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.

48 × 48 mm	48 × 96 mm	96 × 96 mm
E5CC	**E5EC**	**E5AC**

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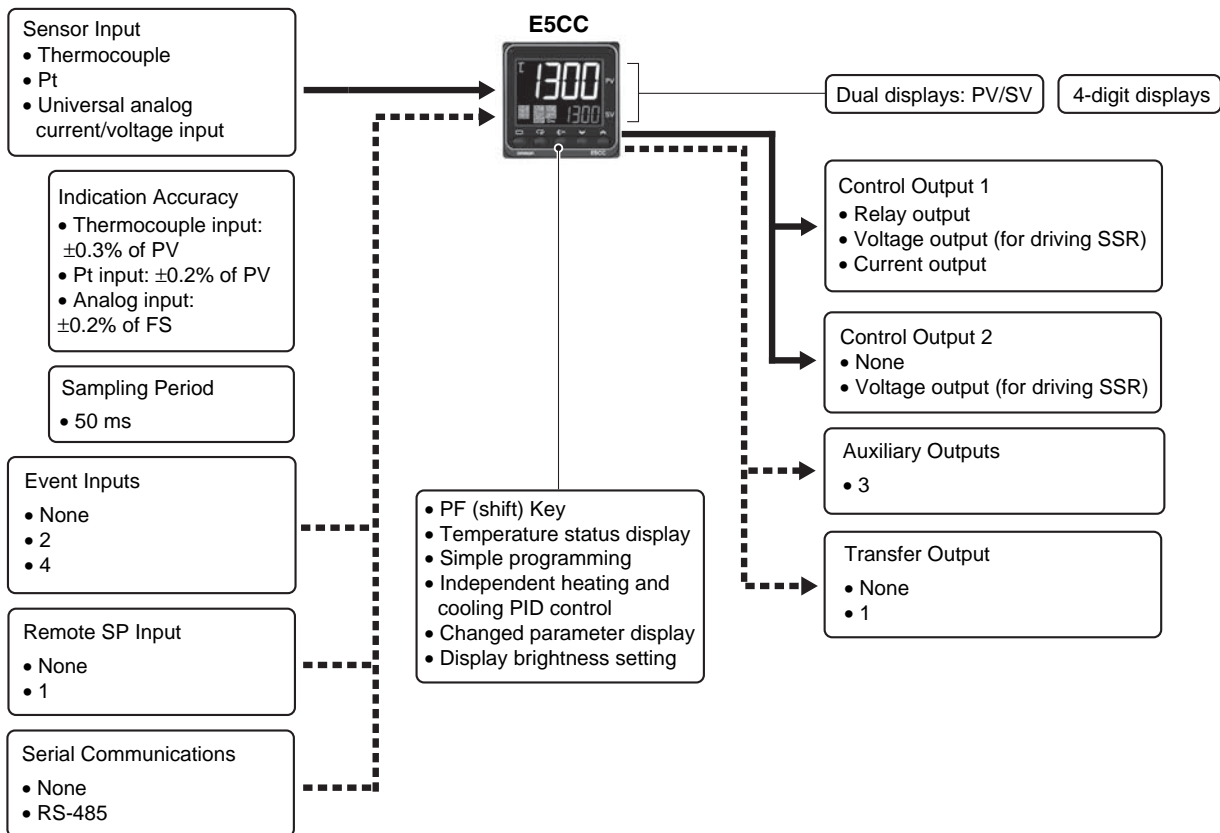
- The white PV display with a height of 15.2 mm improves visibility.
- High-speed sampling at 50 ms.
- Models are available with up to 3 auxiliary outputs, up to 4 event inputs, a transfer output, and a remote SP input to cover a wide range of applications.
- Short body with depth of only 60 mm.
- Set 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

Sensor Input
- Thermocouple
- Pt
- Universal analog current/voltage input

Indication Accuracy
- Thermocouple input: ±0.3% of PV
- Pt input: ±0.2% of PV
- Analog input: ±0.2% of FS

Sampling Period
- 50 ms

Event Inputs
- None
- 2
- 4

Remote SP Input
- None
- 1

Serial Communications
- None
- RS-485

E5CC

- PF (shift) Key
- Temperature status display
- Simple programming
- Independent heating and cooling PID control
- Changed parameter display
- Display brightness setting

Dual displays: PV/SV | **4-digit displays**

Control Output 1
- Relay output
- Voltage output (for driving SSR)
- Current output

Control Output 2
- None
- Voltage output (for driving SSR)

Auxiliary Outputs
- 3

Transfer Output
- None
- 1

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　②③④⑤　⑥

Model	① Control outputs 1 and 2	② No. of auxiliary outputs	③ Power supply voltage	④ Terminal type	⑤ Input type	⑥ Options	Meaning	
E5CC							**48 × 48 mm**	
							Control output 1	**Control output 2**
*1 *3	RX						Relay output	None
	QX						Voltage output (for driving SSR)	None
	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	

	Options	HB alarm and HS alarm	Communications	Event inputs	Remote SP Input	Transfer output
	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
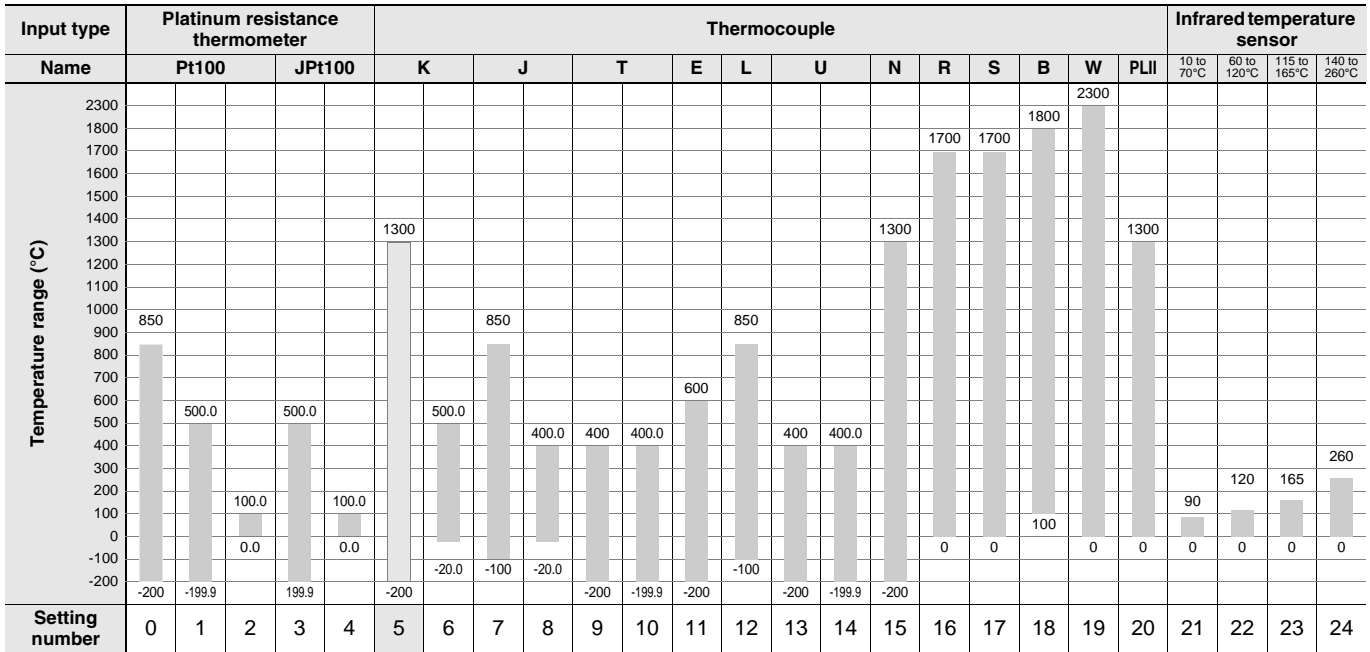(www.ia.omron.com).

Specifications

Ratings

Power supply voltage		A in model number: 100 to 240 VAC, 50/60 Hz D in model number: 24 VAC, 50/60 Hz; 24 VDC
Operating voltage range		85% to 110% of rated supply voltage
Power consumption		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

Sensor input		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

Input impedance		Current input: 150 Ω max., Voltage input: 1 MΩ min. (Use a 1:1 connection when connecting the ES2-HB/THB.)
Control method		ON/OFF control or 2-PID control (with auto-tuning)
Control output	**Relay output**	SPST-NO, 250 VAC, 3 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 5 V, 10 mA *
	Voltage output (for driving SSR)	Output voltage: 12 VDC ±20% (PNP), max. load current: 21 mA, with short-circuit protection circuit
	Current output	4 to 20 mA DC/0 to 20 mA DC, load: 500 Ω max., resolution: approx. 10,000*
Auxiliary output	**Number of outputs**	3
	Output specifications	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
Event input	**Number of inputs**	2 or 4 (depends on model)
	External contact input specifications	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
Transfer output	**Number of outputs**	1 (only on models with a transfer output)
	Output specifications	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
Setting method		Digital setting using front panel keys
Remote SP input		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.)
Indication method		11-segment digital display and individual indicators Character height: PV: 15.2 mm, SV: 7.1 mm
Multi SP		Up to eight set points (SP0 to SP7) can be saved and selected using event inputs, key operations, or serial communications.
Other functions		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
Ambient operating temperature		-10 to 55°C (with no condensation or icing), for 3-year warranty: -10 to 50°C (with no condensation or icing)
Ambient operating humidity		25% to 85%
Storage temperature		-25 to 65°C (with no condensation or icing)

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

E5CC

Input Ranges

●Thermocouple/Platinum Resistance Thermometer (Universal inputs)

Input type	Platinum resistance thermometer				Thermocouple												Infrared temperature sensor			
Name	Pt100		JPt100		K	J	T	E	L	U	N	R	S	B	W	PLII	10 to 70°C	60 to 120°C	115 to 165°C	140 to 260°C
Temperature range (°C) max	850	500.0	100.0	500.0	1300	850	400.0	400	850	400	1300	1700	1700	1800	2300	1300	90	120	165	260
min	-200	-199.9	0.0	0.0	-200	-20.0	-100	-20.0	-100	-200	-200	0	0	100	0	0	0	0	0	0
(additional)				199.9		500.0	400.0	400		600	400.0									
(additional min)						-200	-199.9	-200		-200	-199.9									
Setting number	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Note: The setting numbers continue 0 through 24 across the columns (Pt100: 0,1; JPt100: 2,3,4; K: 5; J: 6,7; T: 8; E: 9; L: 10; U: 11,12,13,14; N: 15; R: 16; S: 17; B: 18; W: 19; PLII: 20; IR sensors: 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
L: Fe-CuNi, DIN 43710-1985
U: Cu-CuNi, DIN 43710-1985
W: W5Re/W26Re, ASTM E988-1990

JPt100: JIS C 1604-1989, JIS C 1606-1989
Pt100: JIS C 1604-1997, IEC 60751
PL II: According to Platinel II electromotive force charts from BASF (previously Engelhard)

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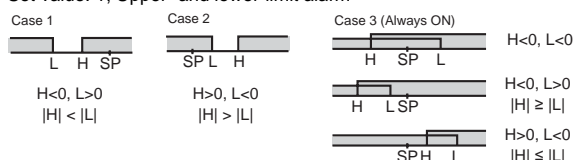Auxiliary outputs are allocated for alarms. ON delays and OFF delays (0 to 999 s) can also be specified.

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.
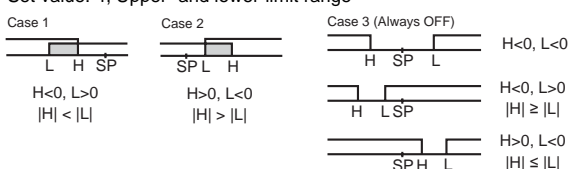
Set value	Alarm type	Alarm output operation		Description of function
		When alarm value X is positive	**When alarm value X is negative**	
0	Alarm function OFF	Output OFF		No alarm
1	Upper- and lower-limit *1	(ON/OFF diagram: L H / SP — PV)	*2	Set the deviation in the set point by setting the alarm upper limit (H) and alarm lower limit (L). The alarm is ON when the PV is outside this deviation range.
2	Upper-limit	(ON/OFF diagram: X / SP — PV)	(ON/OFF diagram: X / SP — PV)	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	(ON/OFF diagram: X / SP — PV)	(ON/OFF diagram: X / SP — PV)	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	(ON/OFF diagram: L H / SP — PV)	*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	(ON/OFF diagram: L H / SP — PV) *5	*4	A standby sequence is added to the upper- and lower-limit alarm (1). *6
6	Upper-limit with standby sequence	(ON/OFF diagram: X / SP — PV)	(ON/OFF diagram: X / SP — PV)	A standby sequence is added to the upper-limit alarm (2). *6
7	Lower-limit with standby sequence	(ON/OFF diagram: X / SP — PV)	(ON/OFF diagram: X / SP — PV)	A standby sequence is added to the lower-limit alarm (3). *6
8	Absolute-value upper-limit	(ON/OFF diagram: X / 0 — PV)	(ON/OFF diagram: X / 0 — PV)	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	(ON/OFF diagram: X / 0 — PV)	(ON/OFF diagram: X / 0 — PV)	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	(ON/OFF diagram: X / 0 — PV)	(ON/OFF diagram: X / 0 — PV)	A standby sequence is added to the absolute-value upper-limit alarm (8). *6
11	Absolute-value lower-limit with standby sequence	(ON/OFF diagram: X / 0 — PV)	(ON/OFF diagram: X / 0 — PV)	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	(ON/OFF diagram: X / 0 — SP)	(ON/OFF diagram: X / 0 — SP)	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	(ON/OFF diagram: X / 0 — SP)	(ON/OFF diagram: X / 0 — SP)	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	(ON/OFF diagram: X / 0 — MV)	(ON/OFF diagram: X / 0 — MV)	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	(ON/OFF diagram: X / 0 — MV)	(ON/OFF diagram: X / 0 — MV)	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	(ON/OFF diagram: X / 0 — RSP)	(ON/OFF diagram: X / 0 — RSP)	The alarm will turn ON when the remote SP (RSP) is larger than the alarm value (X).
19	RSP absolute value lower limit *10	(ON/OFF diagram: X / 0 — RSP)	(ON/OFF diagram: X / 0 — RSP)	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

Case 1   Case 2   Case 3 (Always ON)

L H SP   SP L H   H SP L   H<0, L<0

H<0, L>0   H>0, L<0   H SP L   H<0, L>0
|H| < |L| |H| > |L| H L SP |H| ≥ |L|

SP H L   H>0, L<0
|H| ≤ |L|

*3 Set value: 4, Upper- and lower-limit range

Case 1   Case 2   Case 3 (Always OFF)

L H SP   SP L H   H SP L   H<0, L<0

H<0, L>0   H>0, L<0   H L SP   H<0, L>0
|H| < |L| |H| > |L| |H| ≥ |L|

SP H L   H>0, L<0
|H| ≤ |L|

*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 loop burnout alarm (LBA).

