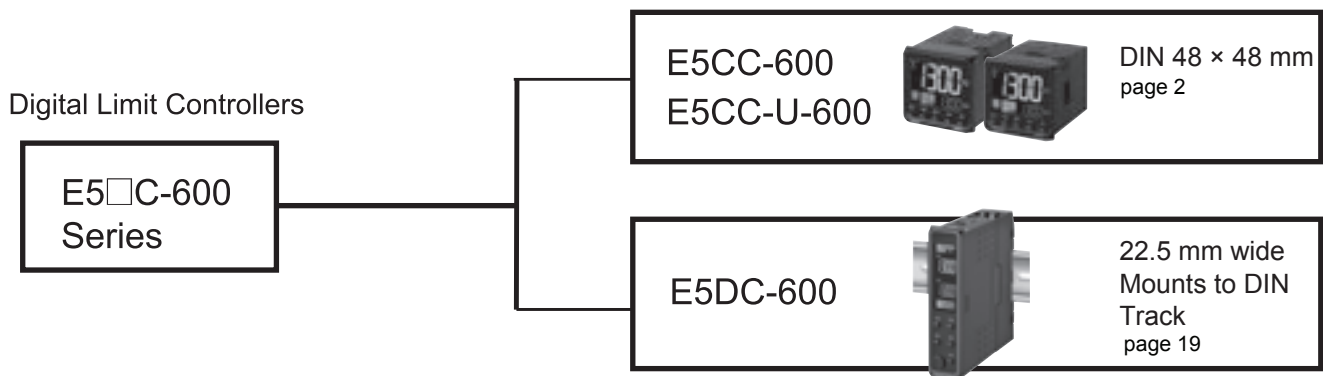**OMRON**

Digital Limit Controllers
E5□C-600 Factory Mutual Approved

Large White PV Display That's Easier to Read.
Easy to Use, from Model Selection to Setup and Operation.
New Plug-in Models that are Convenient for Maintenance and Replacement as replacing limit controllers is possible without changing wiring.
New Models that Mount to DIN Track and are Ideal for HMI/PLC Connections.
Programmable Models Support a Wide Range of Applications.
Digital Limit Controller Functions as a Limit Controller or a Temperature controller based on parameter setup.

Digital Limit Controllers

E5□C-600
Series

| E5CC-600 E5CC-U-600 | DIN 48 × 48 mm page 2 |

| E5DC-600 | 22.5 mm wide Mounts to DIN Track page 19 |

What is a Temperature Limit Controller?

As defined by Factory Mutual, "It is an automatic supervising device used with other equipment to protect against abnormal temperatures by operating electrical contacts in the event of primary temperature controlling equipment failure. The primary application involves protection against an excessive temperature that may otherwise result in a fire hazard. A temperature limit switch that protects against an abnormally low temperature is also considered in the interest of property conservation."

In a typical "High Limit" application, the user sets the limit set point (SP) a few degrees below the temperature that would cause an unsafe condition. If the set point is reached the FM Limit Switch output relay contact opens to shutdown the heat source. The relay will not automatically reset after the temperature goes below the set point value. The operator must manually either push the "Reset" button or activate a remote reset switch.

Factory Mutual and FM Global

FM Global is an international property insurance and loss-prevention engineering leader with research and testing resources dedicated to minimizing the loss of insured manufacturing property. Its research group, the Factory Mutual Research Corporation (FMRC), investigates the most effective practices for preventing and minimizing fire and other types of industrial losses. Factory Mutual laboratories test and approve two broad categories of devices and materials:
1. Those used to control or prevent property damage.
2. Those that would present a serious hazard if not properly designed

FM APPROVED

FM Approvals
FM Approvals certifies industrial and commercial products and services for thousands of companies worldwide. When a product or service meets FM Approvals' standards, it is issued the FM APPROVED mark to signify it will perform as expected and support property loss prevention.

Digital Limit Controller
E5CC/E5CC-U-600 (48× 48 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.

- The white PV display with a height of 1 5.2 mm improves visibility.
- High-speed sampling at 50 ms.
- Models are available with up to 3 auxiliary outputs, up to 2 event inputs, and transfer output to cover a wide range of applications.
- E5CC: 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.
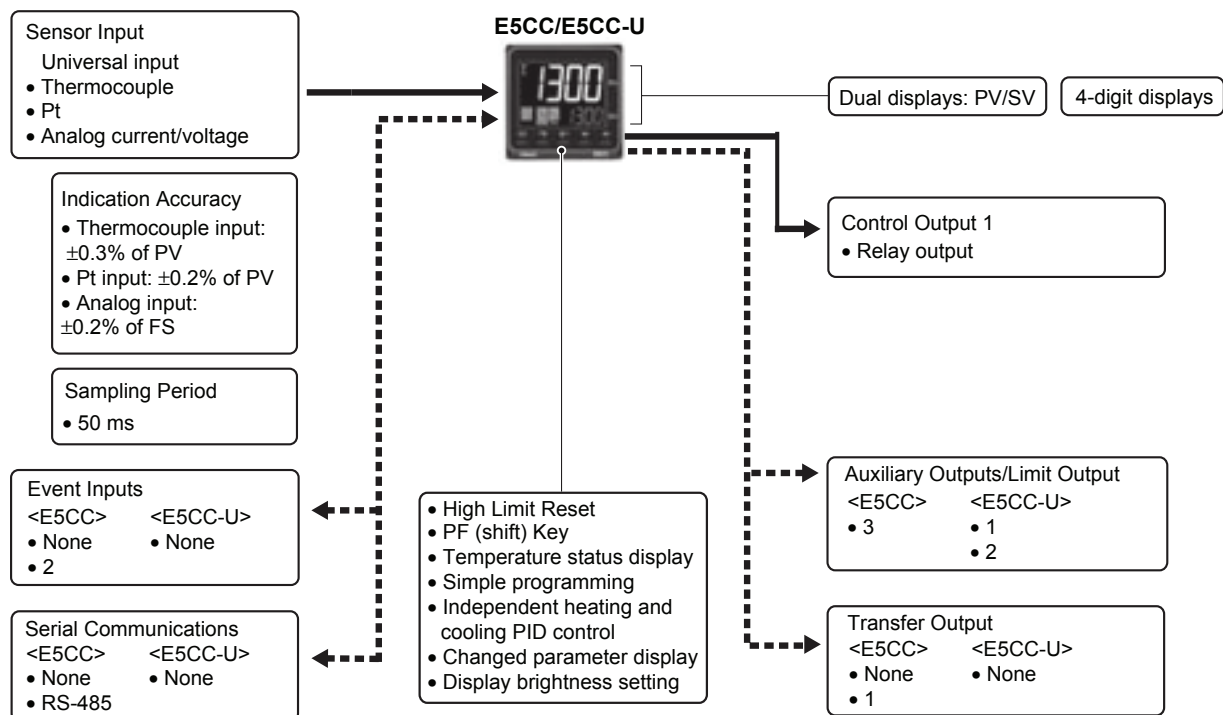- Conforms to FM (Factory Mutual) standards (FM3545/3810).

48 × 48 mm E5CC

48 × 48 mm E5CC-U

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

⚠ Refer to Safety Precautions on page 43.

Main I/O Functions

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

E5CC/E5CC-U

Dual displays: PV/SV   4-digit displays

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

Sampling Period
- 50 ms

Control Output 1
- Relay output

Event Inputs
<E5CC>   <E5CC-U>
- None   - None
- 2

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

Auxiliary Outputs/Limit Output
<E5CC>   <E5CC-U>
- 3   - 1
           - 2

Serial Communications
<E5CC>   <E5CC-U>
- None   - None
- RS-485

Transfer Output
<E5CC>   <E5CC-U>
- None   - 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 Temperature Controllers User's Manual (Cat. No. H174)
    E5□C Digital Temperature Controllers Communications Manual (Cat. No. H175) E5□C
    Temperature High/Low Limit Controller Set up Instruction Sheet (Cat. No. (H32I).

Model Number Legend and Standard Models

Model Number Legend
●Models with Screw Terminals

E5CC-	R	X	3	---	5	M	6	---	---
	1	2	3		4	5		6	

Model	1 Control Outputs 1 and 2	2 Number of auxiliary outputs	3 Power supply voltage	4 Terminal type	5 Input type	6 Options	Meaning			
E5CC							**48 x 48 mm (1/16 DIN size)**			
							Control output 1		**Control output 2**	
	RX						Relay output		None	
		3					3 (one common)			
			A				100 to 240 VAC			
			D				24 VAC/VDC			
				5			Screw terminals			
					M		Universal input			
							HB alarm and HS alarm	Communi-cations	Event Inputs	Transfer output
						600	---	---	---	---
						601	1	---	2	---
						603	2 (for 3-phase heaters)	RS-485	---	---
						606	---	---	2	Provided

E5CC Ordering Information

AC Versions	DC Versions
E5CC-RX3A5M-600	E5CC-RX3D5M-600
E5CC-RX3A5M-601	E5CC-RX3D5M-601
E5CC-RX3A5M-603	E5CC-RX3D5M-603
E5CC-RX3A5M-606	E5CC-RX3D5M-606

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.

E5CC/E5CC-U

Model Number Legend

Plug-in Models (-U):

E5CC-	R	W	---	---	U	M	0	600	0
	1		2	3	4	5		6	

Model	**1** Control Outputs 1 and 2	**2** Number of auxiliary outputs	**3** Power supply voltage	**4** Terminal type	**5** Input type	**6** Options	Meaning			
E5CC							**48 x 48 mm (1/16 DIN size)**			
							Control output 1		**Control output 2**	
	RW						Relay output (SPDT)		None	
		1					1			
		2					2 (One common)			
			A				100 to 240 VAC			
			D				24 VAC/VDC			
				U			Plug-in model			
					M		Universal input			
							HB alarm and HS alarm	Communi-cations	Event Inputs	Transfer output
						600	---	---	---	---

E5CC-U Ordering Information

AC Versions
E5CC-RW1AUM-600
E5CC-RW2AUM-600

DC Versions
E5CC-RW1DUM-600
E5CC-RW2DUM-600

Heating and Cooling Control
●Using Heating and Cooling Control
① Control Output Assignment
An auxiliary output is used as the cooling control output.
② Control
If PID control is used, you can set PID control separately for heating and cooling.
This allows you to handle control systems with different heating and cooling response characteristics.

4 OMRON

Optional Products (Order Separately)

USB-Serial Conversion Cable

Model
E58-CIFQ2

Terminal Covers (for E5CC)

Model
E53-COV17
E53-COV23 (3pcs)

Note: The Terminal Covers E53-COV23 are provided only with E5CC Controllers. The E53-COV10 cannot be used.
Refer to page 28 for the mounted dimensions.

Waterproof Packing

Model
Y92S-P8

Note: The Waterproof Packing is provided only with E5CC Controllers.
The E5CC-U cannot be waterproofed even if the Waterproof Packing is attached.

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

Sockets (for E5CC-U)

Type	Model
Front-connecting Socket	**P2CF-11**
Front-connecting Socket with Finger Protection	**P2CF-11-E**
Back-connecting Socket	**P3GA-11**
Terminal Cover for Back-connecting socket with Finger Protection	**Y92A-48G**

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. CX-Thermo version 4.61 or higher is required for the E5CC-U. For the system requirements for the CX-Thermo, refer to information on the EST2-2C-MV4 on the OMRON website (www.ia.omron.com).

