If power is turned ON for the Temperature Controller before turning ON power for the load, self-tuning will not be performed properly and optimum control will not be achieved.
- When starting operation after the Digital Temperature Controller has warmed up, turn OFF the power and then turn it ON again at the same time as turning ON power for the load. (Instead of turning the Digital Temperature Controller OFF and ON again, switching from STOP mode to RUN mode can also be used.)
- Avoid using the Controller in places near a radio, television set, or wireless installing. These devices can cause radio disturbances which adversely affect the performance of the Controller.

### ● Others

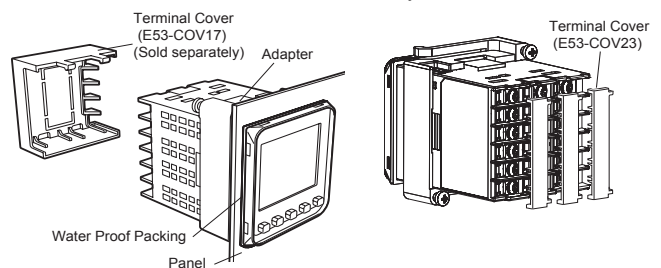
- Do not Connect or disconnect the Conversion Cable connector repeatedly over a short period of time. The computer may malfunction.
- After connecting the Conversion Cable to the computer, check the COM port number before starting communications. The computer requires time to recognize the cable connection. This delay does not indicate failure.
- Do not connect the Conversion Cable through a USB hub. Doing so may damage the Conversion Cable.
- Do not use an extension cable to extend the Conversion Cable length when connecting to the computer. Doing so may damage the Conversion Cable.

### ● Mounting

#### Mounting to a Panel

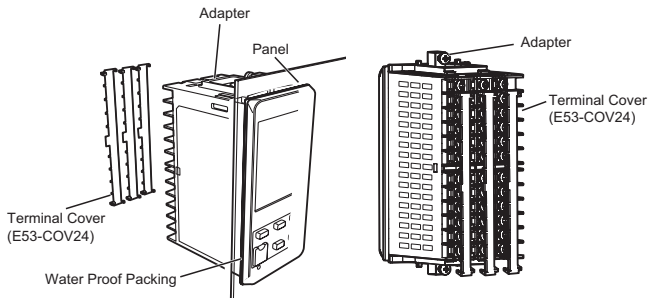
#### E5CC

There are two models of Terminal Covers that you can use with the E5CC.



- For waterproof mounting, waterproof packing must be installed on the Controller. Waterproofing is not possible when group mounting several Controllers. Waterproof packing is not necessary when there is no need for the waterproofing function.
- Insert the E5CC into the mounting hole in the panel.
- Push the adapter from the terminals up to the panel, and temporarily fasten the E5CC.
- Tighten the two fastening screws on the adapter. Alternately tighten the two screws little by little to maintain a balance. Tighten the screws to a torque of 0.29 to 0.39 N•m.

## E5EC/E5AC

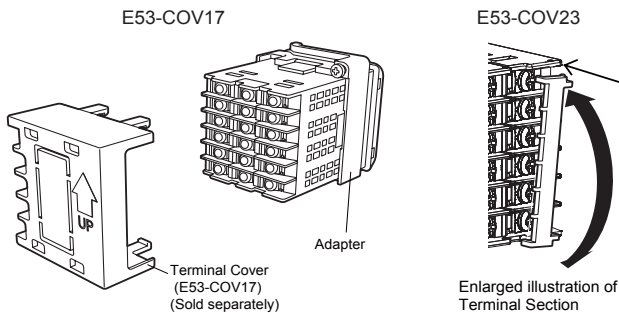


1. For waterproof mounting, waterproof packing must be installed on the Controller. Waterproofing is not possible when group mounting several Controllers. Waterproof packing is not necessary when there is no need for the waterproofing function.
2. Insert the E5EC/E5AC into the mounting hole in the panel.
3. Push the adapter from the terminals up to the panel, and temporarily fasten the E5EC/E5AC.
4. Tighten the two fastening screws on the adapter.  
Alternately tighten the two screws little by little to maintain a balance. Tighten the screws to a torque of 0.29 to 0.39 N•m.