*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

Indication accuracy (at the ambient temperature of 23°C)	Thermocouple: (±0.3% of indicated value or ±1°C, whichever is greater) ±1 digit max. *1 Platinum resistance thermometer: (±0.2% of indicated value or ±0.8°C, whichever is greater) ±1 digit Analog input: ±0.2% FS ±1 digit max. CT input: ±5% FS ±1 digit max.
Transfer output accuracy	±0.3% FS max.
Remote SP Input Type	±0.2% FS ±1 digit max.
Influence of temperature *2	Thermocouple input (R, S, B, W, PL II): (±1% of PV or ±10°C, whichever is greater) ±1 digit max.
Influence of voltage *2	Other thermocouple input: (±1% of PV or ±4°C, whichever is greater) ±1 digit max. *3 Platinum resistance thermometer: (±1% of PV or ±2°C, whichever is greater) ±1 digit max. Analog input: (±1%FS) ±1 digit max. CT input: (±5% FS) ±1 digit max. Remote SP input: (±1% FS) ±1 digit max.
Input sampling period	50 ms
Hysteresis	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)
Proportional band (P)	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)
Integral time (I)	0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *4
Derivative time (D)	0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *4
Proportional band (P) for cooling	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)
Integral time (I) for cooling	0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *4
Derivative time (D) for cooling	0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *4
Control period	0.1, 0.2, 0.5, 1 to 99 s (in units of 1 s)
Manual reset value	0.0 to 100.0% (in units of 0.1%)
Alarm setting range	-1999 to 9999 (decimal point position depends on input type)
Affect of signal source resistance	Thermocouple: 0.1°C/Ω max. (100 Ωmax.) Platinum resistance thermometer: 0.1°C/Ω max. (10 Ω max.)
Insulation resistance	20 MΩ min. (at 500 VDC)
Dielectric strength	2,300 VAC, 50 or 60 Hz for 1 min (between terminals with different charge)
Vibration resistance	10 to 55 Hz, 20 m/s^2 for 10 min each in X, Y, and Z directions
Vibration Malfunction	10 to 55 Hz, 20 m/s^2 for 2 hrs each in X, Y, and Z directions
Destruction Shock resistance	100 m/s^2, 3 times each in X, Y, and Z directions
Destruction Malfunction	300 m/s^2, 3 times each in X, Y, and Z directions
Weight	Controller: Approx. 120 g, Mounting Bracket: Approx. 10 g
Degree of protection	Front panel: IP66, Rear case: IP20, Terminals: IP00
Memory protection	Non-volatile memory (number of writes: 1,000,000 times)
Setup Tool	CX-Thermo version 4.5 or higher
Setup Tool port	E5CC top panel: An E58-CIFQ2 USB-Serial Conversion Cable is used to connect to a USB port on the computer. *5
Standards Approved standards	UL 61010-1, CSA C22.2 No. 611010-1 (evaluated by UL), KOSHA certified (some models) *6, Korean Radio Waves Act (Act 10564)
Standards Conformed standards	EN 61010-1 (IEC 61010-1): Pollution level 2, overcurrent category II, Lloyd's standards *7
EMC	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 ±2°C ±1 digit max. The indication accuracy of the B thermocouple at a temperature of 400°Cmax. is not specified. The indication accuracy of B thermocouples in the 400 to 800°Crange is ±3°C max. The indication accuracy of the R and S thermocouples at a temperature of 200°C max. is ±3°C ±1 digit max. The indication accuracy of W thermocouples is ±0.3 of PV or ±3°C, whichever is greater, ±1 digit max. The indication accuracy of PL II thermocouples is ±0.3 of PV or ±2°C, whichever is greater, ±1 digit max.

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

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

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

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

*6 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*	• 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. Applicable PLCs OMRON PLCs SYSMAC CS Series, CJ Series, or CP Series Mitsubishi Electric PLCs MELSEC Q Series or L Series

Communications between components*	• 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)
	• 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)

* 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^2
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

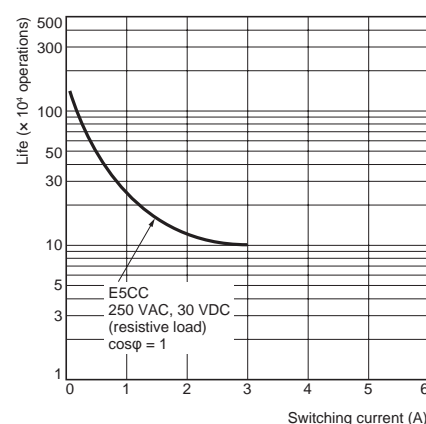|	
CT input (for heater current detection)	Models with detection for singlephase heaters: One input Models with detection for singlephase or three-phase heaters: Two inputs
Maximum heater current	50 A AC
Input current indication accuracy	±5% FS ±1 digit max.
Heater burnout alarm setting range *1	0.1 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.
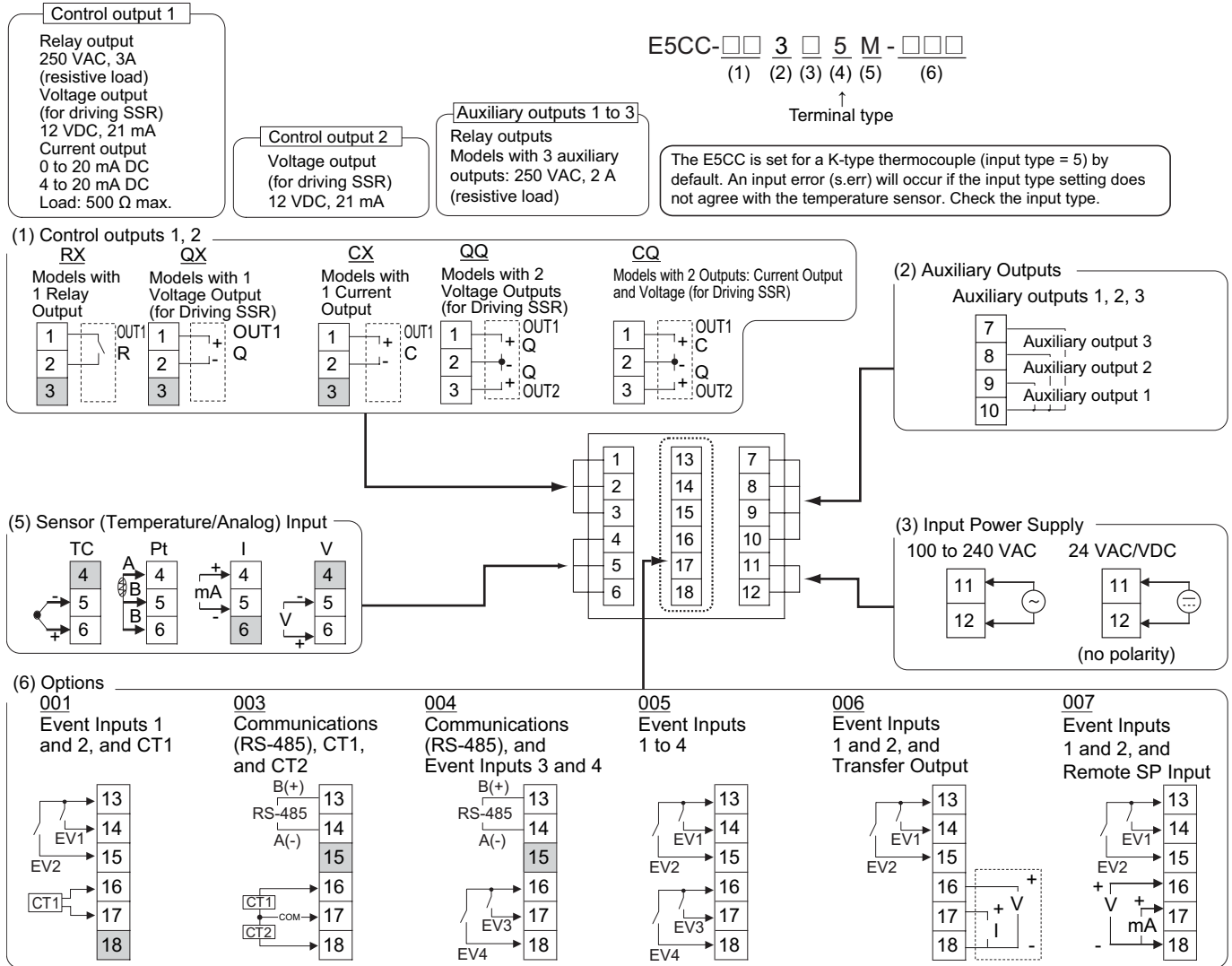*4 The value is 35 ms for a control period of 0.1 s or 0.2 s.

Electrical Life Expectancy Curve for Relays (Reference Values)

Life (x 10^4 operations) vs Switching current (A)
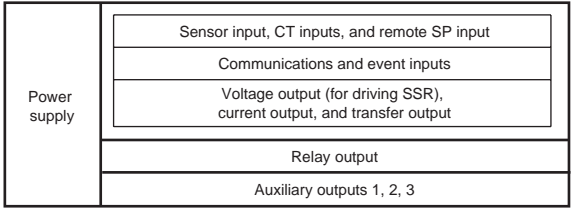
E5CC
250 VAC, 30 VDC
(resistive load)
cosφ = 1

E5CC

External Connections

E5CC

Control output 1

Relay output
250 VAC, 3A
(resistive load)
Voltage output
(for driving SSR)
12 VDC, 21 mA
Current output
0 to 20 mA DC
4 to 20 mA DC
Load: 500 Ω max.

Control output 2

Voltage output
(for driving SSR)
12 VDC, 21 mA

Auxiliary outputs 1 to 3

Relay outputs
Models with 3 auxiliary
outputs: 250 VAC, 2 A
(resistive load)

E5CC-□□ 3 □ 5 M - □□□
(1) (2) (3) (4) (5) (6)

↑
Terminal type

The E5CC 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.

(1) Control outputs 1, 2

RX — Models with 1 Relay Output

QX — Models with 1 Voltage Output (for Driving SSR)

CX — Models with 1 Current Output

QQ — Models with 2 Voltage Outputs (for Driving SSR)

CQ — Models with 2 Outputs: Current Output and Voltage (for Driving SSR)

(2) Auxiliary Outputs

Auxiliary outputs 1, 2, 3

7, 8 — Auxiliary output 3
8, 9 — Auxiliary output 2
9, 10 — Auxiliary output 1

(5) Sensor (Temperature/Analog) Input

TC   Pt   I   V

(3) Input Power Supply

100 to 240 VAC — 11, 12

24 VAC/VDC — 11, 12 (no polarity)

(6) Options

001 — Event Inputs 1 and 2, and CT1

003 — Communications (RS-485), CT1, and CT2

004 — Communications (RS-485), and Event Inputs 3 and 4

005 — Event Inputs 1 to 4

006 — Event Inputs 1 and 2, and Transfer Output

007 — Event Inputs 1 and 2, and Remote SP Input

Note: 1. The application of the terminals depends on the model.
2. Do not wire the terminals that are shown with a gray background.
3. When complying with EMC standards, the cable that connects the sensor must be 30 m or less.
   If the cable length exceeds 30 m, compliance with EMC standards will not be possible.
4. Connect M3 crimped terminals.

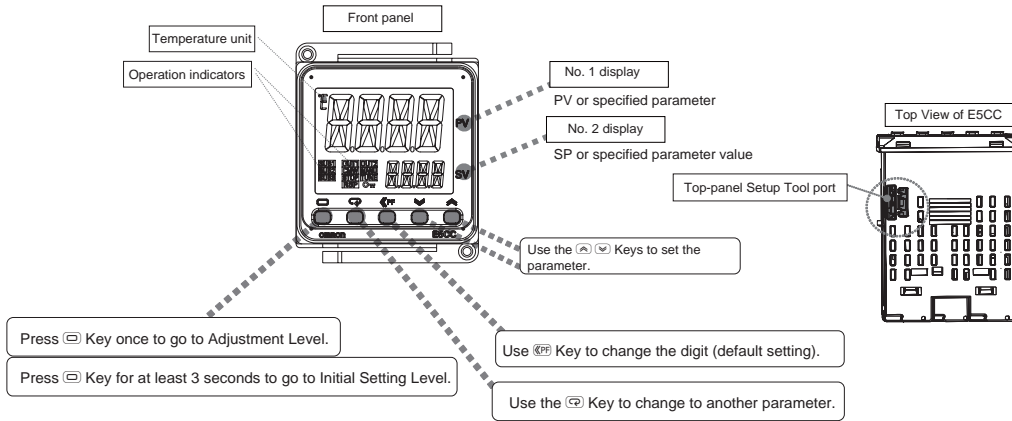## Isolation/Insulation Block Diagrams

Models with 3 Auxiliary Outputs

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

☐ : Reinforced insulation
☐ : Functional isolation

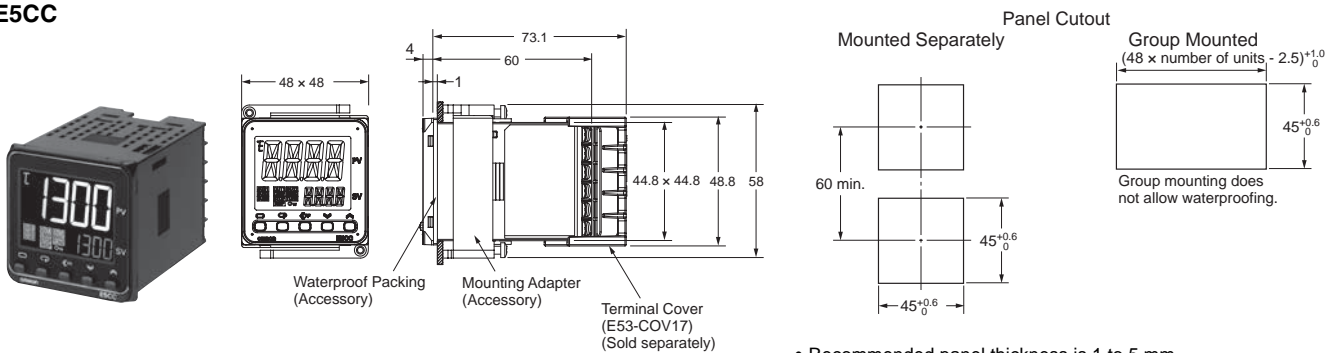**Note:** Auxiliary outputs 1 to 3 are not isolated.

Nomenclature

E5CC

Temperature unit

Operation indicators

Front panel

No. 1 display
PV or specified parameter

No. 2 display
SP or specified parameter value

Top View of E5CC

Top-panel Setup Tool port

Use the ⊼ ⊻ Keys to set the parameter.

Press ▢ Key once to go to Adjustment Level.

Press ▢ Key for at least 3 seconds to go to Initial Setting Level.

Use ⊞ Key to change the digit (default setting).

Use the ⊡ Key to change to another parameter.

Dimensions (Unit: mm)

Controllers

E5CC

Waterproof Packing (Accessory)

Mounting Adapter (Accessory)

Terminal Cover (E53-COV17) (Sold separately)

Panel Cutout
Mounted Separately

Group Mounted
(48 × number of units - 2.5)$^{+1.0}_{0}$

$45^{+0.6}_{0}$

Group mounting does not allow waterproofing.

60 min.