E5CC/E5CC-U

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	Temperature input 　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, 0 to 10 V,or 0 to 50 mV (The 0 to 50 mV range applies to the E5CC-U only for those manufactured in May 2014 or later.)	
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	E5CC:　SPST-NO, 250 VAC, 3 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 5 V, 10 mA (reference value) E5CC-U:　SPDT, 250 VAC, 3 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 5 V, 10 mA (reference value)
Auxiliary/ Limit Output	Number of outputs	E5CC: 3 E5CC-U: 1 or 2 (depends on model)
	Output specifications	SPST-NO relay outputs, 250 VAC, Models with 1 or 2 outputs: 3 A (resistive load), or Models with 3 outputs: 2 A (resistive load), Electrical life: 100,000 operations, Minimum applicable load: 10 mA at 5 V (reference value)
Event input*	Number of inputs	2 (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 min., resolution: Approx. 10,000
Setting method	Digital setting using front panel keys	
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 the event inputs, key operations, or serial communications.	
Bank switching	None	
Other functions	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, MV change rate limit, logic operations, 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 standard mounting (with no condensation or icing)	
Ambient operating humidity	25% to 85%	
Storage temperature	-25 to 65°C (with no condensation or icing)	
Altitude	2,000 m max.	
Recommended fuse	T2A, 250 VAC, time-lag, low-breaking capacity	
Installation environment	Installation Category II, Pollution Degree 2 (IEC 61010-1 compliant)	

* There are no optional functions for the E5CC-U. Refer to *Model Number Legend* and *List of Models.*

Input Ranges

●Thermocouple/Platinum Resistance Thermometer (Universal inputs)

Sensor type	Platinum resistance thermometer		Thermocouple											Infrared temperature sensor			
Sensor specification	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

Set value	Max	Min
0 (Pt100)	850	-200
1 (Pt100)	500.0	-199.9
2 (Pt100)	100.0	0.0
3 (JPt100)	500.0	199.9
4 (JPt100)	100.0	0.0
5 (K)	1300	-200
6 (K)	500.0	-20.0
7 (J)	850	-100
8 (J)	400.0	-20.0
9 (T)	400	-200
10 (T)	400.0	-199.9
11 (E)	600	-200
12 (L)	850	-100
13 (U)	400	-200
14 (U)	400.0	-199.9
15 (N)	1300	-200
16 (R)	1700	0
17 (S)	1700	0
18 (B)	1800	100
19 (W)	2300	0
20 (PLII)	1300	0
21 (10 to 70°C)	90	0
22 (60 to 120°C)	120	0
23 (115 to 165°C)	165	0
24 (140 to 260°C)	260	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	0 to 50 mV*
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					
Set value	25	26	27	28	29	30
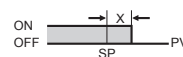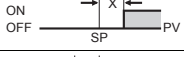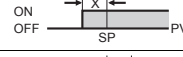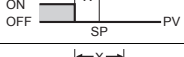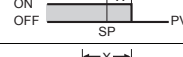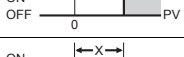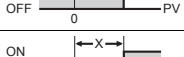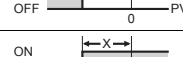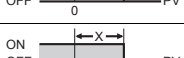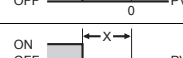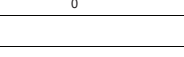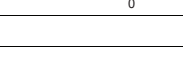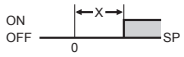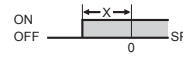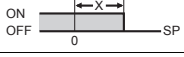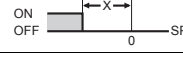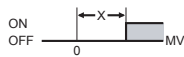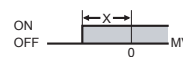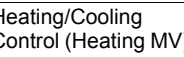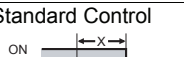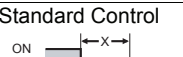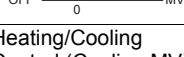
* The range applies to the E5CC-U only for those manufactured in May 2014 or later.

Alarm Types

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

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

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

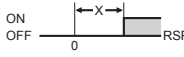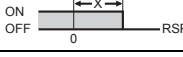| Set value	Alarm type	Alarm output operation		Description of function
		When alarm value X is positive	When alarm value X is negative	
0	Alarm function OFF	Output OFF		No alarm
1	Upper- and lower-limit *1	ON OFF, L H, SP, PV	*2	Set the upward deviation in the set point for the alarm upper limit (H) and the lower deviation in the set point for the alarm lower limit (L). The alarm is ON when the PV is outside this deviation range.
2 (default)	Upper-limit	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 upward deviation in the set point for the alarm upper limit (H) and the lower deviation in the set point for the alarm lower limit (L). The alarm is ON when the PV is inside this deviation range.
5	Upper- and lower-limit with standby sequence *1	*5 ON OFF, L H, SP, PV	*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 alarm	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 alarm	ON OFF, X, 0, SP	ON OFF, X, 0, SP	This alarm type turns ON the alarm when the set point (SP) is lower than the alarm value (X).
16	MV absolute-value upper-limit alarm *9	Standard Control: ON OFF, X, 0, MV / Heating/Cooling Control (Heating MV): ON OFF, X, 0, MV	Standard Control: ON OFF, X, 0, MV / Heating/Cooling Control (Heating MV): Always ON	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 alarm *9	Standard Control: ON OFF, X, 0, MV / Heating/Cooling Control (Cooling MV): ON OFF, X, 0, MV	Standard Control: ON OFF, X, 0, MV / Heating/Cooling Control (Cooling MV): Always ON	This alarm type turns ON the alarm when the manipulated variable (MV) is lower than the alarm value (X).
18	RSP absolute-value upper-limit alarm *10	ON OFF, X, 0, RSP	ON OFF, X, 0, RSP	This alarm type turns ON the alarm when the remote SP (RSP) is higher than the alarm value (X).
19	RSP absolute-value lower-limit alarm *10	ON OFF, X, 0, RSP	ON OFF, X, 0, RSP	This alarm type turns ON the alarm when the remote SP (RSP) is lower than the alarm value (X).

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*1 With set values 1, 4 and 5, the upper and lower limit values can be set independently for each alarm type, and are expressed as "L" and "H."

*2 Set value: 1, Upper- and lower-limit alarm
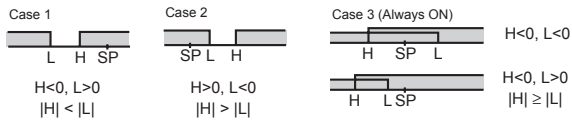
*3 Set value: 4, Upper- and lower-limit range
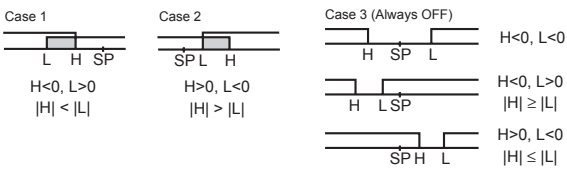
*4 Set value: 5, Upper- and lower-limit with standby sequence
    For Upper- and Lower-Limit Alarm Described Above *2
    • Case 1 and 2
      Always OFF when the upper-limit and lower-limit hysteresis overlaps.
    • Case 3: Always OFF

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

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

*7 Refer to the *E5□C Digital Temperature Controllers User's Manual* (Cat. No.H174) for information on the loop burnout alarm (LBA).

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

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

*10 This value is displayed only when a remote SP input is used. It functions in both Local SP Mode and Remote SP Mode.
     Remote SP input is supported only for the E5CC.

Characteristics

Indication accuracy (at the ambient temperature of 23°C)	E5CC Thermocouple: (±0.3% of indication value or ±1°C, whichever is greater) ±1 digit max. *1 Platinum resistance thermometer: (±0.2% of indication value or ±0.8°C, whichever is greater) ±1 digit max. Analog input: ±0.2% FS ±1 digit max. CT input: ±5% FS ±1 digit max. E5CC-U Thermocouple: (±1% of indication value or ±2°C, whichever is greater) ±1 digit max. *1 Platinum resistance thermometer: (±0.2% of indication value or ±0.8°C, whichever is greater) ±1 digit max. Analog input: ±0.2% FS ±1 digit max.
Transfer output accuracy	±0.3% FS max.
Influence of temperature *3	Thermocouple input (R, S, B, W, PL II): (±1% of indication value or ±10°C, whichever is greater) ±1 digit max. Other thermocouple input: (±1% of indication value or ±4°C, whichever is greater) ±1 digit max. *4
Influence of voltage *3	Platinum resistance thermometer: (±1% of indication value 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) *5
Derivative time (D)	0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *5
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) *5
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) *5
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)
Influence 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	3,000 VAC, 50/60 Hz for 1 min between terminals of different charge
Vibration Malfunction	10 to 55 Hz, 20 m/s² for 10 min each in X, Y, and Z directions
Vibration Resistance	10 to 55 Hz, 20 m/s² for 2 hrs each in X, Y, and Z directions
Shock Malfunction	100 m/s², 3 times each in X, Y, and Z directions
Shock Resistance	300 m/s², 3 times each in X, Y, and Z directions
Weight	E5CC: Controller: Approx. 120 g, Adapter: Approx. 10 g E5CC-U: Controller: Approx. 100 g, Adapter: Approx. 10 g
Degree of protection	E5CC: Front panel: IP66, Rear case: IP20, Terminals: IP00 E5CC-U: Front panel: IP50, Rear case: IP20, Terminals: IP00
Memory protection	Non-volatile memory (number of writes: 1,000,000 times)
Setup Tool	E5CC: CX-Thermo version 4.5 or higher E5CC-U: CX-Thermo version 4.61 or higher
Setup Tool port	E5CC/E5CC-U top panel: An E58-CIFQ2 USB-Serial Conversion Cable is used to connect to a USB port on the computer. *6
Standards Approved standards	FM3545/3810, UL 61010-1*7, KOSHA certified (some models) *8, Korean Radio Waves Act (Act 10564)
Standards Conformed standards	EN 61010-1 (IEC 61010-1): Pollution Degree 2, overvoltage category II, Lloyd's standards *9
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 1,300°C range, T and N thermocouples at a temperature of -100°C max., and U and L thermocouples at any temperatures is ±2°C ±1 digit max. The indication accuracy of the B thermocouple at a temperature of 400°C max. is not specified. The indication accuracy of B thermocouples at a temperature of 400 to 800°C is ±3°C max. The indication accuracy of the R and S thermocouples at a temperature of 200°C max. is ±3°C ±1 digit max. The indication accuracy of 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.

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

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

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

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

*7   The E5CC-U plug-in model is certified for UL listing only when used together with the OMRON P2CF-11 or P2CF-11-E Socket. The P3GA-11 is not certified for UL listing.

*8   Access the following website for information on certified models. *http://www.ia.omron.com/support/models/index.html*

*9   Refer to information on maritime standards in *Shipping Standards* on page 45 for compliance with Lloyd's Standards.

USB-Serial Conversion Cable

Applicable OS	Windows XP/Vista/7/8
Applicable software	CX-Thermo version 4.5 or higher (Version 4.61 or higher is required for the E5CC-U.)
Applicable models	E5□C-T Series, E5□C Series, and E5CB Series
USB interface standard	Conforms to USB Specification 2.0.
DTE speed	38400 bps
Connector specifications	Computer: USB (type A plug) Digital Temperature Controller: Special serial connector
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 on the computer. Refer to the *Instruction Manual* included with the Cable for the installation procedure.

Communications Specifications

Transmission line connection method	RS-485: Multidrop
Communications	RS-485 (two-wire, half duplex)
Synchronization method	Start-stop synchronization
Protocol	CompoWay/F, or Modbus
Baud rate*	9600, 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[1]	You can use the memory in the PLC to read and write E5□C parameters, start and stop operation, etc. The E5□C automatically performs communications with PLCs. No communications programming is required. Number of connected Digital Temperature Controllers: 32 max. (Up to 16 for the FX Series) Applicable PLCs OMRON PLCs CS Series, CJ Series, or CP Series Mitsubishi Electric PLCs MELSEC Q Series, L Series, or FX Series (compatible with the FX2 or FX3 (excluding the FX1S)) KEYENCE PLCs KEYENCE KV Series
Component Communications[1]	When Digital Temperature Controllers are connected, set points and RUN/STOP commands can be sent from the Digital Temperature Controller that is set as the master to the Digital Temperature Controllers that are set as slaves. Slope and offsets can be set for the set point. Number of connected Digital Temperature Controllers: 32 max. (including master)
Copying[2]	When Digital Temperature Controllers are connected, the parameters can be copied from the Digital Temperature Controller that is set as the master to the Digital Temperature Controllers that are set as slaves.

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

[1] A Temperature Controller with version 1.1 or higher is required. A Temperature Controller with version 2.1 or higher is required for the FX Series or the KV Series.
[2] Both the programless communications and the component communications support the copying.