### Mounting the Terminal Cover E5CC

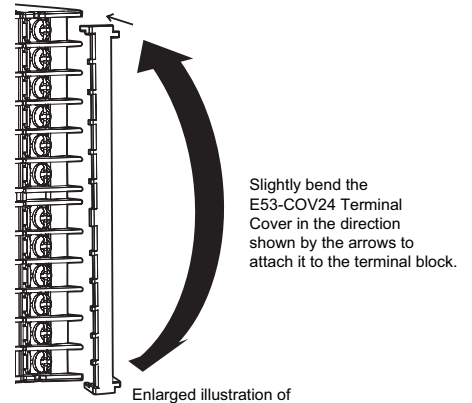
Slightly bend the E53-COV23 Terminal Cover to attach it to the terminal block as shown in the following diagram. The Terminal Cover cannot be attached in the opposite direction. E53-COV17 Terminal Cover can be also attached.

Make sure that the "UP" mark is facing up, and then attach the E53-COV17 Terminal Cover to the holes on the top and bottom of the Digital Temperature Controller.



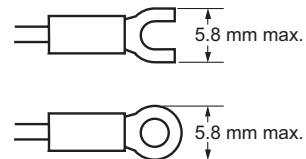
## E5EC/E5AC

Slightly bend the E53-COV24 Terminal Cover to attach it to the terminal block as shown in the following diagram. The Terminal Cover cannot be attached in the opposite direction.



### ●Precautions when Wiring

- Separate input leads and power lines in order to prevent external noise.
- Use a shielded, AWG24 to AWG18 (cross-sectional area of 0.205 to 0.8231 mm<sup>2</sup>) twisted-pair cable.
- Use crimp terminals when wiring the terminals.
- Use the suitable wiring material and crimp tools for crimp terminals.
- Tighten the terminal screws to a torque of 0.43 to 0.58 N•m.
- Use the following types of crimp terminals for M3 screws.



## Three-year Guarantee

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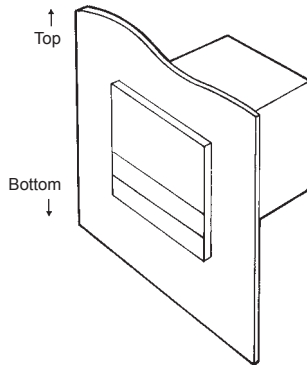
### ●Period of Guarantee

The guarantee period of the Unit is three years starting from the date the Unit is shipped from the factory.

### Scope of Guarantee

The Unit is guaranteed under the following operating conditions.

1. Average Operating Temperature (see note):  $-10^{\circ}\text{C}$  to  $50^{\circ}\text{C}$
2. Mounting Method: Standard mounting



#### **Note:** Average Operating Temperature

Refer to the process temperature of the Unit mounted to a control panel and connected to peripheral devices on condition that the Unit is in stable operation, sensor input type K is selected for the Unit, the positive and negative thermocouple input terminals of the Unit are short-circuited, and the ambient temperature is stable.

Should the Unit malfunction during the guarantee period, OMRON shall repair the Unit or replace any parts of the Unit at the expense of OMRON.

## Read and Understand this Catalog

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

## Warranty and Limitations of Liability

### WARRANTY

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

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

### LIMITATIONS OF LIABILITY

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

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

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

## Application Considerations

### SUITABILITY FOR USE

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

Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used.

Know and observe all prohibitions of use applicable to this product.

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

### PROGRAMMABLE PRODUCTS

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

## Disclaimers

### CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons. Consult with your OMRON representative at any time to confirm actual specifications of purchased product.

### DIMENSIONS AND WEIGHTS

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

### PERFORMANCE DATA

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

**Note: Do not use this document to operate the Unit.**

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**Cat. No. H177-E1-03**

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