$45^{+0.6}_{0}$

$45^{+0.6}_{0}$

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.
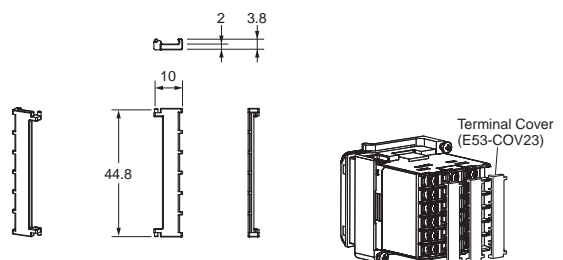
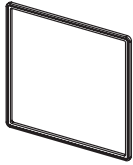## Accessories (Order Separately)

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

USB connector (type A plug)

LED (RD)

LED (PWR)

LED (SD)

Serial connector
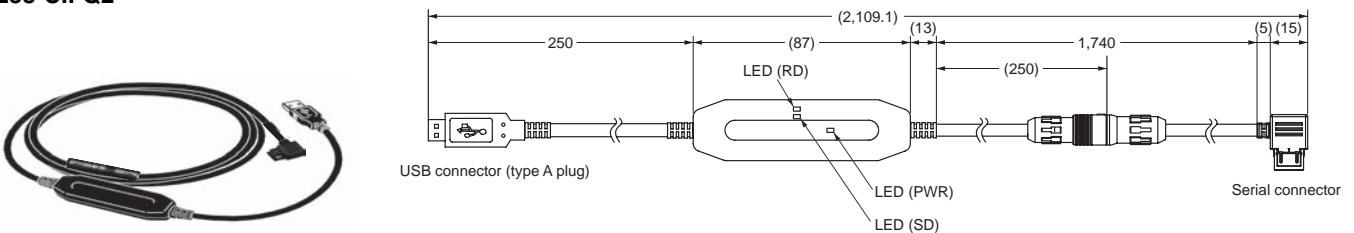
● **Terminal Covers**
E53-COV17
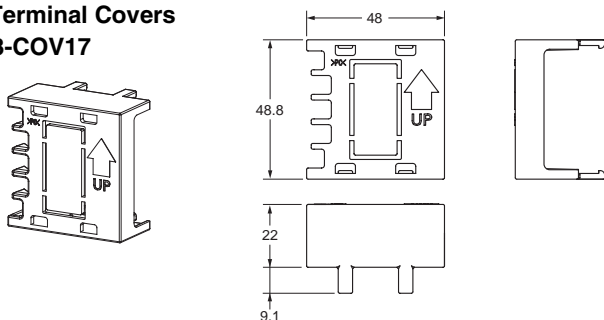
● **Terminal Covers**
E53-COV23 (Three Covers provided.)


Terminal Cover (E53-COV23)

E5CC

● **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.
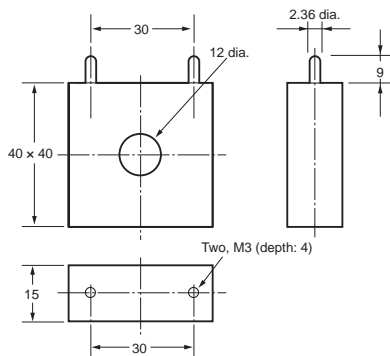
● **Current Transformers**
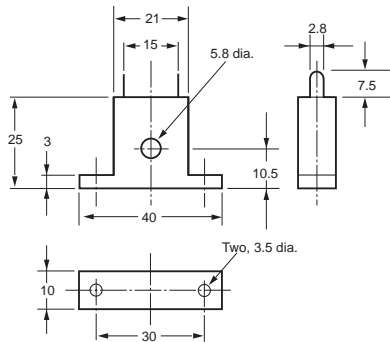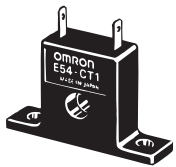
E54-CT1

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
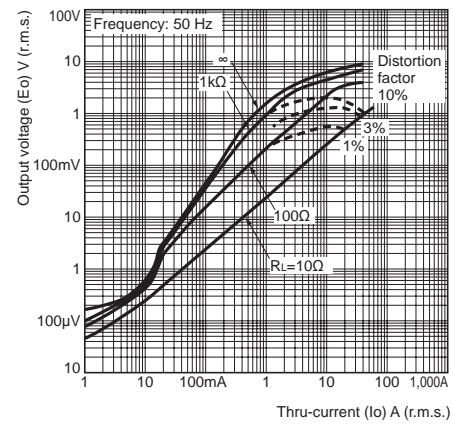
E54-CT3

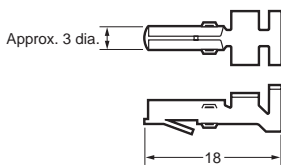### Thru-current (Io) vs. Output Voltage (Eo) (Reference Values)
E54-CT3

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
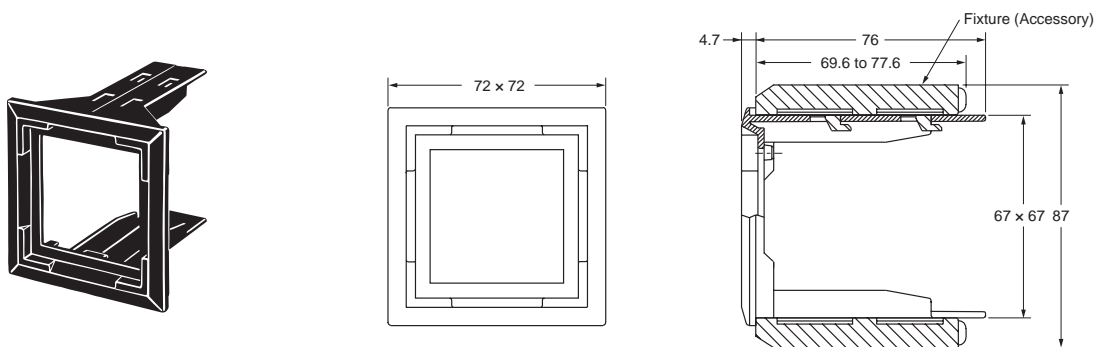• **Armature**

Connection Example

• **Plug**

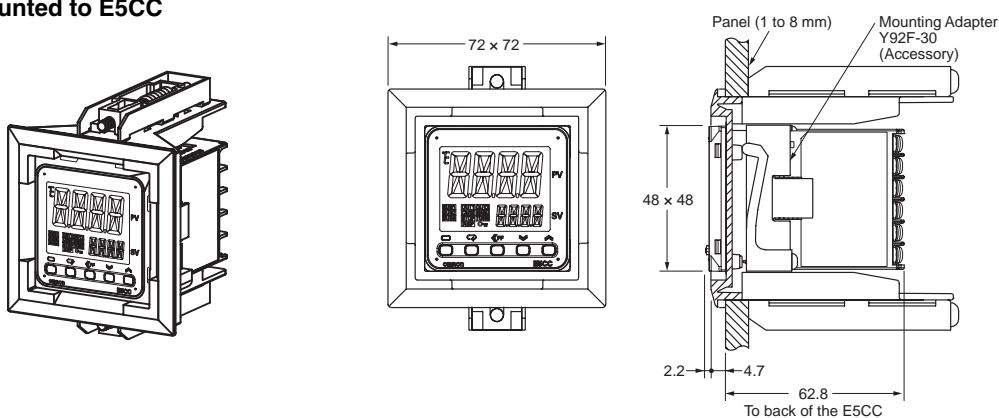**OMRON**
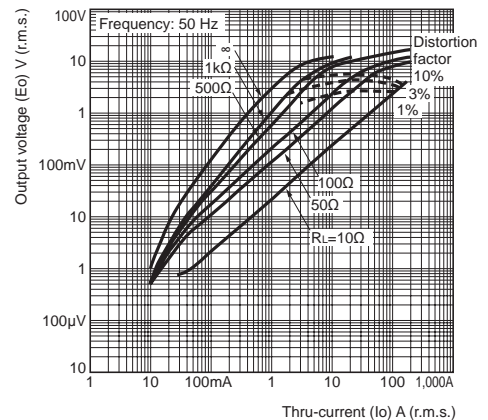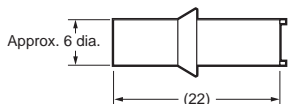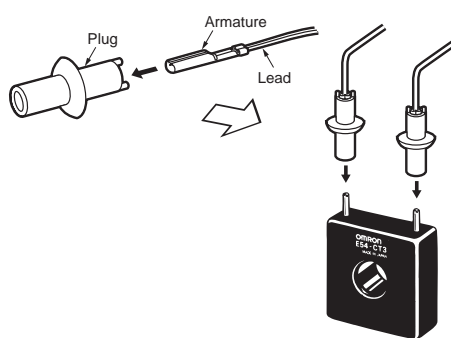
● **Adapter**

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.

72 × 72

4.7 76 Fixture (Accessory)
69.6 to 77.6

67 × 67 87

Mounted to E5CC

72 × 72

Panel (1 to 8 mm) Mounting Adapter Y92F-30 (Accessory)

48 × 48

2.2 4.7
62.8
To back of the E5CC
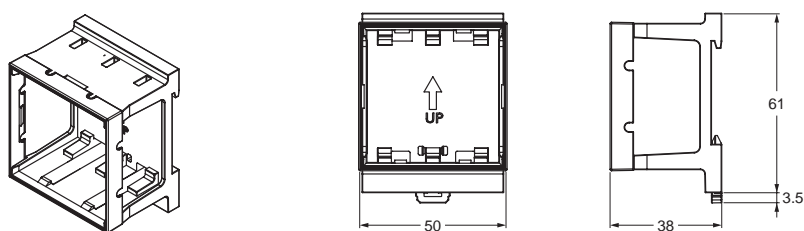
● **DIN Track Mounting Adapter**

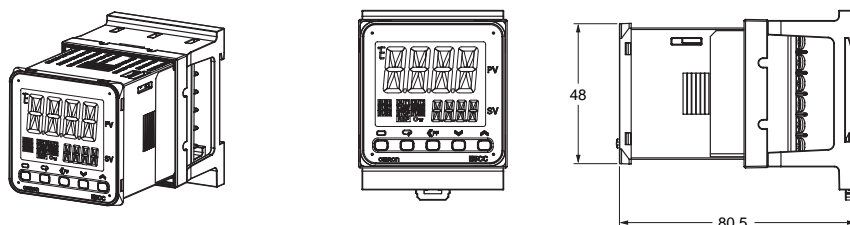**Y92F-52** **Note:** This Adapter cannot be used together with the Terminal Cover.
  Remove the Terminal Cover to use the Adapter.

UP

61

3.5

50 38

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

48

80.5

E5CC

● Watertight Cover
Y92A-48N

87.7 79.2

21.9 14

(2)

69

12

67.6
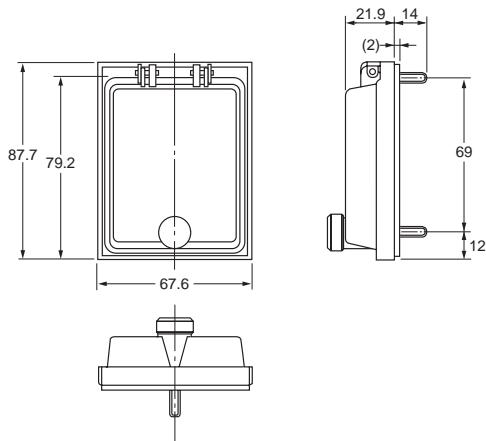
● Mounting Adapter
Y92F-49
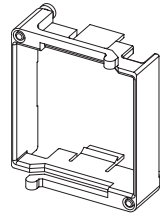
The Mounting Adapter is provided with the Temperature Controller.
Order this Adapter separately if it becomes lost or damaged.

● 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.
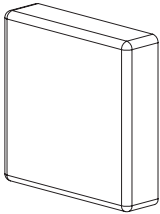
● Protective Cover
Y92A-48H

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

OMRON

MEMO
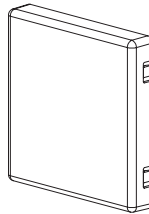
Digital Temperature Controller
E5EC/E5AC (48 × 96 mm/96 × 96 mm)

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.

$_c$**ℛ**$_{us}$ **SP** **IC** **CE**

- 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).

48 × 96 mm E5EC   **96 × 96 mm E5AC**

⚠ **Refer to Safety Precautions on page 34.**

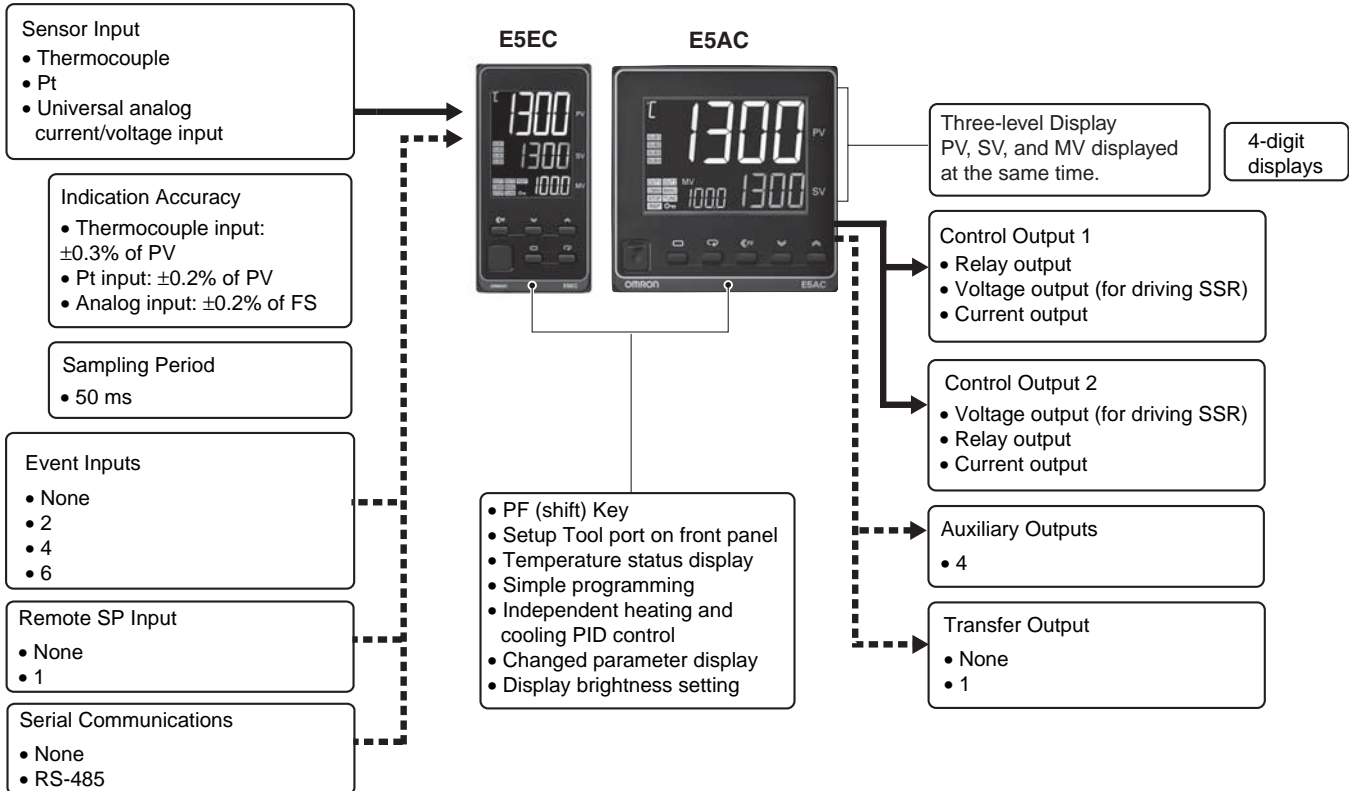- High-speed sampling at 50 ms.
- Models are available with up to 4 auxiliary outputs, up to 6 event inputs, a transfer output, and a remote SP input to cover a wide range of applications.
- Short body with depth of only 60 mm.
- Easy connections to a PLC with programless communications. Use component communications to link Temperature Controllers to each other.
- The new position-proportional control models allow you to control valves as well.