Current Transformer (Order Separately) Ratings

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

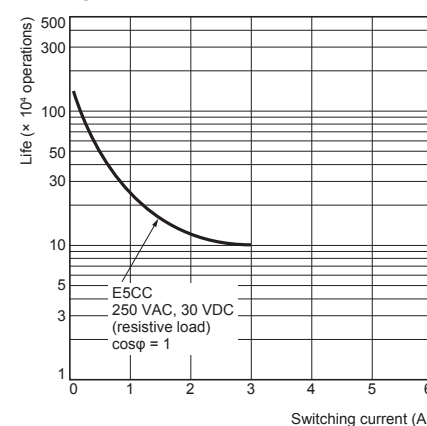[1] For heater burnout alarms, the heater current will be measured when the control output is ON, and the output will turn ON if the heater current is lower than the set value (i.e., heater burnout detection current value).
[2] For SSR failure alarms, the heater current will be measured when the control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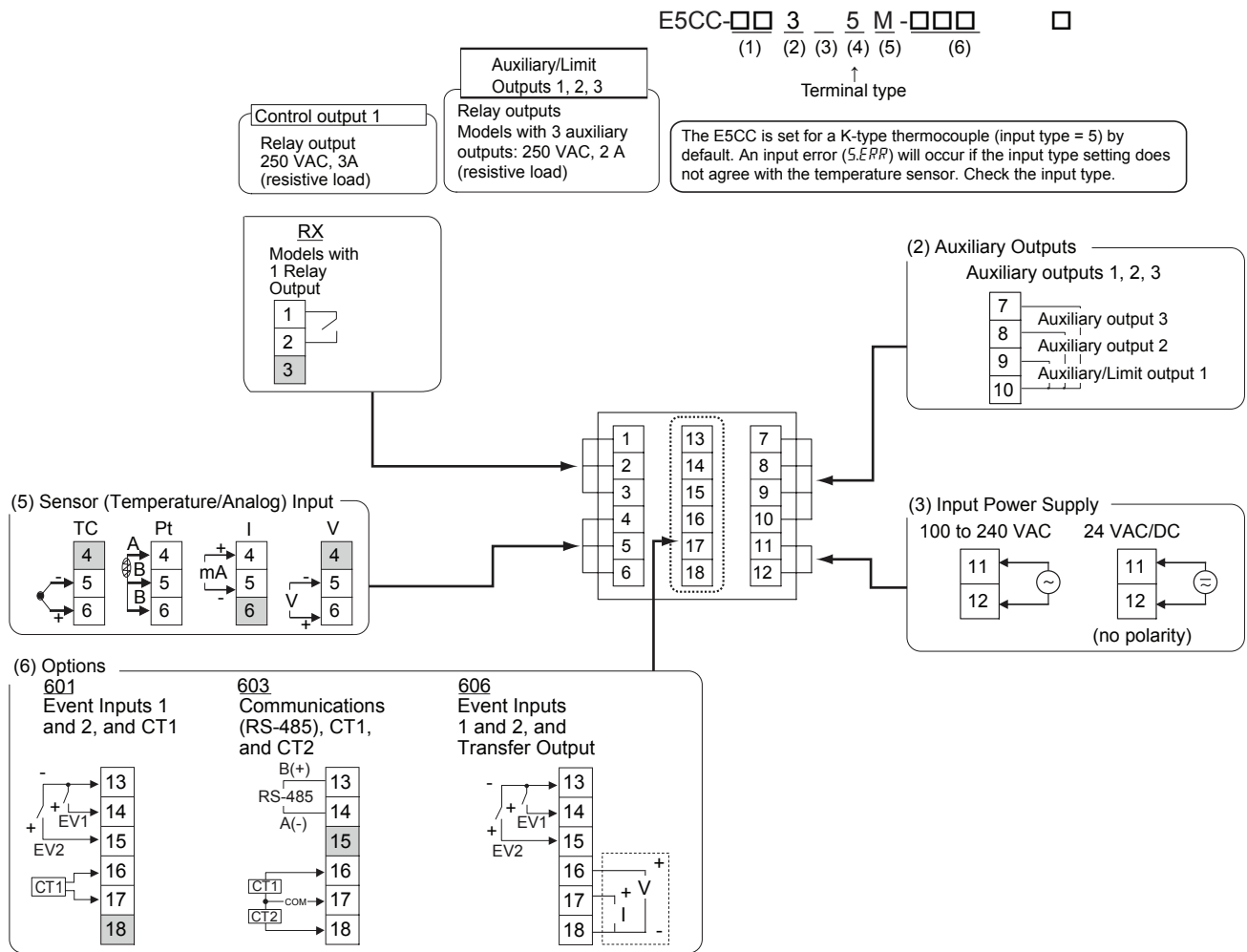[4] The value is 35 ms for a control period of 0.1 s or 0.2 s.

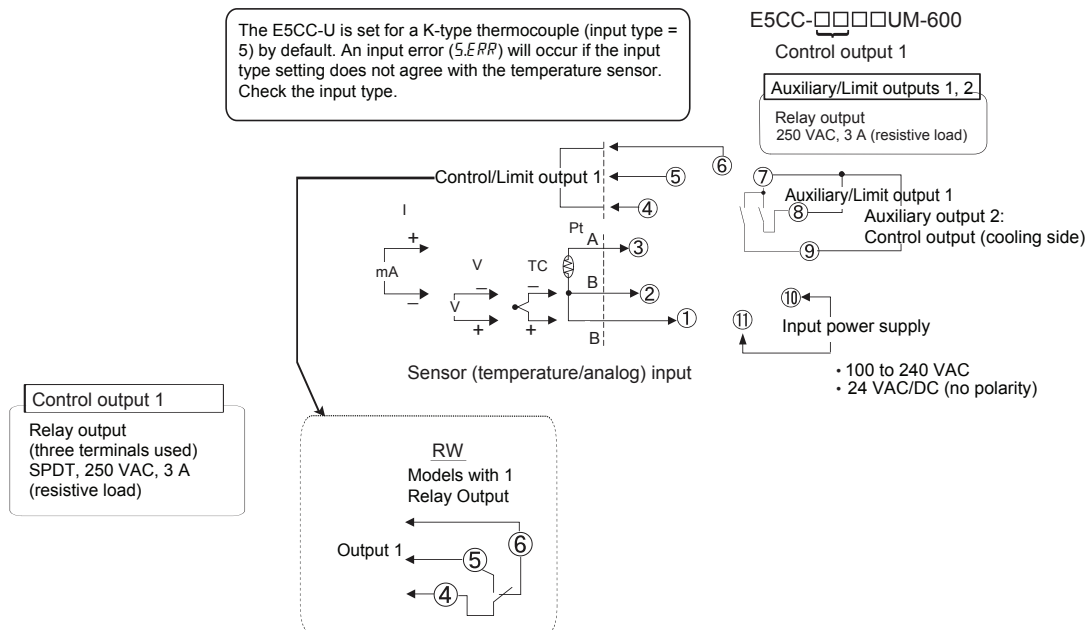## Electrical Life Expectancy Curve for Relays (Reference Values)

E5CC/E5CC-U

External Connections

E5CC

E5CC-☐☐ 3 _ 5 M -☐☐☐   ☐
(1) (2) (3) (4) (5)   (6)

Terminal type

Control output 1
Relay output
250 VAC, 3A
(resistive load)

Auxiliary/Limit Outputs 1, 2, 3
Relay outputs
Models with 3 auxiliary outputs: 250 VAC, 2 A (resistive load)

The E5CC is set for a K-type thermocouple (input type = 5) by default. An input error (5.ERR) will occur if the input type setting does not agree with the temperature sensor. Check the input type.

RX
Models with 1 Relay Output
1
2
3

(2) Auxiliary Outputs
Auxiliary outputs 1, 2, 3
7 — Auxiliary output 3
8 — Auxiliary output 2
9 — Auxiliary/Limit output 1
10

1 13 7
2 14 8
3 15 9
4 16 10
5 17 11
6 18 12

(5) Sensor (Temperature/Analog) Input

TC   Pt   I   V
4   A 4   + 4   4
5   B   mA 5   5
6   B 6   - 6   V 6

(3) Input Power Supply
100 to 240 VAC   24 VAC/DC
11 ~   11 ≃
12   12
                      (no polarity)

(6) Options

601
Event Inputs 1 and 2, and CT1
13
14 EV1
15
16 EV2
17 CT1
18

603
Communications (RS-485), CT1, and CT2
B(+) 13
RS-485 14
A(-) 15
16 CT1
17 COM
18 CT2

606
Event Inputs 1 and 2, and Transfer Output
13
14 EV1
15
16 EV2
17 + V
18 I -

E5CC-U

The E5CC-U is set for a K-type thermocouple (input type = 5) by default. An input error (5.ERR) will occur if the input type setting does not agree with the temperature sensor. Check the input type.

E5CC-☐☐☐☐UM-600

Control output 1

Auxiliary/Limit outputs 1, 2
Relay output
250 VAC, 3 A (resistive load)

Control/Limit output 1 ← ⑤ ⑥
← ④

⑦ Auxiliary/Limit output 1
⑧ Auxiliary output 2: Control output (cooling side)
⑨

I   Pt   A ③
mA V TC B ②
      V   B ①

Sensor (temperature/analog) input

⑩ ⑪ Input power supply
• 100 to 240 VAC
• 24 VAC/DC (no polarity)

Control output 1
Relay output
(three terminals used)
SPDT, 250 VAC, 3 A
(resistive load)

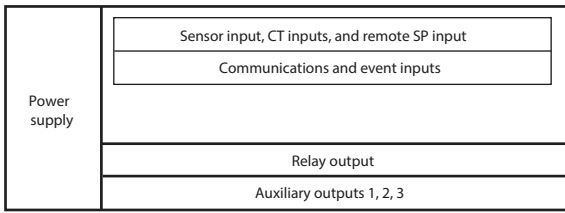**RW**
Models with 1 Relay Output

Output 1 ← ⑥
⑤
④

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 30m or less.
If the cable length exceeds 30 m, compliance with EMC standards will not be possible.
4. Connect M3 crimped terminals.
Connect M3.5 crimped terminals for the E5CC-U.

OMRON

Isolation/Insulation Block Diagrams

• E5CC
Models with 3 Auxiliary Outputs

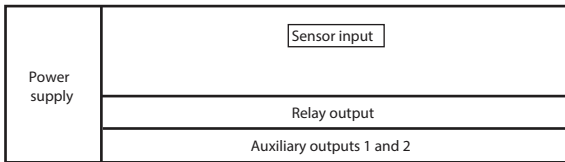| Power supply | Sensor input, CT inputs, and remote SP input |
	Communications and event inputs
	Relay output
	Auxiliary outputs 1, 2, 3

☐ : Reinforced insulation

☐ : Functional isolation

Note: Auxiliary outputs 1 to 3 are not insulated.

• E5CC-U
Models with 2 Auxiliary Outputs

Power supply	Sensor input
	Relay output
	Auxiliary outputs 1 and 2

☐ : Reinforced insulation

☐ : Functional isolation

Nomenclature

E5CC
E5CC-U

Temperature unit

Operation indicators

Front panel

No. 1 display
PV or specified parameter

No. 2 display
SP or specified parameter value

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 the ≫ Key to change the digit (default setting).

Use the ↵ Key to change to another parameter.

Top View of E5CC

Top View of E5CC-U
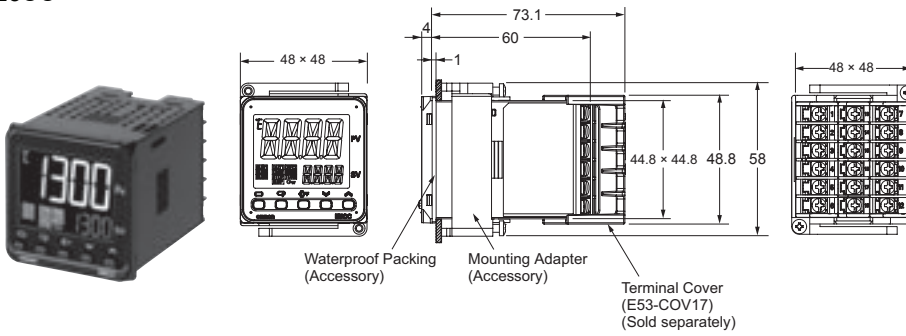
Top-panel Setup Tool port
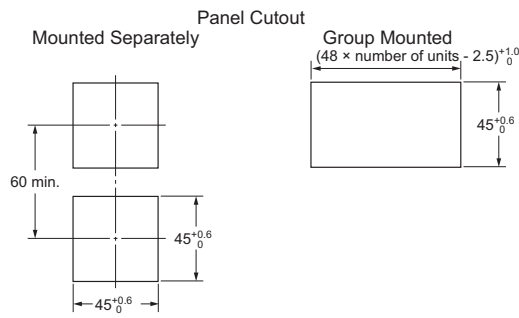
E5CC/E5CC-U

Dimensions
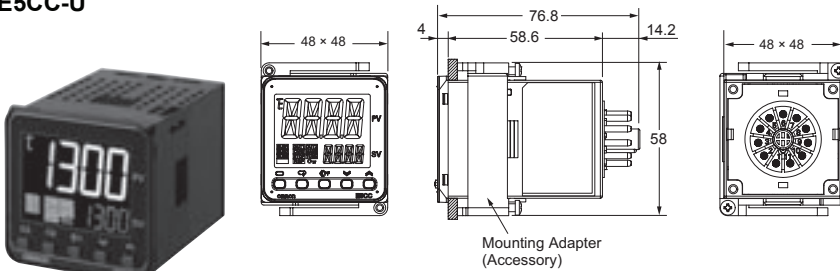
(Unit: mm)

Controllers

E5CC

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

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

Panel Cutout

Mounted Separately

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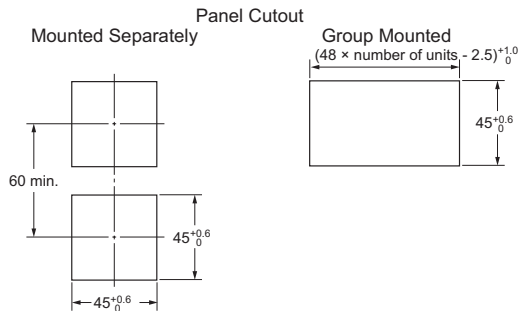$(48 \times \text{number of units} - 2.5)^{+1.0}_{0}$

- 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.
- Use a control panel thickness of 1 to 3 mm if the Y92A-48N and a USB-Serial Conversion Cable are used together.