Main I/O Functions

Sensor Input
- Thermocouple
- Pt
- Universal analog current/voltage input

E5EC   **E5AC**

Indication Accuracy
- Thermocouple input: ±0.3% of PV
- Pt input: ±0.2% of PV
- Analog input: ±0.2% of FS

Sampling Period
- 50 ms

Event Inputs
- None
- 2
- 4
- 6

Remote SP Input
- None
- 1

Serial Communications
- None
- RS-485

Three-level Display
PV, SV, and MV displayed at the same time.

4-digit displays

- PF (shift) Key
- Setup Tool port on front panel
- Temperature status display
- Simple programming
- Independent heating and cooling PID control
- Changed parameter display
- Display brightness setting

Control Output 1
- Relay output
- Voltage output (for driving SSR)
- Current output

Control Output 2
- Voltage output (for driving SSR)
- Relay output
- Current output

Auxiliary Outputs
- 4

Transfer Output
- None
- 1

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)

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16 16 OMRON

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

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

*1. The options that can be selected depend on the type of control output.
*2. The control output cannot be used as a transfer output.
*3. A model with four auxiliary outputs must be selected.

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).

Specifications

Ratings
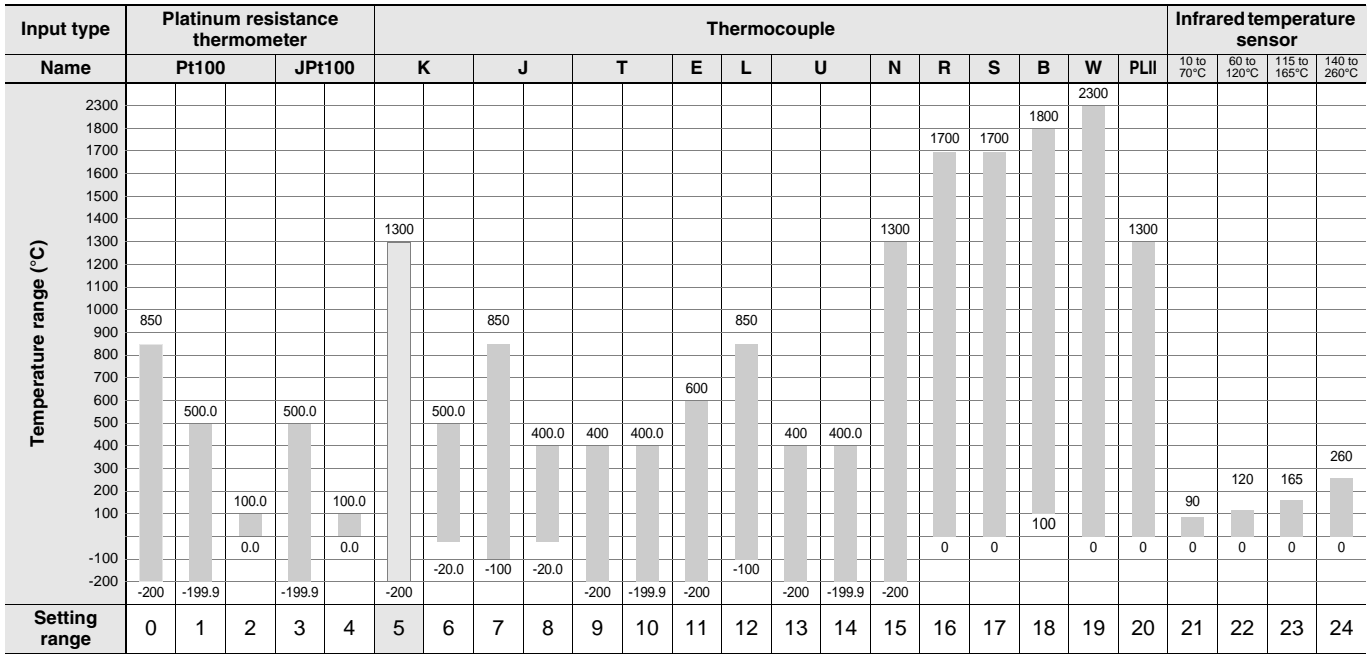
Power supply voltage		A in model number: 100 to 240 VAC, 50/60 Hz D in model number: 24 VAC, 50/60 Hz; 24 VDC
Operating voltage range		85% to 110% of rated supply voltage
Power consumption	E5EC	Models with option selection of 000:6.6 VA max. at 100 to 240 VAC, and 4.1 VA max. at 24 VAC or 2.3 W max. 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
	E5AC	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
Sensor input		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
Input impedance		Current input: 150 Ω max., Voltage input: 1 MΩ min. (Use a 1:1 connection when connecting the ES2-HB/THB.)
Control method		ON/OFF or 2-PID control (with autotuning)
Control output	**Relay output**	SPST-NO, 250 VAC, 5 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 5 V, 10 mA
	Voltage output (for driving SSR)	Output voltage: 12 VDC ±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.)
	Current output	4 to 20 mA DC/0 to 20 mA DC, load: 500 Ω max., resolution: approx. 10,000
Auxiliary output	**Number of outputs**	4
	Output specifications	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
Event input	**Number of inputs**	2, 4 or 6 (depends on model)
	External contact input specifications	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
Transfer output	**Number of outputs**	1 (only on models with a transfer output)
	Output specifications	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
Remote SP input		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.)
Potentiometer input		100 Ω to 10 kΩ
Setting method		Digital setting using front panel keys
Indication method		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
Multi SP		Up to eight set points (SP0 to SP7) can be saved and selected using event inputs, key operations, or serial communications.
Bank switching		None
Other functions		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
Ambient operating temperature		-10 to 55°C (with no condensation or icing), for 3-year warranty: -10 to 50°C (with no condensation or icing)
Ambient operating humidity		25% to 85%
Storage temperature		-25 to 65°C (with no condensation or icing)

E5EC/E5AC

Input Ranges

●Thermocouple/Platinum Resistance Thermometer (Universal inputs)

Input type	Platinum resistance thermometer				Thermocouple													Infrared temperature sensor			
Name	Pt100		JPt100		K		J		T	E	L	U		N	R	S	B	W	PLII	10 to 70°C	60 to 120°C	115 to 165°C	140 to 260°C

Temperature range (°C):

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
Upper	850	500.0	100.0	500.0	100.0	1300	500.0	850	400.0	400	400.0	600	850	400	400.0	1300	1700	1700	1800	2300	1300	90	120	165	260
Lower	-200	-199.9	0.0	-199.9	0.0	-200	-20.0	-100	-20.0	-200	-199.9	-200	-100	-200	-199.9	-200	0	0	100	0	0	0	0	0	0

▢ 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
L: Fe-CuNi, DIN 43710-1985
U: Cu-CuNi, DIN 43710-1985
W: W5Re/W26Re, ASTM E988-1990

JPt100: JIS C 1604-1989, JIS C 1606-1989
Pt100: JIS C 1604-1997, IEC 60751
PL II: According to Platinel II electromotive force charts from BASF (previously Engelhard)

●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

OMRON

Alarm type

Each alarm can be independently set to one of the following 19 alarm types. The default is 2: Upper limit. (see note.)
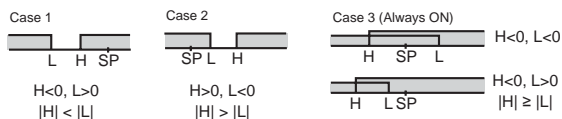Auxiliary outputs are allocated for alarms. ON delays and OFF delays (0 to 999 s) can also be specified.

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.
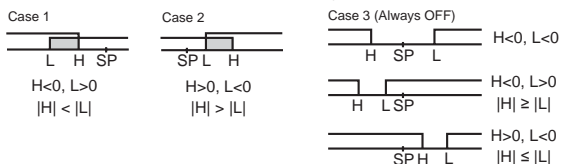
Set value	Alarm type	Alarm output operation		Description of function
		When alarm value X is positive	When alarm value X is negative	
0	Alarm function OFF	Output OFF		No alarm
1	Upper- and lower-limit *1	ON/OFF, L H, SP, PV	*2	Set the deviation in the set point by setting the alarm upper limit (H) and alarm lower limit (L). The alarm is ON when the PV is outside this deviation range.
2	Upper-limit	ON/OFF, X, SP, PV	ON/OFF, X, SP, PV	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	ON/OFF, X, SP, PV	ON/OFF, X, SP, PV	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	ON/OFF, L H, SP, PV	*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	ON/OFF, L H, SP, PV *5	*4	A standby sequence is added to the upper- and lower-limit alarm (1).*6
6	Upper-limit with standby sequence	ON/OFF, X, SP, PV	ON/OFF, X, SP, PV	A standby sequence is added to the upper-limit alarm (2). *6
7	Lower-limit with standby sequence	ON/OFF, X, SP, PV	ON/OFF, X, SP, PV	A standby sequence is added to the lower-limit alarm (3).*6
8	Absolute-value upper-limit	ON/OFF, X, 0, PV	ON/OFF, X, 0, PV	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	ON/OFF, X, 0, PV	ON/OFF, X, 0, PV	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	ON/OFF, X, 0, PV	ON/OFF, X, 0, PV	A standby sequence is added to the absolute-value upper-limit alarm (8). *6
11	Absolute-value lower-limit with standby sequence	ON/OFF, X, 0, PV	ON/OFF, X, 0, PV	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	ON/OFF, X, 0, SP	ON/OFF, X, 0, SP	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	ON/OFF, X, 0, SP	ON/OFF, X, 0, SP	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	ON/OFF, X, 0, MV	ON/OFF, X, 0, MV	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	ON/OFF, X, 0, MV	ON/OFF, X, 0, MV	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	ON/OFF, X, 0, RSP	ON/OFF, X, 0, RSP	The alarm will turn ON when the remote SP (RSP) is larger than the alarm value (X).
19	RSP absolute value lower limit *10	ON/OFF, X, 0, RSP	ON/OFF, X, 0, RSP	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

Case 1: L H SP — H<0, L>0, |H| < |L|
Case 2: SP L H — H>0, L<0, |H| > |L|
Case 3 (Always ON):
H SP L — H<0, L<0
H L SP — H<0, L>0 |H| ≥ |L|
SP H L — H>0, L<0 |H| ≤ |L|

*3. Set value: 4, Upper- and lower-limit range

Case 1: L H SP — H<0, L>0, |H| < |L|
Case 2: SP L H — H>0, L<0, |H| > |L|
Case 3 (Always OFF):
H SP L — H<0, L<0
H L SP — H<0, L>0 |H| ≥ |L|
SP H L — H>0, L<0 |H| ≤ |L|

*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

Indication accuracy (at the ambient temperature of 23°C)	Thermocouple: (±0.3% of indicated value or ±1°C, whichever is greater) ±1 digit max. *1 Platinum resistance thermometer: (±0.2% of indicated value or ±0.8°C, whichever is greater) ±1 digit Analog input: ±0.2% FS ±1 digit max. CT input: ±5% FS ±1 digit max. Potentiometer input: ±5% FS ±1 digit max.
Transfer output accuracy	±0.3% FS max.
Remote SP Input Type	±0.2% FS ±1 digit max.
Influence of temperature *2	Thermocouple input (R, S, B, W, PL II): (±1% of PV or ±10°C, whichever is greater) ±1 digit max. Other thermocouple input: (±1% of PV or ±4°C, whichever is greater) ±1 digit max. *3
Influence of voltage *2	Platinum resistance thermometer: (±1% of PV or ±2°C, whichever is greater) ±1 digit max. Analog input: (±1%FS) ±1 digit max. CT input: (±5% FS) ±1 digit max. Remote SP input: (±1% FS) ±1 digit max.
Input sampling period	50ms
Hysteresis	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)
Proportional band (P)	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)
Integral time (I)	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
Derivative time (D)	0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *4
Proportional band (P) for cooling	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)
Integral time (I) for cooling	0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *4
Derivative time (D) for cooling	0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *4
Control period	0.1, 0.2, 0.5, 1 to 99 s (in units of 1 s)
Manual reset value	0.0 to 100.0% (in units of 0.1%)
Alarm setting range	-1999 to 9999 (decimal point position depends on input type)
Affect of signal source resistance	Thermocouple: 0.1°C/Ω max. (100 Ω max.) Platinum resistance thermometer: 0.1°C/Ω max. (10 Ω max.)
Insulation resistance	20 MΩ min. (at 500 VDC)
Dielectric strength	2,300 VAC, 50 or 60 Hz for 1 min (between terminals with different charge)
Vibration — resistance	10 to 55 Hz, 20 m/s^2 for 10 min each in X, Y, and Z directions
Vibration — Malfunction	10 to 55 Hz, 20 m/s^2 for 2 hrs each in X, Y, and Z directions
Destruction — resistance	100 m/s^2, 3 times each in X, Y, and Z directions
Destruction — Malfunction	300 m/s^2, 3 times each in X, Y, and Z directions
Weight — E5EC	Controller: Approx. 210 g, Mounting Brackets: Approx. 4 g × 2
Weight — E5AC	Controller: Approx. 250 g, Mounting Brackets: Approx. 4 g × 2
Degree of protection	Front panel: IP66, Rear case: IP20, Terminals: IP00
Memory protection	Non-volatile memory (number of writes: 1,000,000 times)
Setup Tool	CX-Thermo version 4.5 or higher
Setup Tool port	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
Standards — Approved standards	UL 61010-1, CSA C22.2 No. 611010-1 (evaluated by UL), Korean Radio Waves Act (Act 10564)
Standards — Conformed standards	EN 61010-1 (IEC 61010-1): Pollution level 2, overcurrent category II, Lloyd's standards *6
EMC	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 ±2°C ±1 digit max. The indication accuracy of the B thermocouple at a temperature of 400°C max.
     is not specified. The indication accuracy of B thermocouples in the 400 to 800°C range is ±3°C max. The indication accuracy of the R and S thermocouples at a temperature of 200°C max. is ±3°C ±1 digit max. The indication accuracy of W thermocouples is ±0.3 of PV or ±3°C, whichever is greater, ±1 digit max. The indication accuracy of PL II thermocouples is ±0.3 of PV or ±2°C, whichever is greater, ±1 digit max.
*2   Ambient temperature: -10°C to 23°C to 55°C, Voltage range: -15% to 10% of rated voltage
*3   K thermocouple at -100°C max.: ±10°C max.
*4   The unit is determined by the setting of the Integral/Derivative Time Unit parameter.
*5   External communications (RS-485) and USB-serial conversion cable communications can be used at the same time.
*6   Refer to 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*	• 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. Applicable PLCs
	    OMRON PLCs
	        SYSMAC CS Series, CJ Series, or CP Series
	    Mitsubishi Electric PLCs
	        MELSEC Q Series or L Series

Communications between components*	• 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)
	• 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)

* 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^2
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).
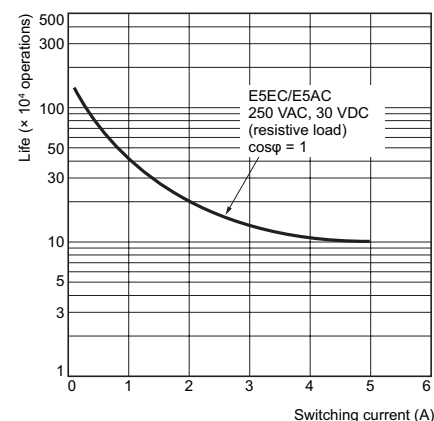*2. For SSR failure alarms, the heater current will be measured when the control output is OFF, and the output will turn ON if the heater current is higher than the set value (i.e., SSR failure detection current value).
*3. The value is 30 ms for a control period of 0.1 s or 0.2 s.
*4. The value is 35 ms for a control period of 0.1 s or 0.2 s.