E5CC-U

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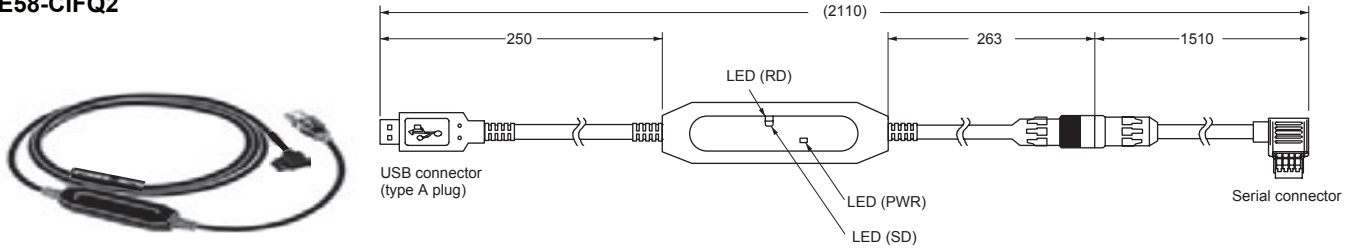
Note: Do not leave the USB-Serial Conversion Cable connected when you use the Temperature Controller.

Panel Cutout

Mounted Separately

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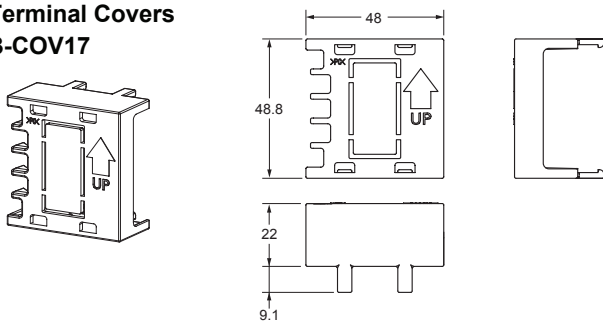$(48 \times \text{number of units} - 2.5)^{+1.0}_{0}$

- Recommended panel thickness is 1 to 5 mm.
- Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers.)
- When two or more Controllers are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature specified in the specifications.
- Use a control panel thickness of 1 to 3 mm if the Y92A-48N and a USB-Serial Conversion Cable are used together.
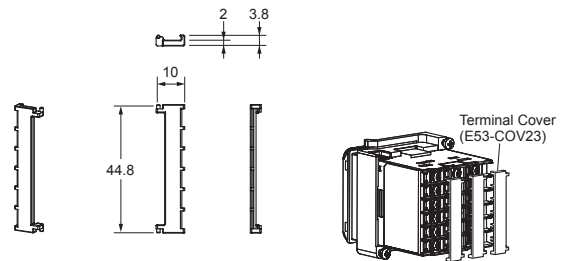
14 OMRON

Accessories (Order Separately)
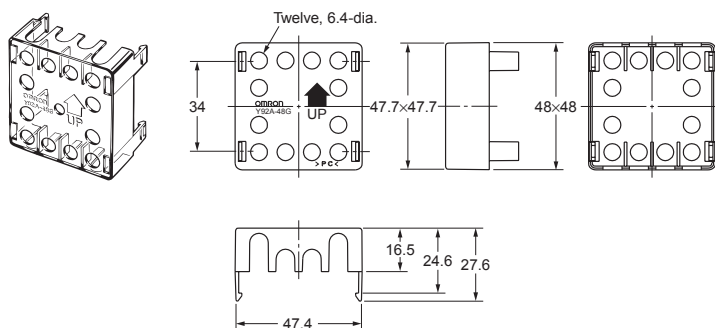
● **USB-Serial Conversion Cable**
E58-CIFQ2

USB connector
(type A plug)

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

Serial connector

(2110)
250
263
1510

● **Terminal Covers**
E53-COV17

48
48.8
UP
22
9.1
UP

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

2   3.8
10
44.8

Terminal Cover
(E53-COV23)

● **Terminal Cover (for the P3GA-11 Back-connecting Socket)**
Y92A-48G

Twelve, 6.4-dia.
34
UP
omron
Y92A-48G
47.7×47.7
48×48

16.5
24.6   27.6
47.4

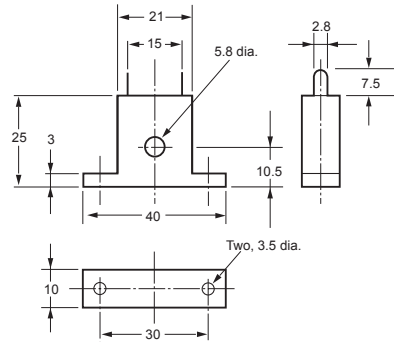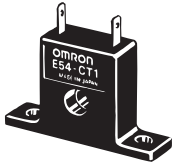**Note:** You can attach the P3GA-11 Back-connecting Socket for finger protection.

● **Waterproof Packing**
Y92S-P8 (for DIN 48 × 48)
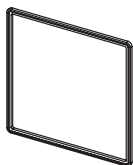
The Waterproof Packing is provided only with the E5CC.
Order the Waterproof Packing separately if it becomes lost or damaged.
The Waterproof Packing can be used to achieve an IP66 degree of protection.
(Deterioration, shrinking, or hardening of the waterproof packing may occur depending on the operating 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 as a rough standard.)
The Waterproof Packing does not need to be attached if a waterproof structure is not required.
The E5CC-U cannot be waterproofed even if the Waterproof Packing is attached.

E5CC/E5CC-U

● **Current Transformers**

E54-CT1

E54-CT3

E54-CT3 Accessories

• **Armature**

Approx. 3 dia.

18

• **Plug**

Approx. 6 dia.
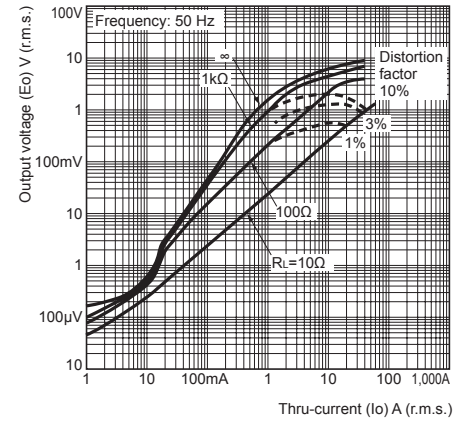
(22)
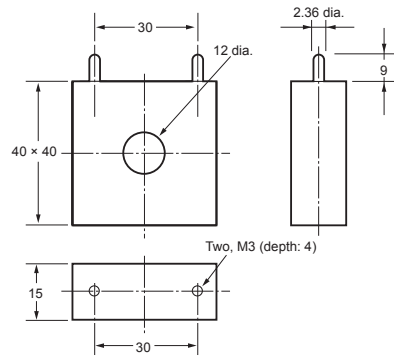
Connection Example

Plug

Armature

Lead

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

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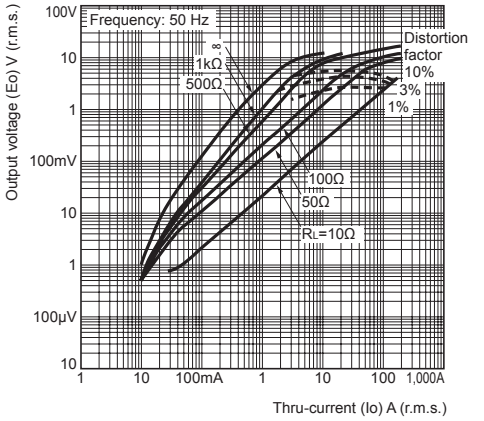Number of windings: 400±2
Winding resistance: 18±2 Ω

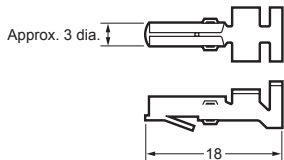**Thru-current (Io) vs. Output Voltage (Eo)
(Reference Values)
E54-CT3**

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
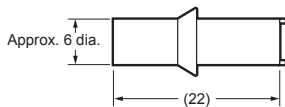Winding resistance: 8±0.8 Ω

● Adapter

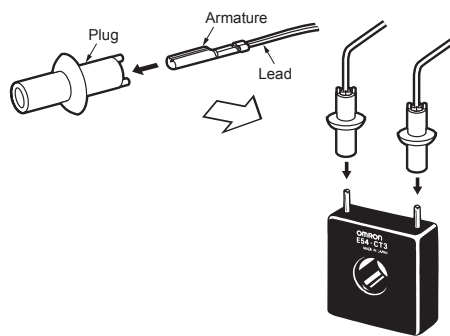**Y92F-45**   **Note: 1.** Use this Adapter when the Front Panel has already been prepared for the E5B☐.
   2. Only black is available.
   3. You cannot use the E58-CIFQ2 USB-Serial Conversion Cable if you use the Y92F-45 Adapter. To use the USB-Serial Conversion Cable to make the settings, do so before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

Fixture (Accessory)

4.7 — 76
69.6 to 77.6
72 × 72
67 × 67 87

Mounted to E5CC

Panel (1 to 8 mm)   Mounting Adapter
Y92F-30
(Accessory)
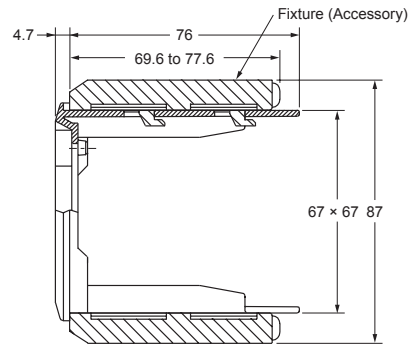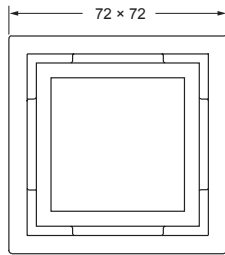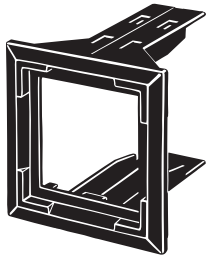
72 × 72
48 × 48
2.2 — 4.7
62.8
To back of the E5CC

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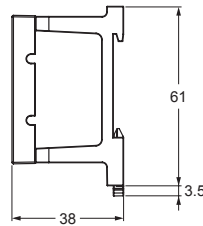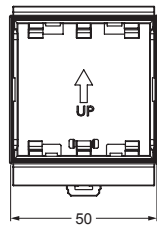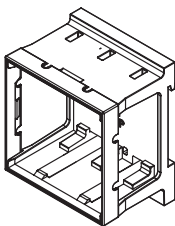
This Adapter is used to mount the E5CC to a DIN Track.
If you use the Adapter, there is no need for a plate to mount in the panel or to drill mounting holes in the panel.

Mounted to E5CC

48
80.5

E5CC/E5CC-U
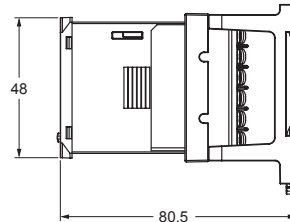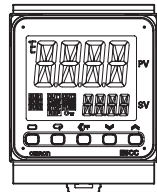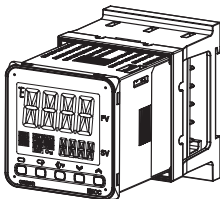
● Watertight Cover
Y92A-48N

21.9 14
(2)
87.7 79.2
69
12
67.6
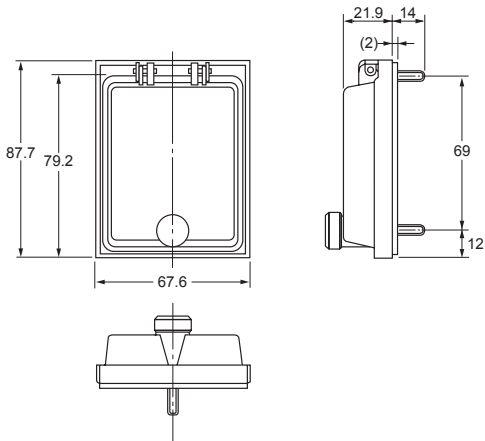
● Mounting Adapter
Y92F-49
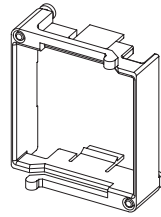
The Mounting Adapter is provided with the Temperature Controller.
Order this Adapter separately if it becomes lost or damaged.