Electrical Life Expectancy Curve for Relays (Reference Values)
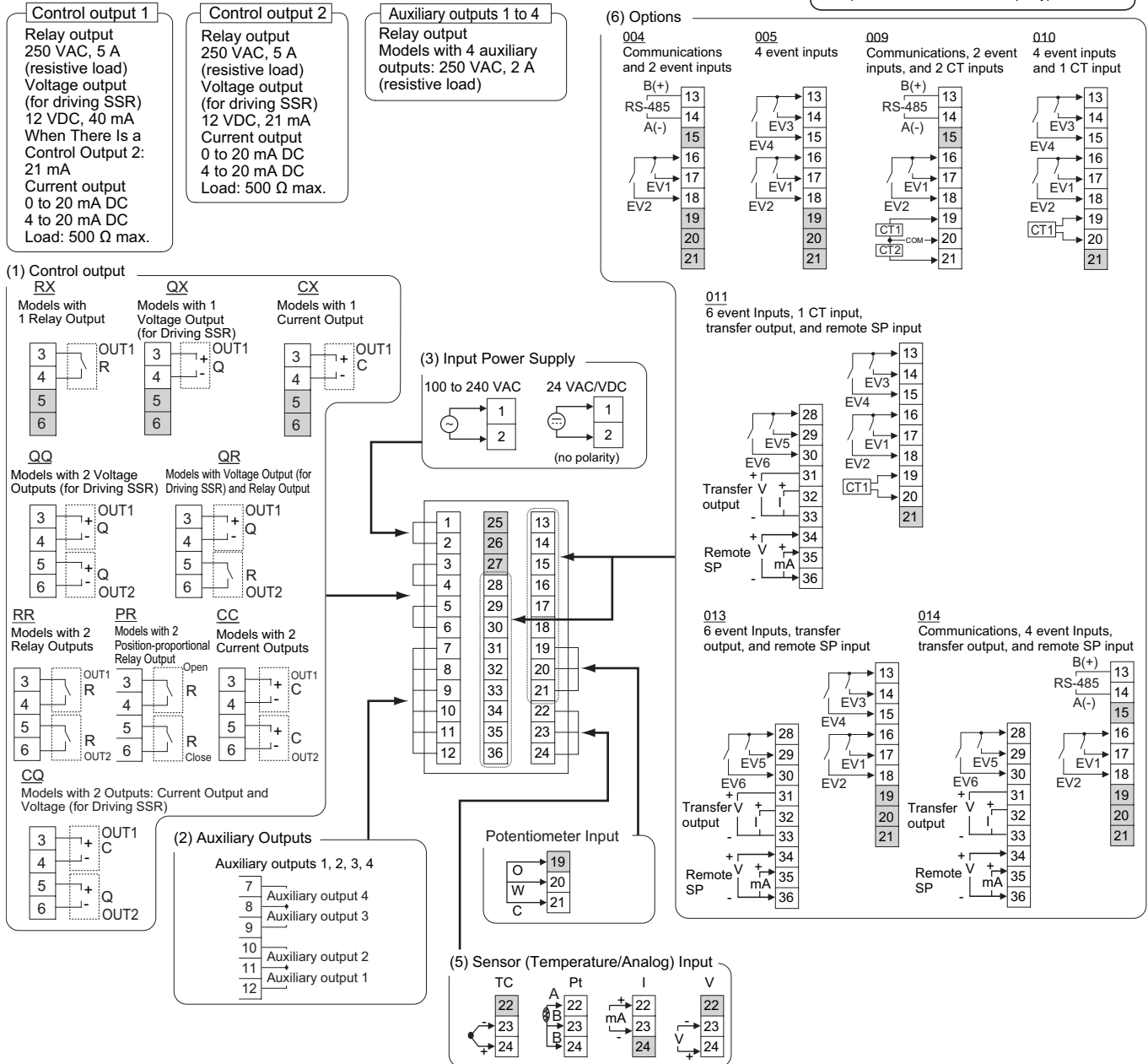
E5EC/E5AC

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.

Control output 1
Relay output
250 VAC, 5 A (resistive load)
Voltage output (for driving SSR)
12 VDC, 40 mA
When There Is a Control Output 2: 21 mA
Current output
0 to 20 mA DC
4 to 20 mA DC
Load: 500 Ω max.

Control output 2
Relay output
250 VAC, 5 A (resistive load)
Voltage output (for driving SSR)
12 VDC, 21 mA
Current output
0 to 20 mA DC
4 to 20 mA DC
Load: 500 Ω max.

Auxiliary outputs 1 to 4
Relay output
Models with 4 auxiliary outputs: 250 VAC, 2 A (resistive load)

(6) Options

004 Communications and 2 event inputs
B(+) RS-485 A(-) — 13 14 15 / EV1 EV2 — 16 17 18 19 20 21

005 4 event inputs
EV3 EV4 / EV1 EV2 — 13 14 15 16 17 18 19 20 21

009 Communications, 2 event inputs, and 2 CT inputs
B(+) RS-485 A(-) — 13 14 15 / EV1 EV2 — 16 17 18 / CT1 CT2 COM — 19 20 21

010 4 event inputs and 1 CT input
EV3 EV4 / EV1 EV2 — 13 14 15 16 17 18 / CT1 — 19 20 21

(1) Control output

RX Models with 1 Relay Output
3 4 / OUT1 R / 5 6

QX Models with 1 Voltage Output (for Driving SSR)
3 4 / OUT1 Q + - / 5 6

CX Models with 1 Current Output
3 4 / OUT1 C + - / 5 6

QQ Models with 2 Voltage Outputs (for Driving SSR)
3 4 / OUT1 Q + - / 5 6 / Q + - OUT2

QR Models with Voltage Output (for Driving SSR) and Relay Output
3 4 / OUT1 Q + - / 5 6 / R OUT2

RR Models with 2 Relay Outputs
3 4 / OUT1 R / 5 6 / R OUT2

PR Models with 2 Position-proportional Relay Output
3 4 / Open R / 5 6 / R Close

CC Models with 2 Current Outputs
3 4 / OUT1 C + - / 5 6 / C + - OUT2

CQ Models with 2 Outputs: Current Output and Voltage (for Driving SSR)
3 4 / OUT1 C + - / 5 6 / Q + - OUT2

(3) Input Power Supply
100 to 240 VAC — 1 2
24 VAC/VDC — 1 2 (no polarity)

(2) Auxiliary Outputs
Auxiliary outputs 1, 2, 3, 4
7 Auxiliary output 4
8 Auxiliary output 3
9
10 Auxiliary output 2
11 Auxiliary output 1
12

Potentiometer Input
O 19 / W 20 / C 21

011 6 event Inputs, 1 CT input, transfer output, and remote SP input
EV3 EV4 — 13 14 15 / EV1 EV2 — 16 17 18 19 / CT1 — 20 21
EV5 EV6 — 28 29 30
Transfer output V + I - — 31 32 33
Remote SP V + mA - — 34 35 36

013 6 event Inputs, transfer output, and remote SP input
EV3 EV4 — 13 14 15 / EV1 EV2 — 16 17 18 19 20 21
EV5 EV6 — 28 29 30
Transfer output V + I - — 31 32 33
Remote SP V + mA - — 34 35 36

014 Communications, 4 event Inputs, transfer output, and remote SP input
B(+) RS-485 A(-) — 13 14 15 / EV1 EV2 — 16 17 18 19 20 21
EV5 EV6 — 28 29 30
Transfer output V + I - — 31 32 33
Remote SP V + mA - — 34 35 36

Terminal block: 1 2 3 4 5 6 7 8 9 10 11 12 / 25 26 27 28 29 30 31 32 33 34 35 36 / 13 14 15 16 17 18 19 20 21 22 23 24

(5) Sensor (Temperature/Analog) Input
TC — 22 23 24
Pt — A B B — 22 23 24
I — mA + - — 22 23 24
V — V + - — 22 23 24

Note: 1. The application of the terminals depends on the model.
2. Do not wire the terminals that are shown with a gray background.
3. When complying with EMC standards, the cable that connects the sensor must be 30 m or less. If the cable length exceeds 30 m, compliance with EMC standards will not be possible.
4. Connect M3 crimped terminals.
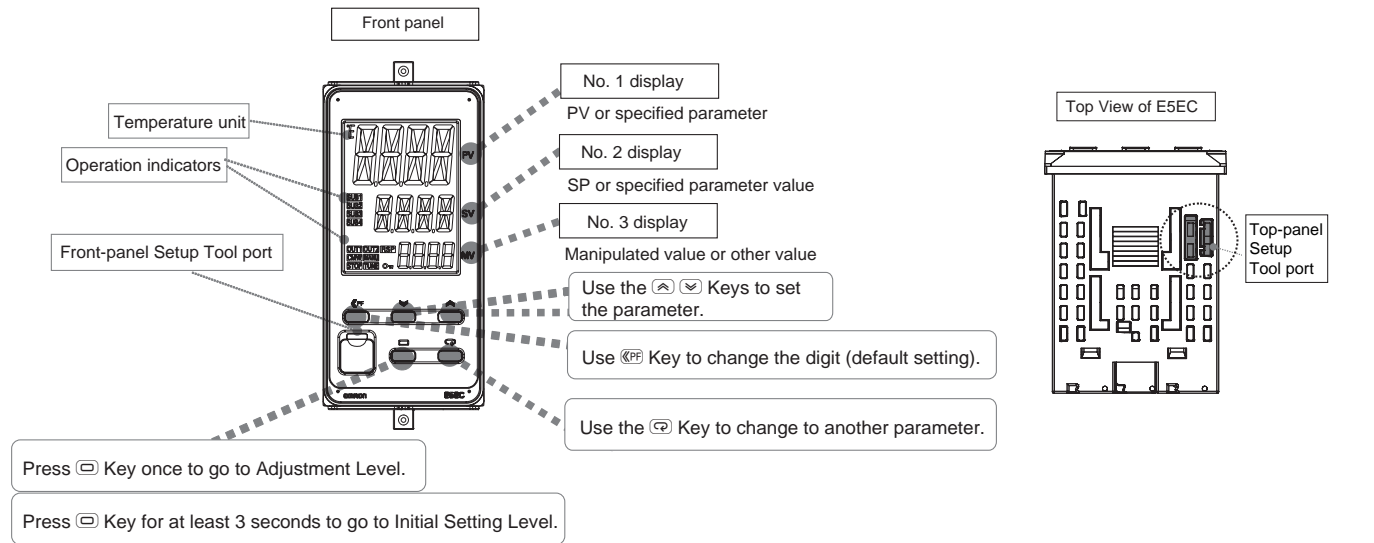
Isolation/Insulation Block Diagrams

Models with 4 Auxiliary Outputs

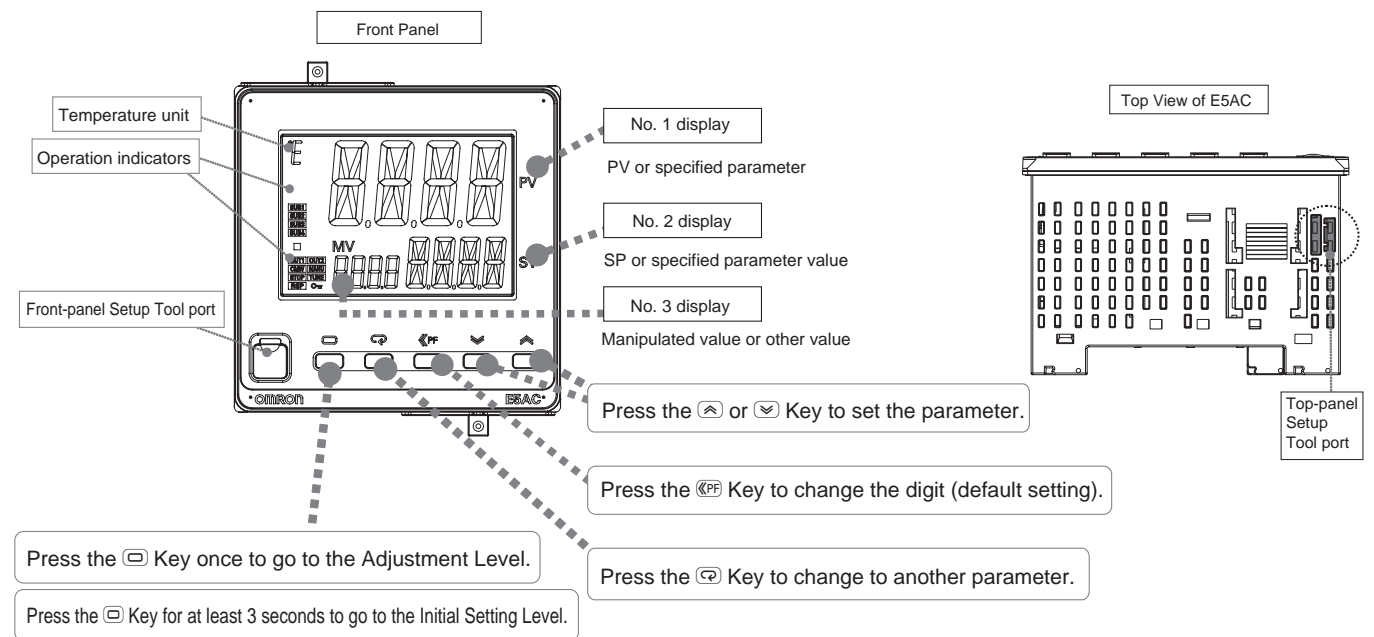| Power Supply | Sensor input, CT inputs, potentiometer input, and remote SP input |
	Communications and event inputs
	Voltage output (for driving SSR), current output, and transfer output
	Relay output
	Auxiliary outputs 1, 2
	Auxiliary outputs 3, 4

☐ : Reinforced insulation

☐ : Functional isolation

Nomenclature

E5EC

Front panel

Temperature unit

Operation indicators

Front-panel Setup Tool port

No. 1 display
PV or specified parameter

No. 2 display
SP or specified parameter value

No. 3 display
Manipulated value or other value

Use the ⊼ ⊻ Keys to set the parameter.

Use 《PF Key to change the digit (default setting).

Use the ⊡ Key to change to another parameter.

Press ▭ Key once to go to Adjustment Level.

Press ▭ Key for at least 3 seconds to go to Initial Setting Level.