● Protective Cover
 Y92A-48D

Note: This Protective Cover cannot be used if the Waterproof Packing is installed.
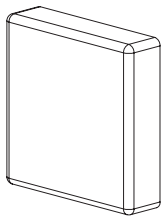
This Protective Cover is soft type.
It is able to operate the controller with using this cover.

● Protective Cover
Y92A-48H
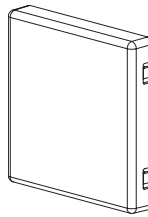
This Protective Cover is hard type.
Please use it for the mis-operation prevention etc.

● E5CC-U Wiring Socket

Front-connecting Socket
P2CF-11

Eleven, M3.5 × 7.5 sems screws
7.8
3
4.5
70 max.
35.4
Two, 4.5-dia. holes
4
50 max.
31.2 max.
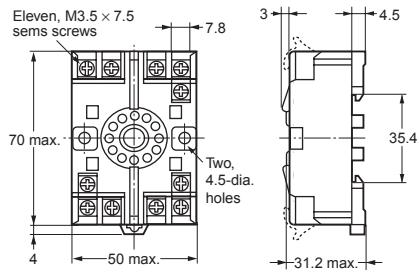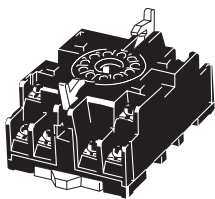
Terminal Layout/Internal Connections
(Top View)

8 7 6 5
4
9 3
10 11 1 2

Mounting Holes

Two, 4.5 dia. mounting holes
40±0.2
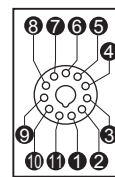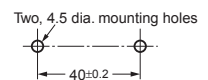
Note: Can also be mounted to a DIN track

Note: 1. A model with finger protection (P2CF-11-E) is also available.
2. You cannot use the P2CF-11 or P2CF-11-E together with the Y92F-45.

Back-connecting Socket
P3GA-11

27dia.
45
45
25.6
4.5 16.3 6.2

Eleven, M3.5 sems screws
4 7 3
8.7
6

Terminal Layout/Internal Connections
(Bottom View)

5 6 7 8
4
3 9
2 1 11 10
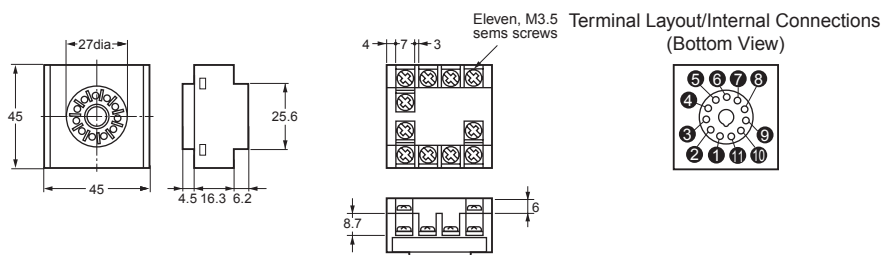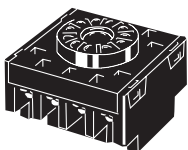
Note: 1. Using any other sockets will adversely affect accuracy. Use only the specified sockets.
2. A Protective Cover for finger protection (Y92A-48G) is also available.
3. You cannot use the P3GA-11 together with the Y92F-45.

Digital Limit Controller
E5DC-600 (22.5 mm Wide for DIN Track-mounting)

The E5DC Mounts to DIN Track and Is Ideal for Connections to HMIs and PLCs. It provides the Same Easy Operation and Advanced Performance as the Rest of the E5□C Series.

- A slim body at 85 x 22.5 mm (D x W) that fits into narrow control panels and mounts to DIN track.
- Removable terminal block for easy replacement to simplify maintenance.
- High-speed sampling at 50 ms for applications with high-speed temperature increases.
- Easy connections to a PLC with programless communications.
- Set up the controller without wiring the power supply by connecting to the computer with a Communication Conversion Cable (sold separately).
- Setup is easy with CX-Thermo software (sold separately)
- Models are available with up to 2 auxiliary outputs and 2 event inputs to compete basic functions.
- A white PV display (8.5 mm high) is easy to read when setting up,checking alarms, and making settings in a control panel.
- Conforms to FM (Factory Mutual) standards (FM3545/3810).

**E5DC
22.5 mm Wide, and
DIN Track-mounting Type**

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

⚠ **Refer to *Safety Precautions* on page 45.**

Main I/O Functions
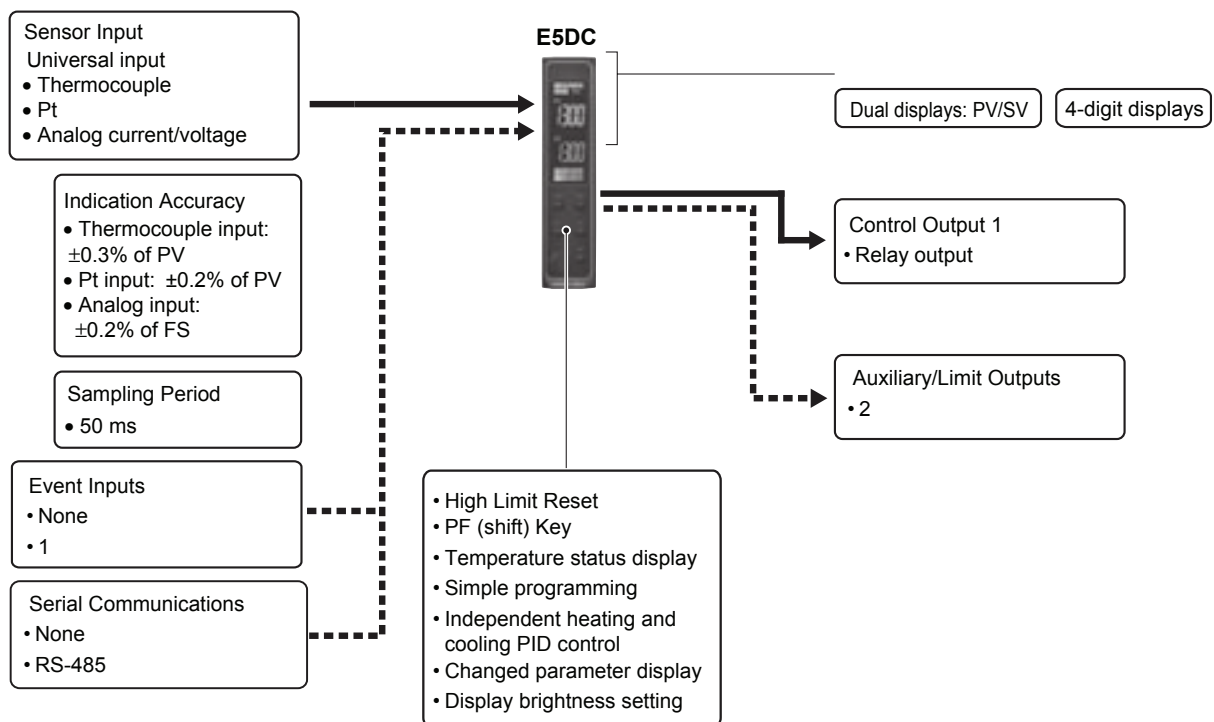
Sensor Input
Universal input
- Thermocouple
- Pt
- Analog current/voltage

E5DC

Dual displays: PV/SV | 4-digit displays

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

Control Output 1
- Relay output

Sampling Period
- 50 ms

Auxiliary/Limit Outputs
- 2

Event Inputs
- None
- 1

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

Serial Communications
- None
- RS-485

This datasheet is provided as a guideline for selecting products.
Be sure to refer to the following manuals for application precautions and other information required for operation before attempting to use the product.
E5□C Digital Temperature Controller User's Manual (Cat. No. H174)
E5□C Digital Temperature Controller Communications Manual (Cat. No. H175)
E5□C Temperature High/Low Limit Controller Set up Instruction Sheet (Cat. No. H32I)

E5DC

Model Number Legend and Standard Models

Model Number Legend
● Models with Screw Terminals)

E5DC-	R	X	2	---	S	M	6	---	---
	1		2	3	4	5		6	

Model	1 Control Outputs 1 and 2	2 Number of auxiliary outputs	3 Power supply voltage	4 Terminal type	5 Input type	6 Options	Meaning			
E5DC							22.5 mm wide and mounts to DIN Rail			
							Control output 1			
	RX						Relay output			
		2					2 (one common)			
			A				100 to 240 VAC			
			D				24 VAC/VDC			
				S			Screw terminals			
					M		Universal input			
							HB alarm and HS alarm	Communi-cations	Event Inputs	Transfer output
						600	---	---	---	---
						602	1	RS-485	---	---
						617	1	---	1	---

E5DC Ordering Information

AC Versions	DC Versions
E5DC-RX2ASM-600	E5DC-RX2DSM-600
E5DC-RX2ASM-602	E5DC-RX2DSM-602
E5DC-RX2ASM-617	E5DC-RX2DSM-617

Heating and Cooling Control
● Using Heating and Cooling Control

① Control Output Assignment
An auxiliary output is used as the cooling control output.

② Control
If PID control is used, you can set PID control separately for heating and cooling.
This allows you to handle control systems with different heating and cooling response characteristics.

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Optional Products (Order Separately)

Terminal Unit

Model
E5DC-SCT1S

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.

Current Transformers (CTs)

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

Mounting Adapter

Model
Y92F-53 (2pcs)

Short Bars

Model
Y92S-P11 (4 pcs)

CX-Thermo Support Software

Model
EST2-2C-MV4

Note: CX-Thermo version 4.6 or higher is required for the E5DC. For the system requirements for the CX-Thermo, refer to information on the EST2-2C-MV4 on the OMRON website (www.ia.omron.com).

End Plate

Model
PFP-M

Spacer

Model
PFP-S

DIN Tracks

Model
PFP-100N
PFP-50N

Unit Labels

Model
Y92S-L2

End Cover

Model
Y92F-54

E5DC

Specifications
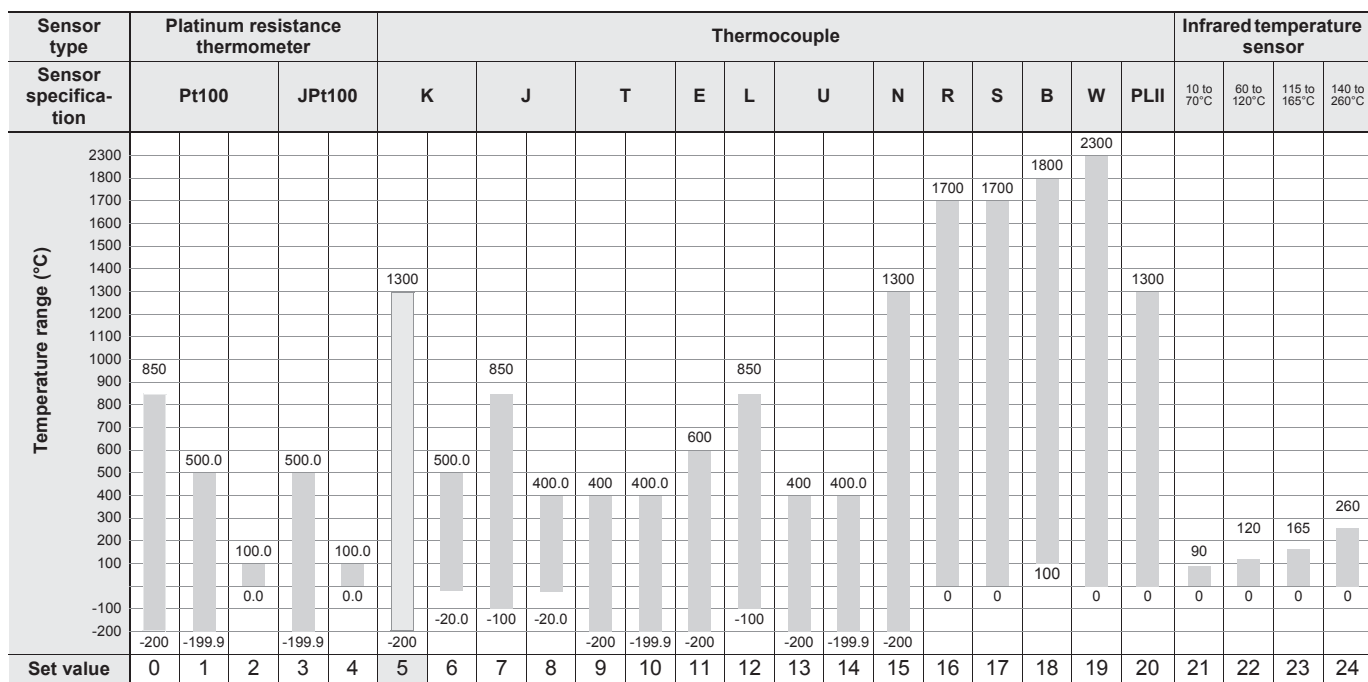
Ratings

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	4.9 VA max. at 100 to 240 VAC, and 2.8 VA max. at 24 VDC or 1.5 W max. at 24 VDC

Sensor input	Temperature input
	    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 (reference value)
Auxiliary/ Limit Output	**Number of outputs**	2
	Output specifications	SPST-NO relay outputs: 250 VAC, 2 A (resistive load), Electrical life: 100,000 operations, Minimum applicable load: 10 mA at 5 V (reference value)
Event input	**Number of inputs**	1 (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

Setting method	Digital setting using front panel keys
Indication method	11-segment digital displays and individual indicators Character height: PV: 8.5 mm, SV: 8.0 mm
Multi SP	Up to eight set points (SP0 to SP7) can be saved and selected using the event inputs, key operations, or serial communications.*1
Bank switching	None
Other functions	Manual output, heating/cooling control, loop burnout alarm, SP ramp, other alarm functions, heater burn-out (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, MV change rate limit, logic operations, temperature status display, simple programming, moving average of input val-ue, display brightness setting, and work bit message*2
Ambient operating temperature	−10 to 55°C (with no condensation or icing), For 3-year warranty: −10 to 50°C with standard mounting (with no condensation or icing)
Ambient operating humidity	25% to 85%
Storage temperature	−25 to 65°C (with no condensation or icing)
Altitude	2,000 m max.
Recommended fuse	T2A, 250 VAC, time-lag, low-breaking capacity
Installation environment	Installation Category II, Pollution Degree 2 (IEC 61010-1 compliant)

*1   Only two set points are selectable for event inputs.
*2   Usage is possible for the Digital Temperature Controllers manufactured in July 2014 or later.

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Input Ranges

●Thermocouple/Platinum Resistance Thermometer (Universal inputs)

Sensor type	Platinum resistance thermometer		Thermocouple												Infrared temperature sensor			
Sensor specification	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	1300	850	400	600	850	400	1300	1700	1700	1800	2300	1300	90	120	165	260
Temperature range (°C) — second bar	500.0 (Pt100 set 1) / 100.0 (set 2)	500.0 (set 3) / 100.0 (set 4)	500.0 (set 6)	400.0 (set 8)	400.0 (set 10)			400.0 (set 14)				100						
Temperature range (°C) — min	-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
Set value	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

Detailed set values:

Set value	Sensor	Range
0	Pt100	-200 to 850
1	Pt100	-199.9 to 500.0
2	Pt100	0.0 to 100.0
3	JPt100	-199.9 to 500.0
4	JPt100	0.0 to 100.0
5	K	-200 to 1300
6	K	-20.0 to 500.0
7	J	-100 to 850
8	J	-20.0 to 400.0
9	T	-200 to 400
10	T	-199.9 to 400.0
11	E	-200 to 600
12	L	-100 to 850
13	U	-200 to 400
14	U	-199.9 to 400.0
15	N	-200 to 1300
16	R	0 to 1700
17	S	0 to 1700
18	B	100 to 1800
19	W	0 to 2300
20	PLII	0 to 1300
21	Infrared 10 to 70°C	0 to 90
22	Infrared 60 to 120°C	0 to 120
23	Infrared 115 to 165°C	0 to 165
24	Infrared 140 to 260°C	0 to 260

☐ 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				
Set value	25	26	27	28	29

Alarm Types

Each alarm can be independently set to one of the following 17 alarm types. The default is 2: Upper limit. (See note.)
Auxiliary outputs are allocated to alarms. ON delays and OFF delays (0 to 999 s) can also be specified.
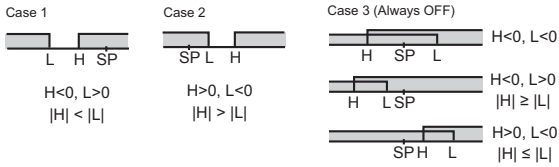**Note:** In the default settings for models with HB or HS alarms, alarm 1 is set to a heater alarm (HA) and the Alarm Type 1 parameter is not displayed.
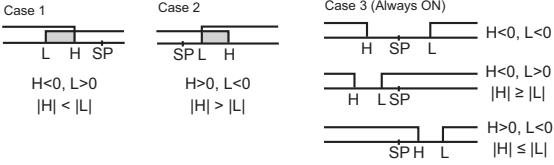To use alarm 1, set the output assignment to alarm 1.

Set value	Alarm type	Alarm output operation When alarm value X is positive	When alarm value X is negative	Description of function
0	Alarm function OFF	Output OFF		No alarm
1	Upper- and lower-limit *1	(ON/OFF, L H, SP, PV)	*2	Set the upward deviation in the set point for the alarm upper limit (H) and the lower deviation in the set point for the alarm lower limit (L). The alarm is ON when the PV is outside this deviation range.
2 (default)	Upper-limit	(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 upward deviation in the set point for the alarm upper limit (H) and the lower deviation in the set point for the alarm lower limit (L). The alarm is ON when the PV is inside this deviation range.
5	Upper- and lower-limit with standby sequence *1	(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 alarm	(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 alarm	(ON/OFF, X, 0, SP)	(ON/OFF, X, 0, SP)	This alarm type turns ON the alarm when the set point (SP) is lower than the alarm value (X).
16	MV absolute-value upper-limit alarm *9	Standard Control (ON/OFF, X, 0, MV) — Heating/Cooling Control (Heating MV) (ON/OFF, X, 0, MV)	Standard Control (ON/OFF, X, 0, MV) — Heating/Cooling Control (Heating MV) Always ON	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 alarm *9	Standard Control (ON/OFF, X, 0, MV) — Heating/Cooling Control (Cooling MV) (ON/OFF, X, 0, MV)	Standard Control (ON/OFF, X, 0, MV) — Heating/Cooling Control (Cooling MV) Always ON	This alarm type turns ON the alarm when the manipulated variable (MV) is lower than the alarm value (X).

*1 With set values 1, 4, and 5, the upper- and lower-limit values can be set independently for each alarm type, and are expressed as "L" and "H."

*2 Set value: 1, Upper- and lower-limit alarm

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

*4 Set value: 5, Upper- and lower-limit with standby sequence
For Upper- and Lower-Limit Alarm Described Above at *2
- In cases 1 and 2 above, the alarm is <u>always OFF</u> if the upper- and lower-limit hysteresis overlaps.
- In case 3, the alarm is <u>always OFF</u>.

*5 Set value: 5, Upper- and lower-limit alarm with standby sequence
The alarm is <u>always OFF</u> if upper- and lower-limit hysteresis overlaps.

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

*7 Refer to the *E5□C Digital Temperature Controllers User's Manual* (Cat. No. H174) for information on the LBA.

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

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

E5DC

Characteristics

Indication accuracy (when mounted individually, ambient temperature of 23°C)	Thermocouple: (±0.3 % of indication value or ±1°C, whichever is greater) ±1 digit max.*1 Platinum resistance thermometer: (±0.2 % of indication value or ±0.8°C, whichever is greater) ±1 digit max. Analog input: ±0.2% FS ±1 digit max. CT input: ±5% FS ±1 digit max.
Influence of temperature *3	Thermocouple input (R, S, B, W, PL II): (±1% of indication value or ±10°C, whichever is greater) ±1 digit max.
Influence of voltage *3	Other thermocouple input: (±1% of indication value or ±4°C, whichever is greater) ±1 digit max. *4 Platinum resistance thermometer: (±1% of indication value or ±2°C, whichever is greater) ±1 digit max. Analog input: ±1% FS ±1 digit max. CT input: ±5% FS ±1 digit max.
Installation influence (E5DC only)	R, S, B, W, or PLII thermocouple: (±1% of PV or ±10°C, whichever is greater) ±1 digit max. Other thermocouple: (±1% of PV or ±4°C, whichever is greater) ±1 digit max. *4
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) *5
Derivative time (D)	0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *5
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) *5
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) *5
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	−1,999 to 9,999 (decimal point position depends on input type)
Influence 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	3,000 VAC, 50/60 Hz for 1 min between terminals of different charge
Vibration	Malfunction	10 to 55 Hz, 20 m/s² for 10 min each in X, Y and Z directions
	Resistance	10 to 55 Hz, 20 m/s² for 2 hr each in X, Y, and Z directions
Shock	Malfunction	100 m/s², 3 times each in X, Y, and Z directions
	Resistance	300 m/s², 3 times each in X, Y, and Z directions
Weight	Main unit: Approx. 80 g, Terminal unit: Approx. 40 g
Degree of protection	Main unit: IP20, Terminal unit: IP00
Memory protection	Non-volatile memory (number of writes: 1,000,000 times)
Setup Tool	CX-Thermo version 4.6 or higher
Setup Tool port	E5DC bottom panel: An E58-CIFQ2 USB-Serial Conversion Cable is used to connect a USB port on the computer. *6 E5DC front panel: An E58-CIFQ2 USB-Serial Conversion Cable and E58-CIFQ2-E Conversion Cable are used together to connect a USB port on the computer.*6
Standards	Approved standards	FM3545/3810, UL 61010-1, Korean Radio Waves Act (Act 10564)
	Conformed standards	EN 61010-1 (IEC 61010-1): Pollution Degree 2, overvoltage category II, Lloyd's standards *7
EMC	EMI: EN61326 Radiated Interference Electromagnetic Field Strength: EN55011 Group 1, class A Noise Terminal Voltage: EN55011 Group 1, class A EMS: EN61326 ESD Immunity: EN61000-4-2 Electromagnetic Field Immunity: EN61000-4-3 Burst Noise Immunity: EN61000-4-4 Conducted Disturbance Immunity: EN61000-4-6 Surge Immunity: EN61000-4-5 Voltage Dip/Interrupting Immunity: EN61000-4-11

*1 The indication accuracy of K thermocouples in the −200 to 1,300°C range, T and N thermocouples at a temperature of −100°C max., and U and L thermocouples at any temperature is ±2°C ±1 digit max. The indication accuracy of B thermocouples at a temperature of 400°C max. is not specified. The indication accuracy of B thermocouples at a temperature of 400 to 800°C is ±3°C max.
The indication accuracy of 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 PLII thermocouples is (±0.3% of PV or ±2°C, whichever is greater) ±1 digit max.
*2 However, the precision between 0 and 4 mA for a 0 to 20 mA output is ±1% FS max.
*3 Ambient temperature: −10°C to 23°C to 55°C, Voltage range: −15% to 10% of rated voltage
*4 K thermocouple at −100°C max.: ±10°C max.
*5 The unit is determined by the setting of the Integral/Derivative Time Unit parameter.
*6 External serial communications (RS-485) and USB-Serial Conversion Cable communications can be used at the same time.
*7 Refer to information on maritime standards in *Shipping Standards* on page 45 for compliance with Lloyd's Standards.

USB-Serial Conversion Cable

Applicable OS	Windows XP/Vista/7/8
Applicable software	CX-Thermo version 4.6 or higher
Applicable models	E5□C-T Series, E5□C Series, and E5CB Series
USB interface standard	Conforms to USB Specification 2.0
DTE speed	38,400 bps
Connector specifications	Computer: USB (Type A plug) Digital Temperature Controller: Special serial connector
Power supply	Bus power (Supplied from the 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 on the computer. Refer to the *Instruction Manual* included with the Cable for the installation procedure.