Top View of E5EC

Top-panel Setup Tool port

E5AC

Front Panel

Temperature unit

Operation indicators

Front-panel Setup Tool port

No. 1 display
PV or specified parameter

No. 2 display
SP or specified parameter value

No. 3 display
Manipulated value or other value

Press the ⊼ or ⊻ Key to set the parameter.

Press the 《PF Key to change the digit (default setting).

Press the ⊡ Key to change to another parameter.

Press the ▭ Key once to go to the Adjustment Level.

Press the ▭ Key for at least 3 seconds to go to the Initial Setting Level.

Top View of E5AC

Top-panel Setup Tool port

E5EC/E5AC

Dimensions

Controllers

E5EC

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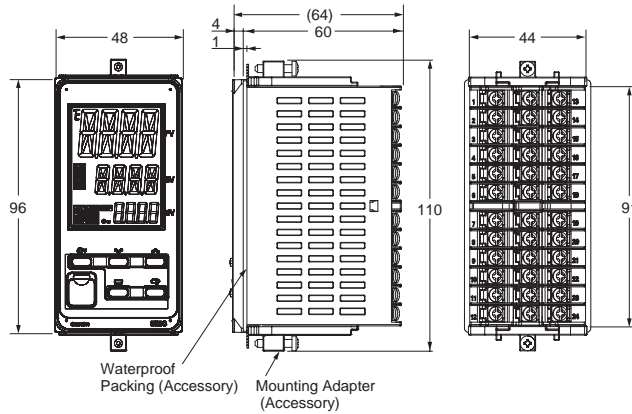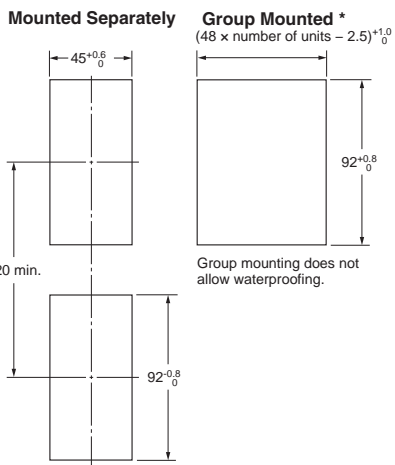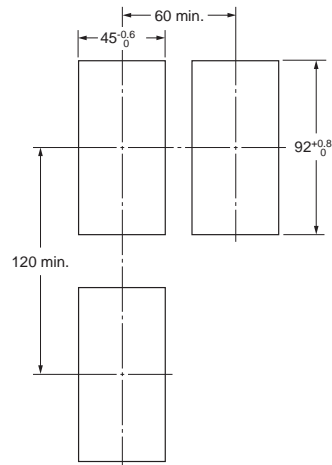
The Setup Tool port is on the top of the Temperature Controller.
It is used to connect the Temperature Controller to the computer to use the Setup Tool. The E58-CIFQ2 USB-Serial Conversion Cable is required to make the connection. Refer to the instructions that are provided with the USB-Serial Conversion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

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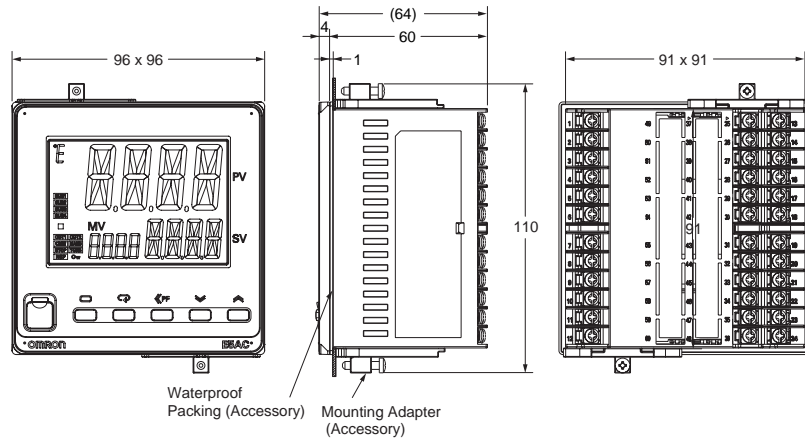
Mounted Separately

Group Mounted *
$(48 \times \text{number of units} - 2.5)^{+1.0}_{0}$

$45^{+0.6}_{0}$

120 min.

$92^{-0.8}_{0}$

$92^{+0.8}_{0}$

Group mounting does not allow waterproofing.

* 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.

60 min.

$45^{-0.6}_{0}$
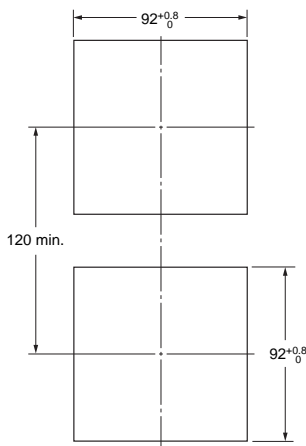
$92^{+0.8}_{0}$

120 min.

- 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.

OMRON

E5AC

96 x 96

(64)
4
60
1

110

91 x 91

91

Waterproof Packing (Accessory)

Mounting Adapter (Accessory)

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

$92^{+0.8}_{0}$

120 min.

$92^{+0.8}_{0}$

Group Mounted *

$(96 \times \text{number of units} - 3.5)^{+1.0}_{0}$
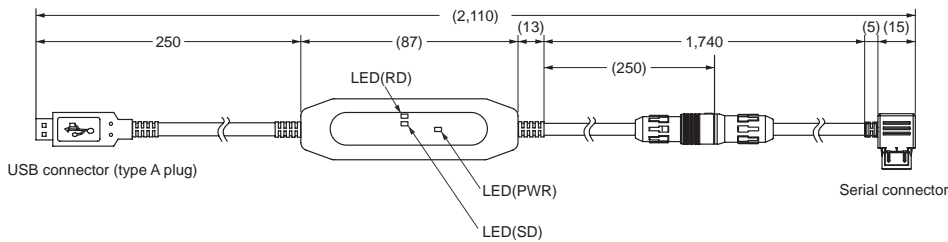
$92^{+0.8}_{0}$

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.
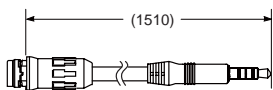
E5EC/E5AC

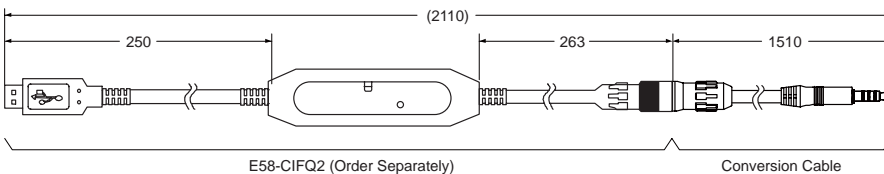## Accessories (Order Separately)

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

USB connector (type A plug)

LED(RD)
LED(PWR)
LED(SD)

Serial connector

(2,110)
250 (87) (13) 1,740 (5) (15)
(250)

● **Conversion Cable**
E58-CIFQ2-E

Conversion Cable

Connecting to the E58-CIFQ2 USB-Serial Conversion Cable

(1510)

(2110)
250 263 1510

E58-CIFQ2 (Order Separately)

Conversion Cable

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

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

2 3.8
10
91
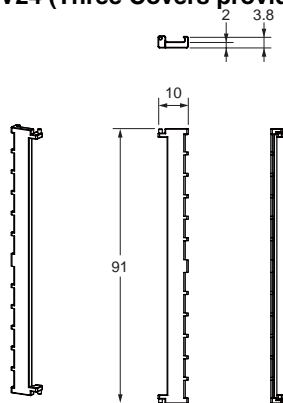
● **Waterproof Packing**
Y92S-P9 (for DIN 48 × 96)
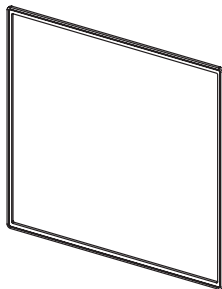
Y92S-P10 (for DIN 96 × 96)

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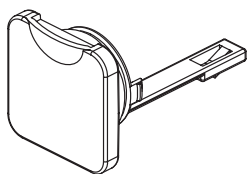
Order this Port Cover separately if the Port Cover on the front-panel Setup Tool port is lost or damaged. The Waterproof Packing must be periodically replaced because it may deteriorate, shrink, or harden depending on the operating environment.

● **Mounting Adapter**
Y92F-51 (for DIN 48 × 96)
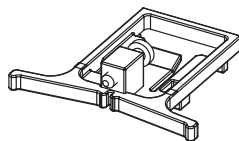
One pair is provided with the Controller.
Order this Adapter separately if it becomes lost or damaged.

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

21.9 (2)

131.7

67.6 29.4

● **Watertight Cover**
Y92A-96N (96 × 96)
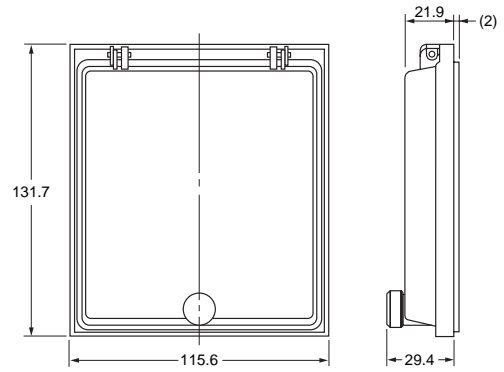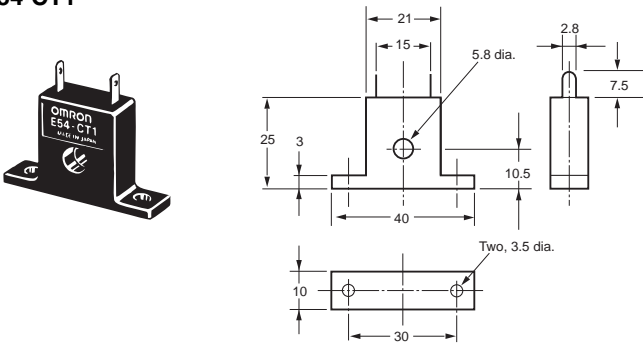
21.9 (2)

131.7

115.6 29.4

● **Current Transformers**

E54-CT1

OMRON
E54 · CT1
MADE IN JAPAN

21
15
5.8 dia.
2.8
7.5
25
3
10.5
40
Two, 3.5 dia.
10
30

Thru-current (Io) vs. Output Voltage (Eo)
(Reference Values)
E54-CT1

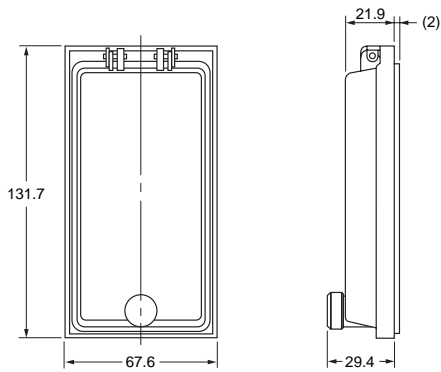Maximum continuous heater current: 50 A (50/60 Hz)
Number of windings: 400±2
Winding resistance: 18±2 Ω

E54-CT3

OMRON
E54 · CT3

30
2.36 dia.
12 dia.
9
40 × 40
Two, M3 (depth: 4)
15
30

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**

Approx. 3 dia.

18

Connection Example

Plug
Armature
Lead

• **Plug**

Approx. 6 dia.

(22)

E5CC/E5EC/E5AC
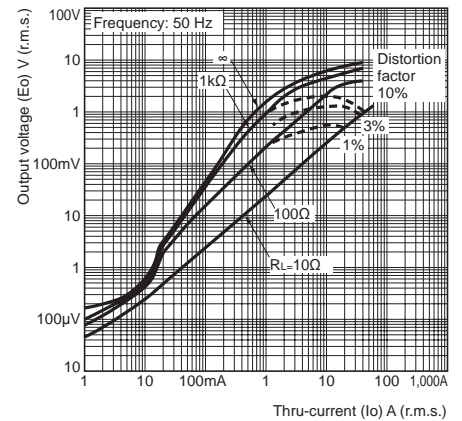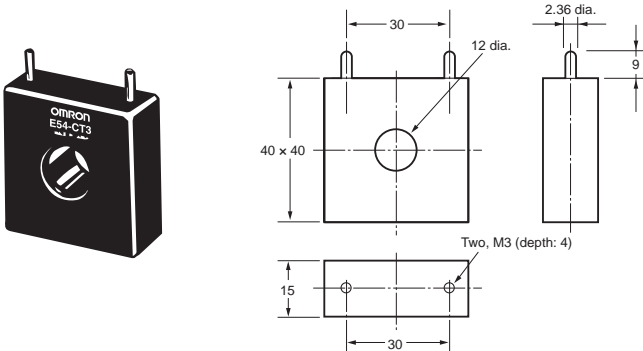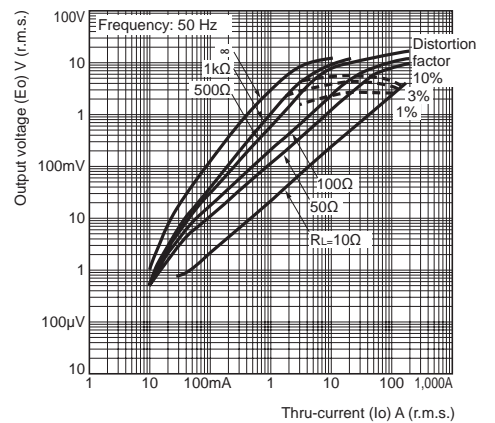
Operation