Communications Specifications

Transmission line connection method	RS-485: Multidrop
Communications	RS-485 (two-wire, half duplex)
Synchronization method	Start-stop synchronization
Protocol	CompoWay/F, or Modbus
Baud rate*	9,600, 19,200, 38,400, or 57,600 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 with 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 [1]	You can use the memory in the PLC to read and write E5□C parameters, start and stop operation, etc. The E5□C automatically performs communications with PLCs. No communications programming is required. Number of connected Digital Temperature Controllers: 32 max. (Up to 16 for the FX Series) Applicable PLCs: OMRON PLCs CS Series, CJ Series, or CP Series Mitsubishi Electric PLCs MELSEC Q Series, L Series, or FX Series (compatible with the FX2 or FX3 (excluding the FX1S)) KEYENCE PLCs KEYENCE KV Series
Component Communications [1]	When Digital Temperature Controllers are connected, set points and RUN/STOP commands can be sent from the Digital Temperature Controller that is set as the master to the Digital Temperature Controllers that are set as slaves. Slope and offsets can be set for the set point. Number of connected Digital Temperature Controllers: 32 max. (including master)
Copying [2]	When Digital Temperature Controllers are connected, the parameters can be copied from the Digital Temperature Controller that is set as the master to the Digital Temperature Controllers that are set as slaves.

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

[1] A Temperature Controller with version 2.1 or higher is required for the FX Series or the KV Series.
[2] Both the programless communications and the component communications support the copying.

Current Transformer (Order Separately) Ratings

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

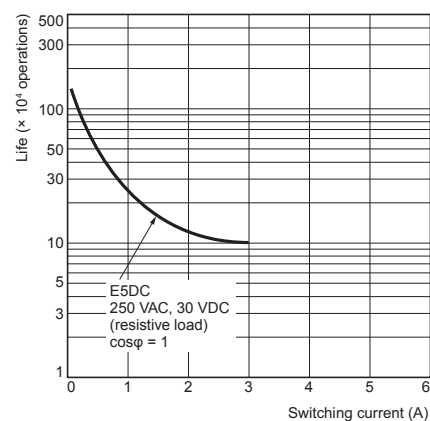|	
CT input (for heater current detection)	Models with detection for single-phase heaters: One input
Maximum heater current	50 A AC
Input current indication accuracy	±5% FS ±1 digit max.
Heater burnout alarm setting range [1]	0.1 to 49.9 A (in units of 0.1 A) Minimum detection ON time: 100 ms [3]
SSR 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.
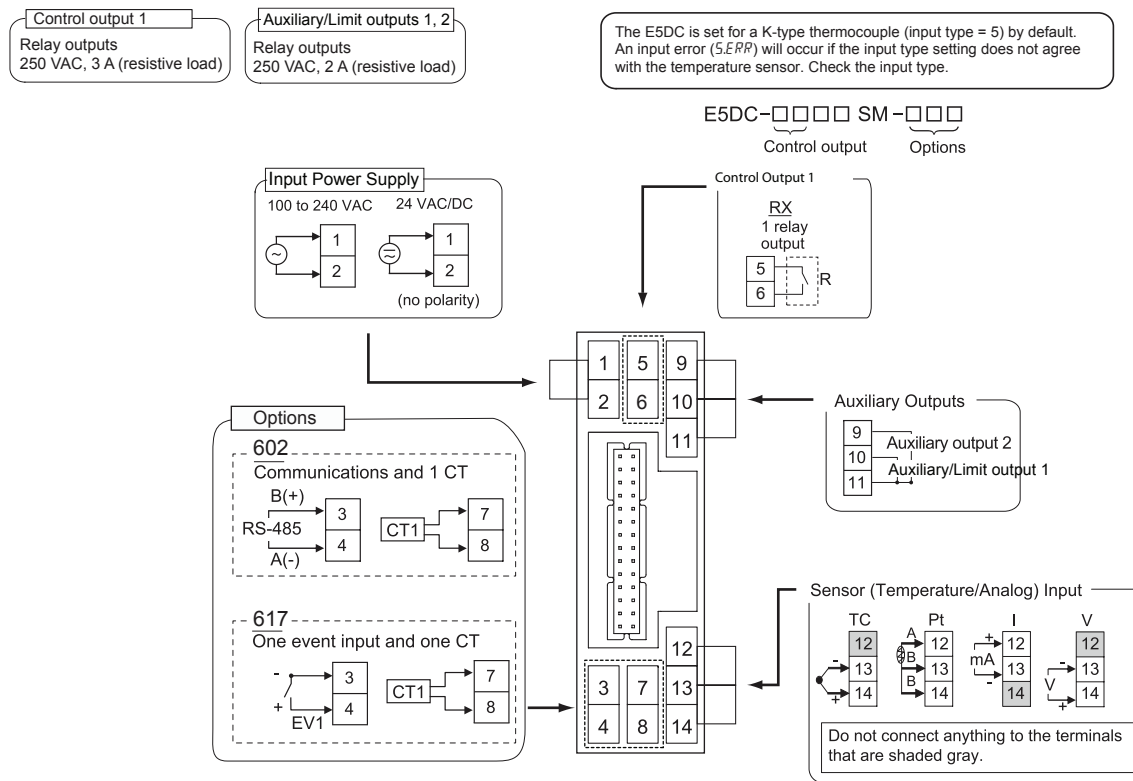[4] The value is 35 ms for a control period of 0.1 s or 0.2 s.

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

E5DC

External Connections

E5DC

Control output 1	Auxiliary/Limit outputs 1, 2
Relay outputs 250 VAC, 3 A (resistive load)	Relay outputs 250 VAC, 2 A (resistive load)

The E5DC is set for a K-type thermocouple (input type = 5) by default. An input error (5.ERR) will occur if the input type setting does not agree with the temperature sensor. Check the input type.

E5DC−□□□□ SM −□□□
  Control output   Options

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 30m, compliance with EMC standards will not be possible.
   4. Connect M3 crimped terminals.
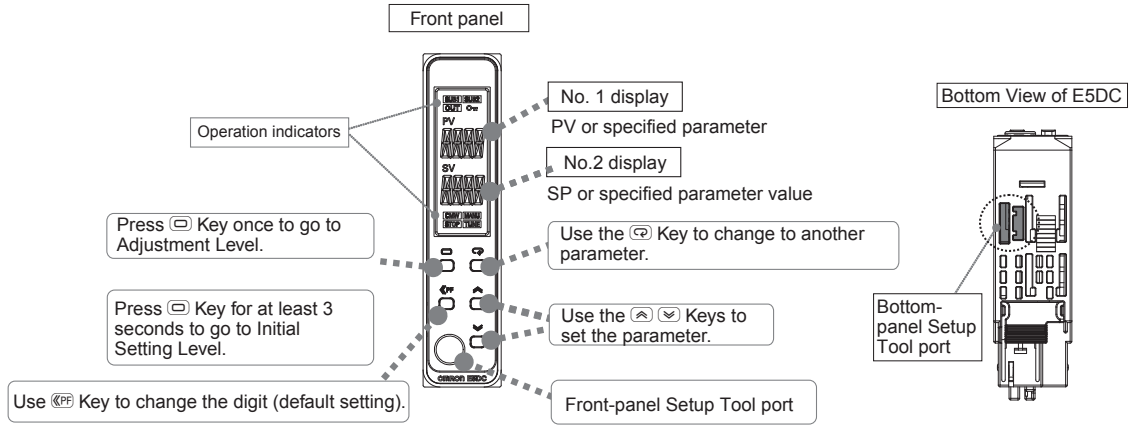
Isolation/Insulation Block Diagrams
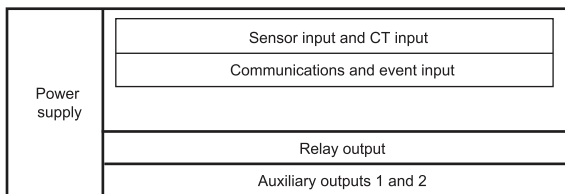
: Reinforced insulation

: Functional isolation

Note: Auxiliary outputs 1 to 2 are not insulated.

OMRON

Nomenclature

E5DC

Front panel

No. 1 display
PV or specified parameter

No.2 display
SP or specified parameter value

Operation indicators

Press ◻ Key once to go to Adjustment Level.

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

Use the ⊂⊃ Key to change to another parameter.

Use the ⌃ ⌄ Keys to set the parameter.

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

Front-panel Setup Tool port

Bottom View of E5DC

Bottom-panel Setup Tool port

Dimensions
(Unit: mm)

Controllers

E5DC

The above figure shows the Terminal Unit attached to the Main Unit.

(85)
81
4
22.5
96
35 110
4
22.5
91

Mounting Adapter
(Accessory: Sold separately)
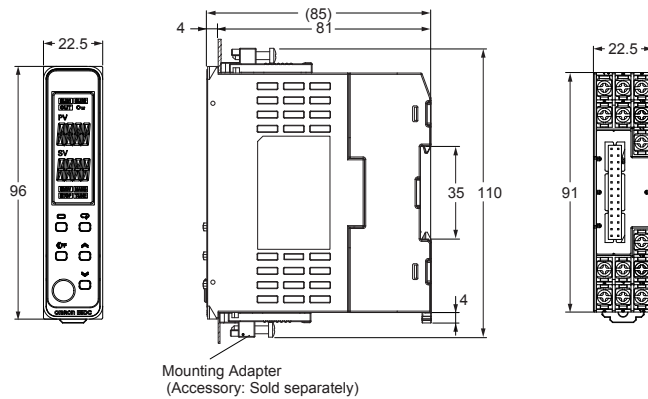
The Setup Tool ports are on the front and bottom of the Digital Temperature Controller.
It is used to connect the Temperature Controller to the computer to use the Setup Tool.
The E58-CIFQ2 USB-Serial Conversion Cable is required to make the connection.

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 Digital Temperature Controller.

Mounted Separately

$22.7^{+0.3}_{0}$

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

120 min

Two-Unit Mounting

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

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

Group Mounted

$(22.5 \times \text{number of units})^{+1.0}_{0}$

$92^{+0.8}_{0}$
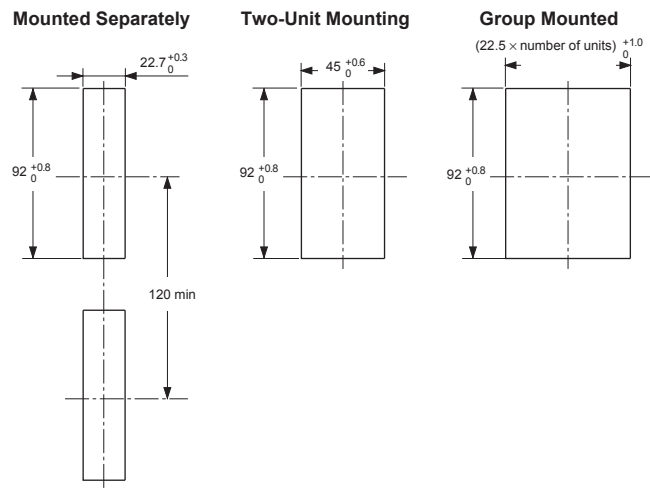
• Recommended panel thickness is 1 to 8 mm.
• Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers.)
• When two or more Digital Temperature Controllers are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature specified in the specifications.
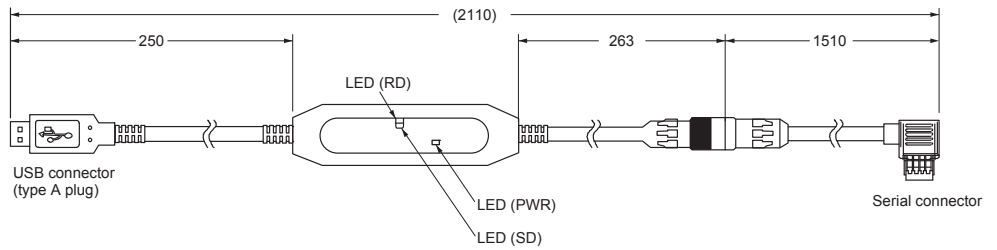
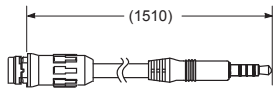# E5DC

Accessories (Order Separately)

● **Terminal Unit**
E5DC-SCT1S

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

USB connector
(type A plug)

LED (RD)

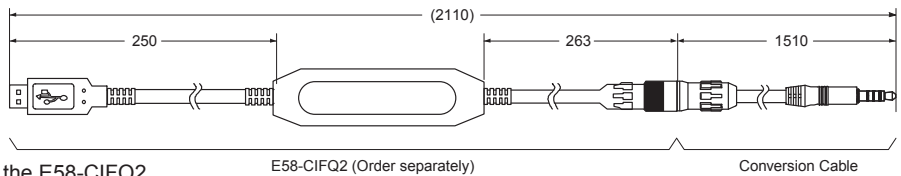LED (PWR)