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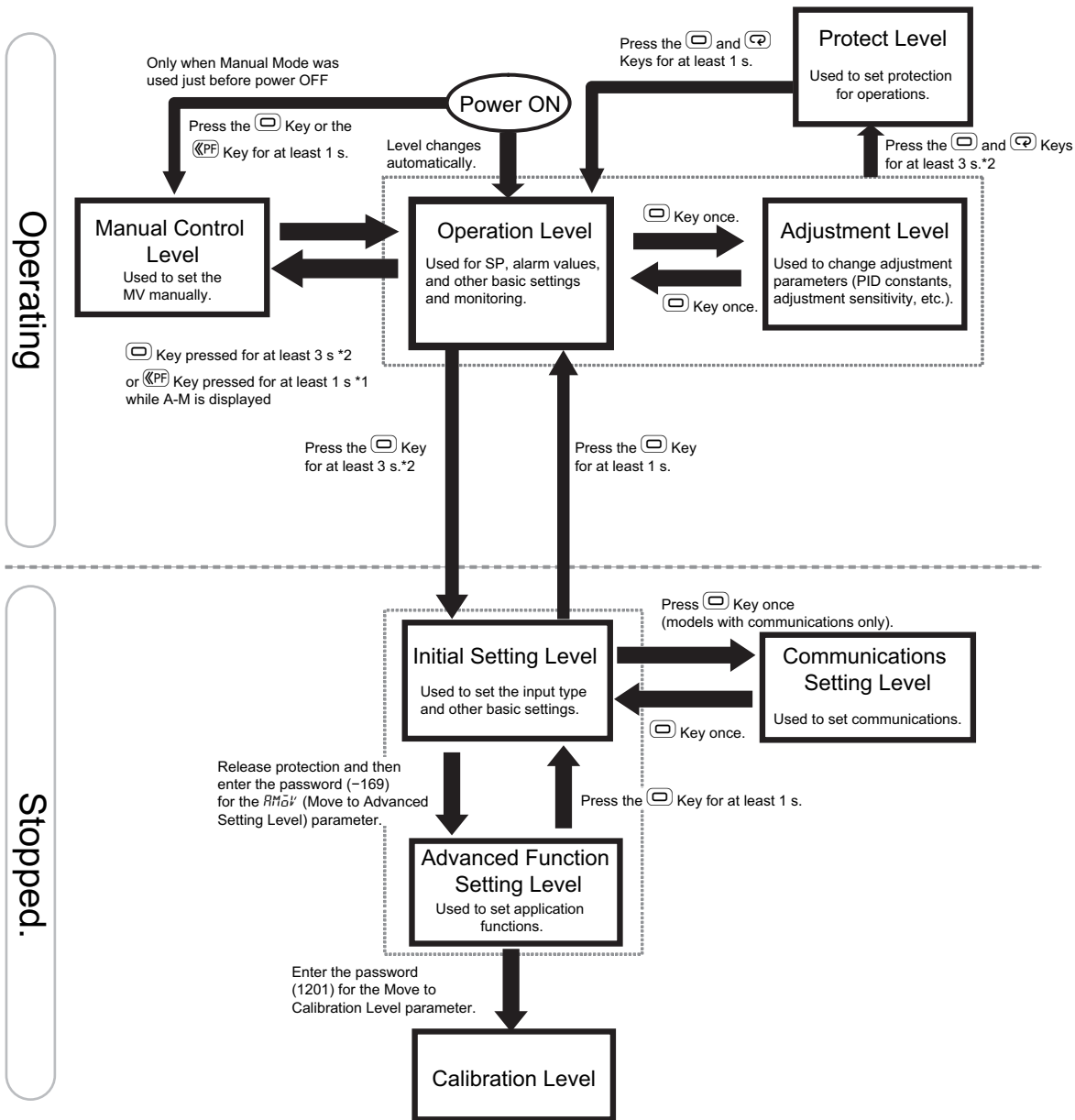
*1. To use a key procedure to move to Manual Control Level, set the Auto/Manual Select Addition parameter to ON and set the PF Setting parameter to a-m (Auto/Manual).
*2. The No. 1 display will flash in the middle when the keys are pressed for 1 s or longer.

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.

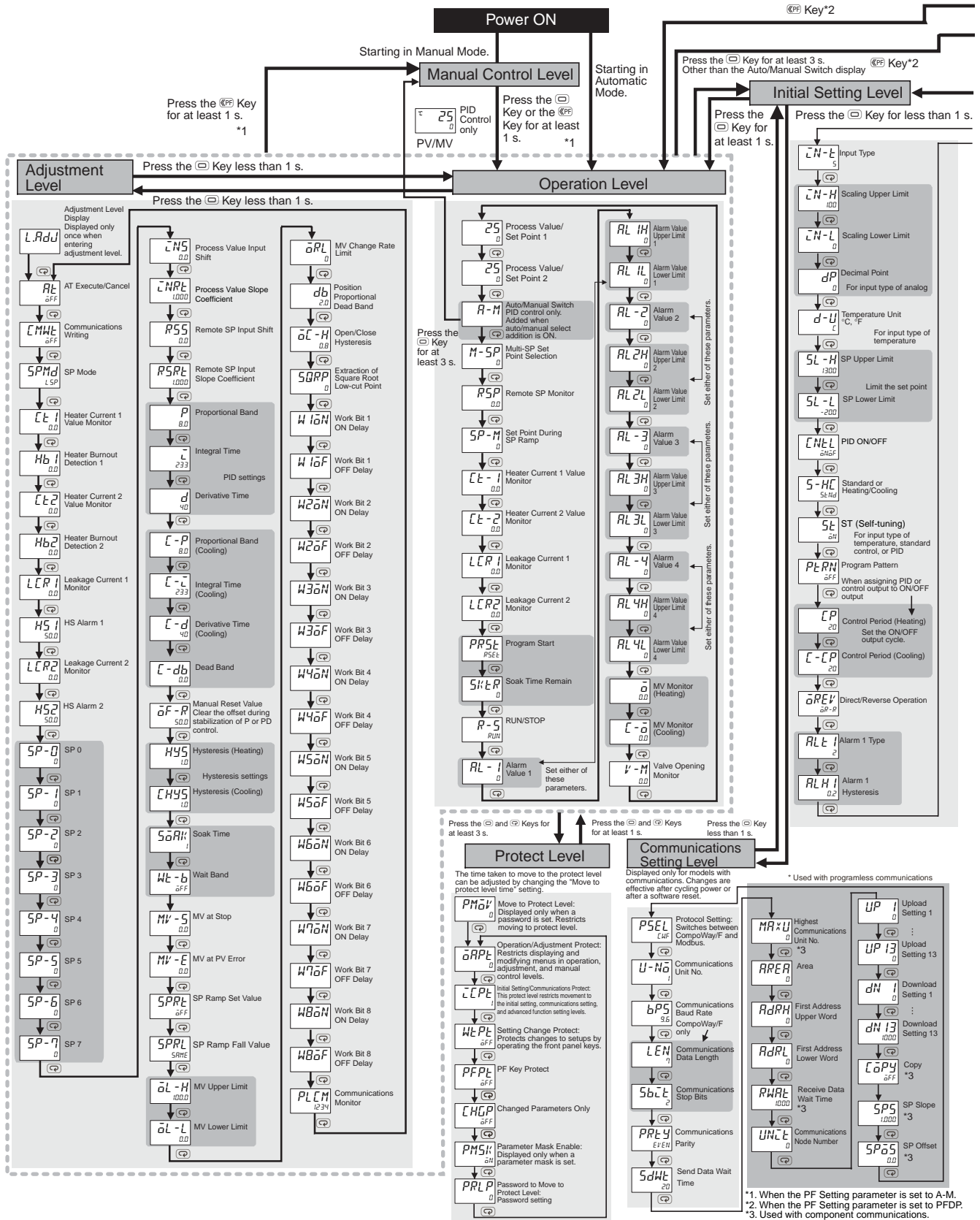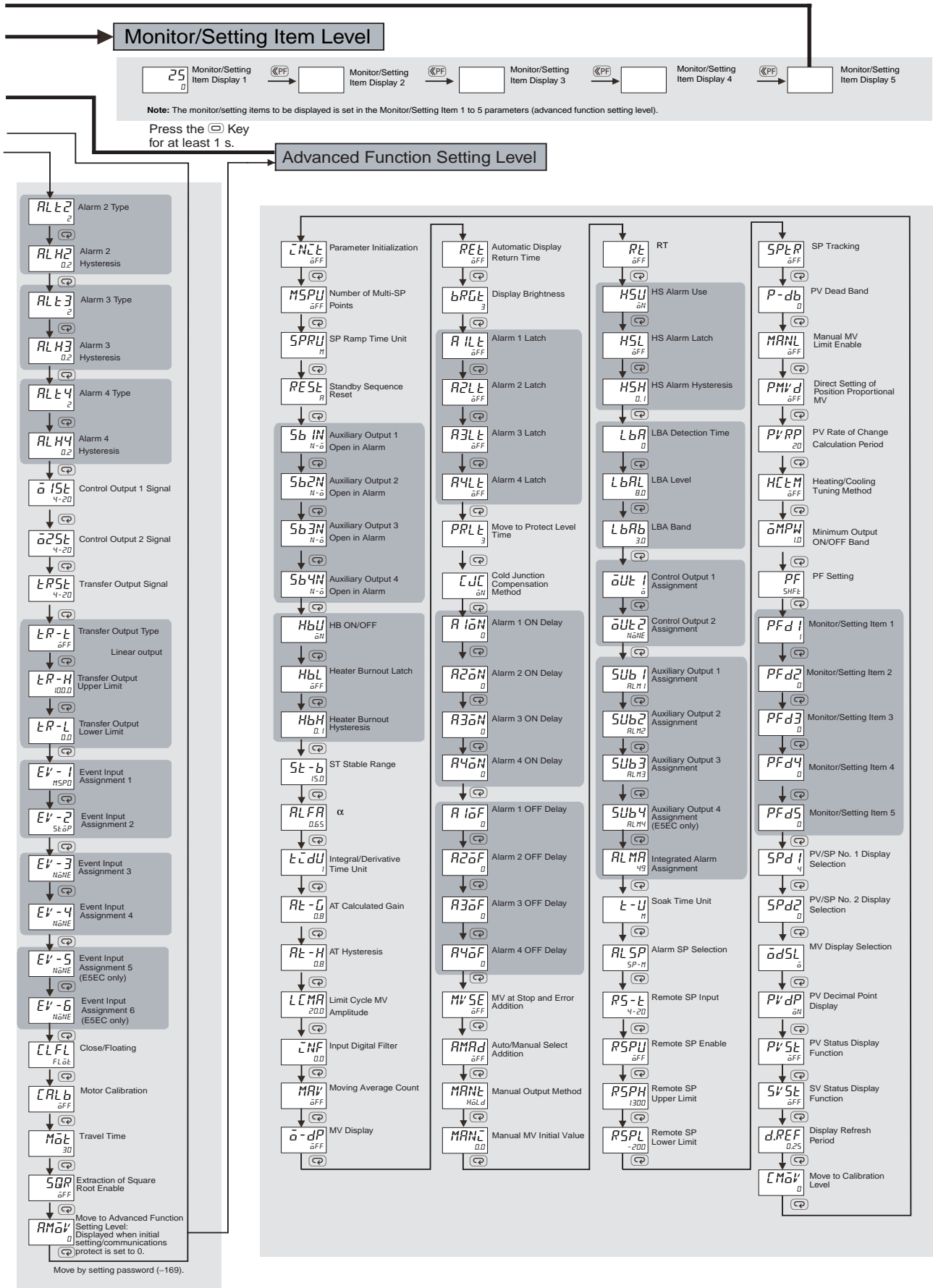| Display	Name	Meaning		Action	Operation

5.ERR	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.
				
				Note: 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.
					
					Note: 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.

⊏⊏⊏⊏ ⊐⊐⊐⊐	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.
		Above 9,999			
E333	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.)
E111	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.)
FFFF	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
Ct1 Ct2 LCR1 LCR2	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.
- - - -	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.

E5CC/E5EC/E5AC

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.

Power ON

Starting in Manual Mode. — Starting in Automatic Mode.

KPF Key*2

Press the KPF Key for at least 3 s. Other than the Auto/Manual Switch display — KPF Key*2

Manual Control Level

τ 25 / 0 — PID Control only — PV/MV

Press the ◻ Key or the KPF Key for at least 1 s. *1

Initial Setting Level

Press the KPF Key for at least 1 s. *1

Press the ◻ Key for at least 1 s.

Press the ◻ Key for less than 1 s.

Adjustment Level

Press the ◻ Key less than 1 s.

Operation Level

Press the ◻ Key less than 1 s.

Adjustment Level
- L.AdJ — Adjustment Level Display. Displayed only once when entering adjustment level.
- At (oFF) — AT Execute/Cancel
- CMWt (oFF) — Communications Writing
- SPMd (LSP) — SP Mode
- Ct 1 (0.0) — Heater Current 1 Value Monitor
- Hb1 (0.0) — Heater Burnout Detection 1
- Ct2 (0.0) — Heater Current 2 Value Monitor
- Hb2 (0.0) — Heater Burnout Detection 2
- LCR1 (0.0) — Leakage Current 1 Monitor
- HS1 (50.0) — HS Alarm 1
- LCR2 (0.0) — Leakage Current 2 Monitor
- HS2 (50.0) — HS Alarm 2
- SP-0 (0) — SP 0
- SP-1 (0) — SP 1
- SP-2 (0) — SP 2
- SP-3 (0) — SP 3
- SP-4 (0) — SP 4
- SP-5 (0) — SP 5
- SP-6 (0) — SP 6
- SP-7 (0) — SP 7

(middle column)
- INS (0.0) — Process Value Input Shift
- INRt (1.000) — Process Value Slope Coefficient
- RSS (0.0) — Remote SP Input Shift
- RSRt (1.000) — Remote SP Input Slope Coefficient
- P (8.0) — Proportional Band
- I (233) — Integral Time
- d (40) — Derivative Time (PID settings)
- C-P (8.0) — Proportional Band (Cooling)
- C-I (233) — Integral Time (Cooling)
- C-d (40) — Derivative Time (Cooling)
- C-db (0.0) — Dead Band
- oF-R (50.0) — Manual Reset Value. Clear the offset during stabilization of P or PD control.
- HYS (1.0) — Hysteresis (Heating)
- CHYS (1.0) — Hysteresis (Cooling)
- SoAK (1) — Soak Time
- Wt-b (oFF) — Wait Band
- MV-S — MV at Stop
- MV-E — MV at PV Error
- SPRt (oFF) — SP Ramp Set Value
- SPRL (SAME) — SP Ramp Fall Value
- oL-H (100.0) — MV Upper Limit
- oL-L (0.0) — MV Lower Limit

(next column)
- oRL (0) — MV Change Rate Limit
- db (2.0) — Position Proportional Dead Band
- oC-H (0.8) — Open/Close Hysteresis
- SQRP (0) — Extraction of Square Root Low-cut Point
- W1oN (0) — Work Bit 1 ON Delay
- W1oF (0) — Work Bit 1 OFF Delay
- W2oN (0) — Work Bit 2 ON Delay
- W2oF (0) — Work Bit 2 OFF Delay
- W3oN (0) — Work Bit 3 ON Delay
- W3oF (0) — Work Bit 3 OFF Delay
- W4oN (0) — Work Bit 4 ON Delay
- W4oF (0) — Work Bit 4 OFF Delay
- W5oN (0) — Work Bit 5 ON Delay
- W5oF (0) — Work Bit 5 OFF Delay
- W6oN (0) — Work Bit 6 ON Delay
- W6oF (0) — Work Bit 6 OFF Delay
- W7oN (0) — Work Bit 7 ON Delay
- W7oF (0) — Work Bit 7 OFF Delay
- W8oN (0) — Work Bit 8 ON Delay
- W8oF (0) — Work Bit 8 OFF Delay
- PLCM (1234) — Communications Monitor

Operation Level
- 25 / 0 — Process Value/Set Point 1
- 25 / 0 — Process Value/Set Point 2
- A-M — Auto/Manual Switch PID control only. Added when auto/manual select addition is ON.
- M-SP (0) — Multi-SP Set Point Selection
- RSP (0) — Remote SP Monitor
- SP-M (0) — Set Point During SP Ramp
- Ct-1 (0.0) — Heater Current 1 Value Monitor
- Ct-2 (0.0) — Heater Current 2 Value Monitor
- LCR1 (0.0) — Leakage Current 1 Monitor
- LCR2 (0.0) — Leakage Current 2 Monitor
- PRSt (RSEt) — Program Start
- SKtR (0) — Soak Time Remain
- R-S (RUN) — RUN/STOP
- AL-1 (0) — Alarm Value 1

Press the ◻ Key for at least 3 s.

(alarm column)
- AL1H (0) — Alarm Value Upper Limit 1
- AL1L (0) — Alarm Value Lower Limit 1
- AL-2 (0) — Alarm Value 2
- AL2H (0) — Alarm Value Upper Limit 2
- AL2L (0) — Alarm Value Lower Limit 2
- AL-3 (0) — Alarm Value 3
- AL3H (0) — Alarm Value Upper Limit 3
- AL3L (0) — Alarm Value Lower Limit 3
- AL-4 (0) — Alarm Value 4
- AL4H (0) — Alarm Value Upper Limit 4
- AL4L (0) — Alarm Value Lower Limit 4
- o (0.0) — MV Monitor (Heating)
- C-o (0.0) — MV Monitor (Cooling)
- V-M (0.0) — Valve Opening Monitor

Protect Level
Press the ◻ and ◖ Keys for at least 3 s.

The time taken to move to the protect level can be adjusted by changing the "Move to protect level time" setting.

- PMoV (0) — Move to Protect Level: Displayed only when a password is set. Restricts moving to protect level.
- oAPt (0) — Operation/Adjustment Protect: Restricts displaying and modifying menus in operation, adjustment, and manual control levels.
- ICPt (1) — Initial Setting/Communications Protect: This protect level restricts movement to the initial setting, communications setting, and advanced function setting levels.
- WtPt (oFF) — Setting Change Protect: Protects changes to setups by operating the front panel keys.
- PFPt (oFF) — PF Key Protect
- CHGP (oFF) — Changed Parameters Only
- PMSK (oN) — Parameter Mask Enable: Displayed only when a parameter mask is set.
- PRLP (0) — Password to Move to Protect Level: Password setting

Communications Setting Level
Displayed only for models with communications. Changes are effective after cycling power or after a software reset.

- PSEL (CWF) — Protocol Setting: Switches between CompoWay/F and Modbus.
- U-No (1) — Communications Unit No.
- bPS (9.6) — Communications Baud Rate CompoWay/F only
- LEN (7) — Communications Data Length
- Sbit (2) — Communications Stop Bits
- PRtY (EVEN) — Communications Parity
- SdWt (20) — Send Data Wait Time

* Used with programless communications

- MRXU (0) — Highest Communications Unit No. *3
- RRER (0) — Area
- AdRH (0) — First Address Upper Word
- AdRL (0) — First Address Lower Word
- RWRt (1000) — Receive Data Wait Time *3
- UNit (0) — Communications Node Number

- UP 1 (0) — Upload Setting 1
- UP 13 (0) — Upload Setting 13
- dN 1 (0) — Download Setting 1
- dN 13 (1000) — Download Setting 13
- CoPY (oFF) — Copy *3
- SPS (1.000) — SP Slope *3
- SPoS (0) — SP Offset *3

Initial Setting Level
- IN-t (5) — Input Type
- IN-H (100) — Scaling Upper Limit
- IN-L (0) — Scaling Lower Limit
- dP (0) — Decimal Point. For input type of analog
- d-U (C) — Temperature Unit °C, °F. For input type of temperature
- SL-H (1300) — SP Upper Limit. Limit the set point
- SL-L (-200) — SP Lower Limit
- CNtL (oNoF) — PID ON/OFF
- S-HC (Stnd) — Standard or Heating/Cooling
- St (oN) — ST (Self-tuning). For input type of temperature, standard control, or PID
- PtRN (oFF) — Program Pattern. When assigning PID or control output to ON/OFF output
- CP (20) — Control Period (Heating). Set the ON/OFF output cycle.
- C-CP (20) — Control Period (Cooling)
- oREV (oR-R) — Direct/Reverse Operation
- ALt1 (2) — Alarm 1 Type
- AL1H (0.2) — Alarm 1 Hysteresis

*1. When the PF Setting parameter is set to A-M.
*2. When the PF Setting parameter is set to PFDP.
*3. Used with component communications.

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Monitor/Setting Item Level

| `25` `0` Monitor/Setting Item Display 1 | 《PF》 → | Monitor/Setting Item Display 2 | 《PF》 → | Monitor/Setting Item Display 3 | 《PF》 → | Monitor/Setting Item Display 4 | 《PF》 → | Monitor/Setting Item Display 5 |

Note: The monitor/setting items to be displayed is set in the Monitor/Setting Item 1 to 5 parameters (advanced function setting level).

Press the ◻ Key for at least 1 s.

Advanced Function Setting Level

Column 1 (left gray path):

- `ALt2` `2` Alarm 2 Type
- `ALH2` `0.2` Alarm 2 Hysteresis
- `ALt3` `2` Alarm 3 Type
- `ALH3` `0.2` Alarm 3 Hysteresis
- `ALt4` `2` Alarm 4 Type
- `ALH4` `0.2` Alarm 4 Hysteresis
- `o1St` `4-20` Control Output 1 Signal
- `o2St` `4-20` Control Output 2 Signal
- `tRSt` `4-20` Transfer Output Signal
- `tR-t` `oFF` Transfer Output Type / Linear output
- `tR-H` `100.0` Transfer Output Upper Limit
- `tR-L` `0.0` Transfer Output Lower Limit
- `EV-1` `MSPD` Event Input Assignment 1
- `EV-2` `StoP` Event Input Assignment 2
- `EV-3` `NoNE` Event Input Assignment 3
- `EV-4` `NoNE` Event Input Assignment 4
- `EV-5` `NoNE` Event Input Assignment 5 (E5EC only)
- `EV-6` `NoNE` Event Input Assignment 6 (E5EC only)
- `CLFL` `FLoE` Close/Floating
- `CALb` `oFF` Motor Calibration
- `Mot` `30` Travel Time
- `SQR` `oFF` Extraction of Square Root Enable
- `AMoV` `0` Move to Advanced Function Setting Level: Displayed when initial setting/communications protect is set to 0.

Move by setting password (–169).

Column 2:

- `INIt` `oFF` Parameter Initialization
- `MSPU` `oFF` Number of Multi-SP Points
- `SPRU` `M` SP Ramp Time Unit
- `RESt` `A` Standby Sequence Reset
- `Sb1N` `N-o` Auxiliary Output 1 Open in Alarm
- `Sb2N` `N-o` Auxiliary Output 2 Open in Alarm
- `Sb3N` `N-o` Auxiliary Output 3 Open in Alarm
- `Sb4N` `N-o` Auxiliary Output 4 Open in Alarm
- `HbU` `oN` HB ON/OFF
- `HbL` `oFF` Heater Burnout Latch
- `HbH` `0.1` Heater Burnout Hysteresis
- `St-b` `15.0` ST Stable Range
- `ALFA` `0.65` α
- `ti dU` `1` Integral/Derivative Time Unit
- `At-G` `0.8` AT Calculated Gain
- `At-H` `0.8` AT Hysteresis
- `LCMA` `20.0` Limit Cycle MV Amplitude
- `INF` `0.0` Input Digital Filter
- `MAV` `oFF` Moving Average Count
- `o-dP` `oFF` MV Display

Column 3:

- `REt` `oFF` Automatic Display Return Time
- `bRGt` `3` Display Brightness
- `A1Lt` `oFF` Alarm 1 Latch
- `A2Lt` `oFF` Alarm 2 Latch
- `A3Lt` `oFF` Alarm 3 Latch
- `A4Lt` `oFF` Alarm 4 Latch
- `PRLt` `3` Move to Protect Level Time
- `CJC` `oN` Cold Junction Compensation Method
- `A1oN` `0` Alarm 1 ON Delay
- `A2oN` `0` Alarm 2 ON Delay
- `A3oN` `0` Alarm 3 ON Delay
- `A4oN` `0` Alarm 4 ON Delay
- `A1oF` `0` Alarm 1 OFF Delay
- `A2oF` `0` Alarm 2 OFF Delay
- `A3oF` `0` Alarm 3 OFF Delay
- `A4oF` `0` Alarm 4 OFF Delay
- `MVSE` `oFF` MV at Stop and Error Addition
- `AMAd` `oFF` Auto/Manual Select Addition
- `MANt` `HoLd` Manual Output Method
- `MANi` `0.0` Manual MV Initial Value

Column 4:

- `Rt` `oFF` RT
- `HSU` `oN` HS Alarm Use
- `HSL` `oFF` HS Alarm Latch
- `HSH` `0.1` HS Alarm Hysteresis
- `LbA` `0` LBA Detection Time
- `LbAL` `8.0` LBA Level
- `LbAb` `3.0` LBA Band
- `out1` `o` Control Output 1 Assignment
- `out2` `NoNE` Control Output 2 Assignment
- `Sub1` `ALM1` Auxiliary Output 1 Assignment
- `Sub2` `ALM2` Auxiliary Output 2 Assignment
- `Sub3` `ALM3` Auxiliary Output 3 Assignment
- `Sub4` `ALM4` Auxiliary Output 4 Assignment (E5EC only)
- `ALMA` `49` Integrated Alarm Assignment
- `t-U` `M` Soak Time Unit
- `ALSP` `SP-M` Alarm SP Selection
- `RS-t` `4-20` Remote SP Input
- `RSPU` `oFF` Remote SP Enable
- `RSPH` `1300` Remote SP Upper Limit
- `RSPL` `-200` Remote SP Lower Limit

Column 5 (right):

- `SPtR` `oFF` SP Tracking
- `P-db` `0` PV Dead Band
- `MANL` `oFF` Manual MV Limit Enable
- `PMVd` `oFF` Direct Setting of Position Proportional MV
- `PVRP` `20` PV Rate of Change Calculation Period
- `HCtM` `oFF` Heating/Cooling Tuning Method
- `oMPW` `1.0` Minimum Output ON/OFF Band
- `PF` `SHFt` PF Setting
- `PFd1` `1` Monitor/Setting Item 1
- `PFd2` `0` Monitor/Setting Item 2
- `PFd3` `0` Monitor/Setting Item 3
- `PFd4` `0` Monitor/Setting Item 4
- `PFd5` `0` Monitor/Setting Item 5
- `SPd1` `4` PV/SP No. 1 Display Selection
- `SPd2` `0` PV/SP No. 2 Display Selection
- `odSL` `o` MV Display Selection
- `PVdP` `oN` PV Decimal Point Display
- `PVSt` `oFF` PV Status Display Function
- `SVSt` `oFF` SV Status Display Function
- `d.REF` `0.25` Display Refresh Period
- `CMoV` `0` Move to Calibration Level

E5CC/E5EC/E5AC

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

⚠ **CAUTION**	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.
Precautions for Safe Use	Supplementary comments on what to do or avoid doing, to use the product safely.
Precautions for Correct Use	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.

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*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.

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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 crosssectional area of 0.205 to 0.823 mm^2). (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 may 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.

E5CC/E5EC/E5AC

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

1. 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.
2. 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.
3. 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

1. When extending or connecting the thermocouple lead wire, be sure to use compensating wires that match the thermocouple types.
2. 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.
3. Mount the product so that it is horizontally level.
4. 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

1. 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.
2. 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.
3. 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.
4. 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.)
5. 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

1. Do not Connect or disconnect the Conversion Cable connector repeatedly over a short period of time.
   The computer may malfunction.
2. 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.
3. Do not connect the Conversion Cable through a USB hub. Doing so may damage the Conversion Cable.
4. Do not use an extension cable to extend the Conversion Cable length when connecting to the computer. Doing so may damage the Conversion Cable.
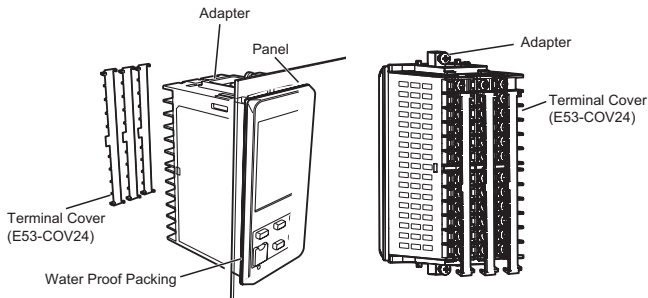
●Mounting
Mounting to a Panel

E5CC

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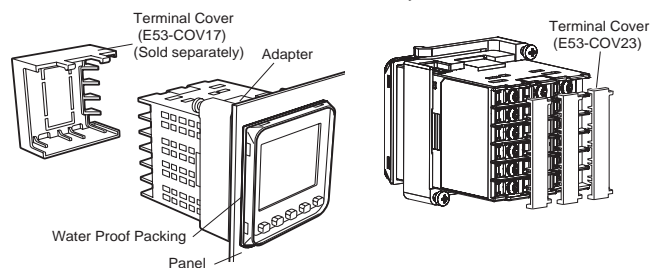

1. For waterproof mounting, waterproof packing must be installed on the Controller. Waterproofing is not possible when group mounting several Controllers. Waterproof packing is not necessary when there is no need for the waterproofing function.
2. Insert the E5CC into the mounting hole in the panel.
3. Push the adapter from the terminals up to the panel, and temporarily fasten the E5CC.
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.

E5EC/E5AC

Adapter
Panel
Adapter
Terminal Cover
(E53-COV24)
Terminal Cover
(E53-COV24)
Water Proof Packing

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.

E53-COV17   E53-COV23

Terminal Cover
(E53-COV17)
(Sold separately)
Adapter

Enlarged illustration of
Terminal Section
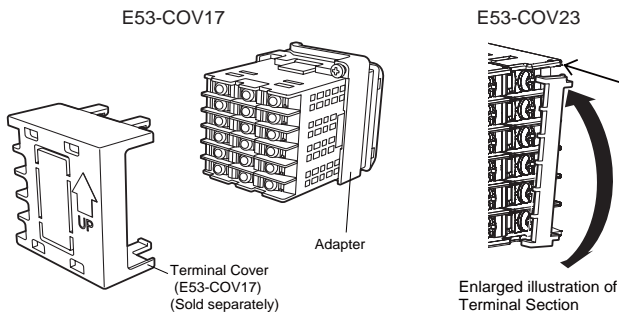
E5EC/E5AC

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.

Slightly bend the
E53-COV24 Terminal
Cover in the direction
shown by the arrows to
attach it to the terminal block.

Enlarged illustration of
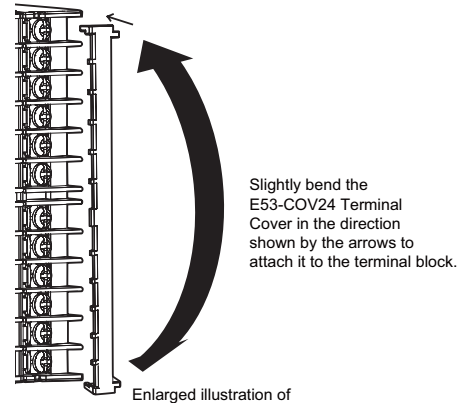
●Precautions when Wiring

- 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^2) 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.

5.8 mm max.

5.8 mm max.
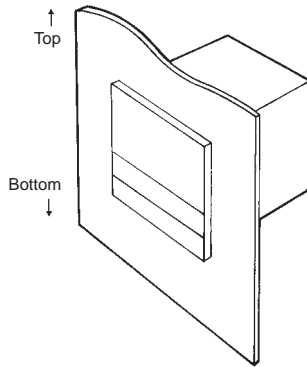
E5CC/E5EC/E5AC
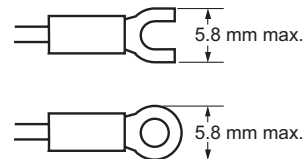
Three-year Guarantee

●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°C to 50°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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