LED (SD)
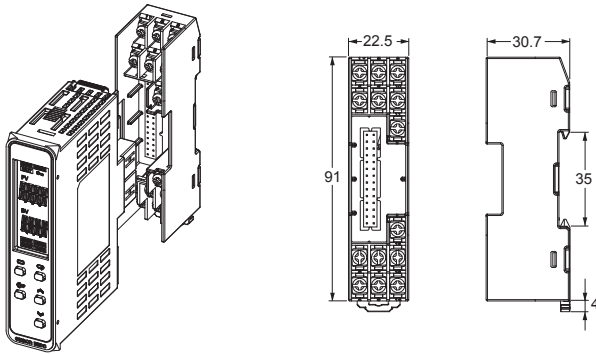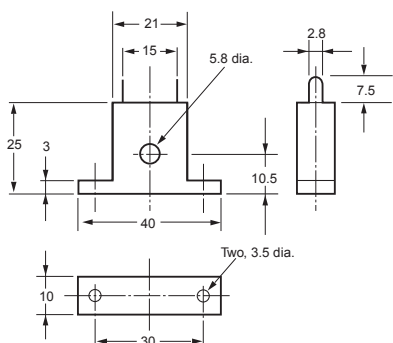
Serial connector

● **Conversion Cable**
E58-CIFQ2-E

Conversion Cable

Connecting to the E58-CIFQ2 USB-Serial Conversion Cable

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

E58-CIFQ2 (Order separately)
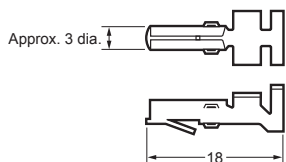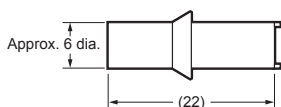
Conversion Cable

OMRON

● Current Transformers

E54-CT1

E54-CT3

E54-CT3 Accessories
• Armature

Connection Example

• Plug

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

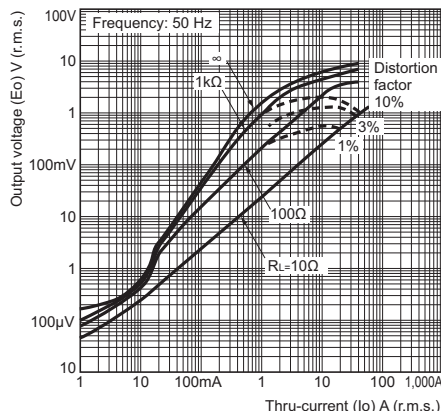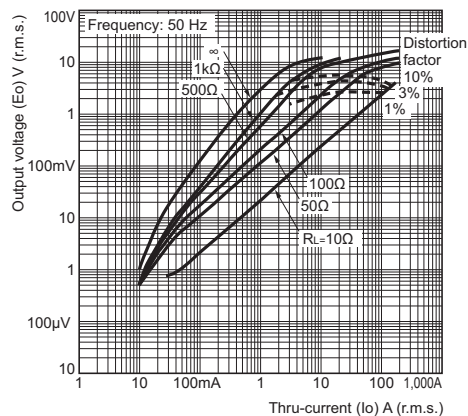### Thru-current (Io) vs. Output Voltage (Eo) (Reference Values)
E54-CT3

Maximum continuous heater current: 120 A (50/60 Hz) (Maximum continuous heater current for an OMRON Digital Temperature Controller is 50 A.)
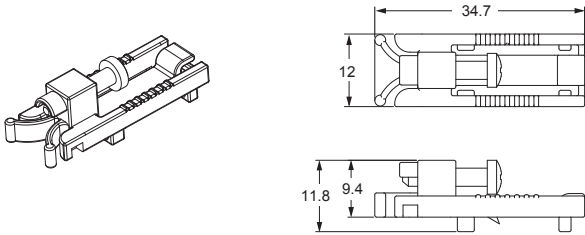
Number of windings: 400±2
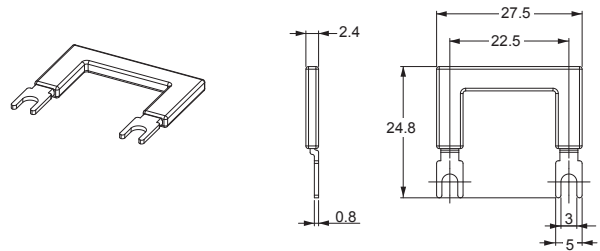
Winding resistance: 8±0.8 Ω

E5DC

● **Mounting Adapters**
 Y92F-53 (Two included.)

This accessory is not included with the product. Order it separately to mount the product to a panel.

● **Short Bars**
 Y92S-P11 (Four included.)

Use this product to connect between terminals (for power supplies, communications, etc.) when you use multiple E5DC Controllers.

● **End Plate**
 PFP-M
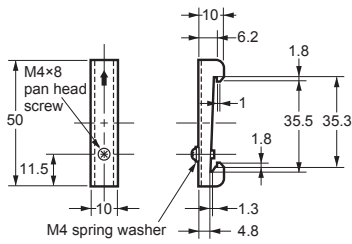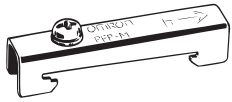
● **DIN Tracks**
 PFP-100N
 PFP-50N
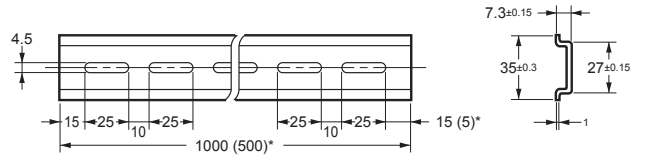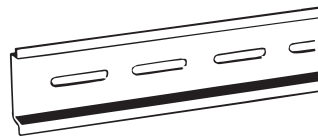
* Dimensions in parentheses are for the PFP-50N.

● **Spacer**
 PFP-S
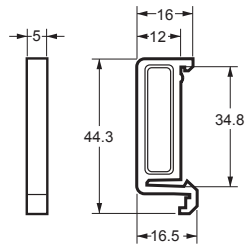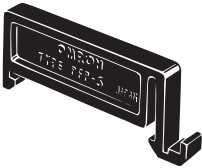
● **Unit Labels**
 Y92S-L2

V	A	V	A	%	J	Pa	Ω
s	/	N	m	W	℃	m³	k
℉	g	min	mm	rpm
VA	mV	mA	Hz
m/min	OMRON		
OUT	OUT		

The Unit Labels for the Digital Panel Meter are used. Use either the °C or °F label from the sheet.

● **End Cover**
 Y92F-54 (Two included.)
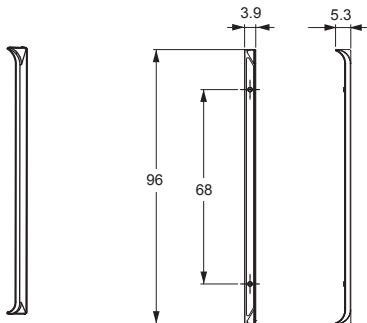
Use the End Cover when you mount the E5DC to a panel to hide the gap between the Controller and the panel.

OMRON

Operation

Setting Levels Diagram

E5□C

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.
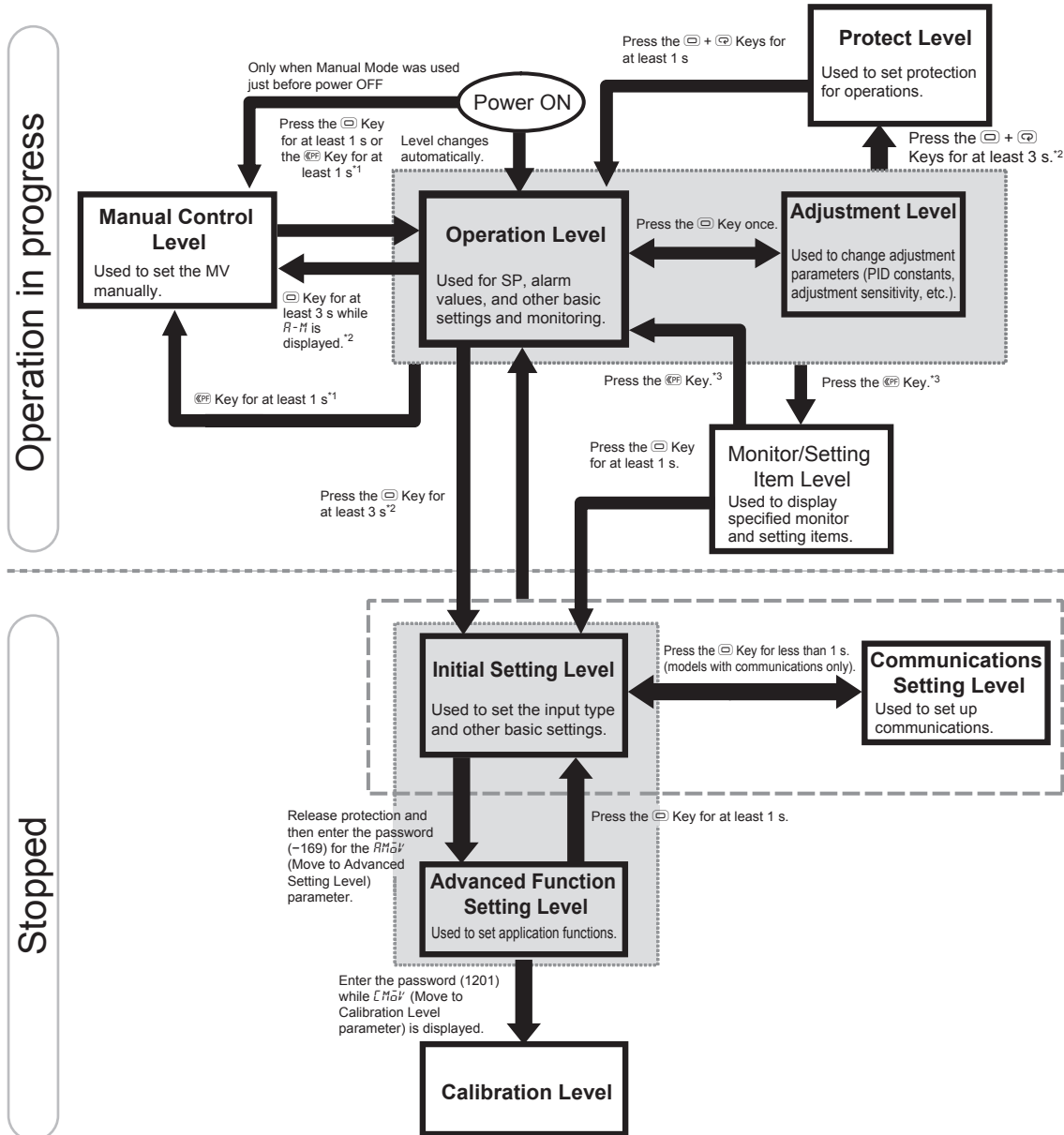
*1 Set the PF Setting parameter to R-M (Auto/Manual).
*2 The No. 1 display will flash when the keys are pressed for 1 s or longer.
*3 Set the PF Setting parameter to $PFdP$ (monitor/setting items).

Operation

Parameters

E5□C

The following pages describe the parameters set in each level. Pressing the ⊘ (Mode) Key at the last parameter in each level returns to the top parameter in that level. Some parameters may not be displayed depending on the model and other settings.

Power ON

Press the ⟪PF⟫ Key*2

Starting in Manual Mode.

Manual Control Level

Starting in Automatic Mode.

Press the ⊙ Key for at least 3 s. Other than the Auto/Manual Switch display

Press the ⟪PF⟫ Key*2

Press the ⟪PF⟫ Key for at least 1 s. *1

τ 25 / 0 — PID Control only
PV/MV

Press the ⊘ Key or the ⟪PF⟫ Key for at least 1 s. *1

Press the ⊙ Key for at least 1 s.

Initial Setting Level

Press the ⊙ Key for less than 1 s.

Adjustment Level

Press the ⊙ Key less than 1 s.

Operation Level

Initial Setting Level parameters:
- ΓN-Ł (5) — Input Type
- ΓN-H (100) — Scaling Upper Limit
- ΓN-L (0) — Scaling Lower Limit
- dP (0) — Decimal Point
- d-U (C) — Temperature Unit
- SL-H (1300) — SP Upper Limit
- SL-L (-200) — SP Lower Limit
- CNŁL (oFoF) — PID ON/OFF
- S-HC (StNd) — Standard or Heating/Cooling
- St (oN) — ST (Self-tuning)
- PŁRN (oFF) — Program Pattern
- CP (20) — Control Period (Heating)
- C-CP (20) — Control Period (Cooling)
- oRЕV (oR-R) — Direct/Reverse Operation
- RLŁ1 (2) — Alarm 1 Type
- RLH1 (0.2) — Alarm 1 Hysteresis
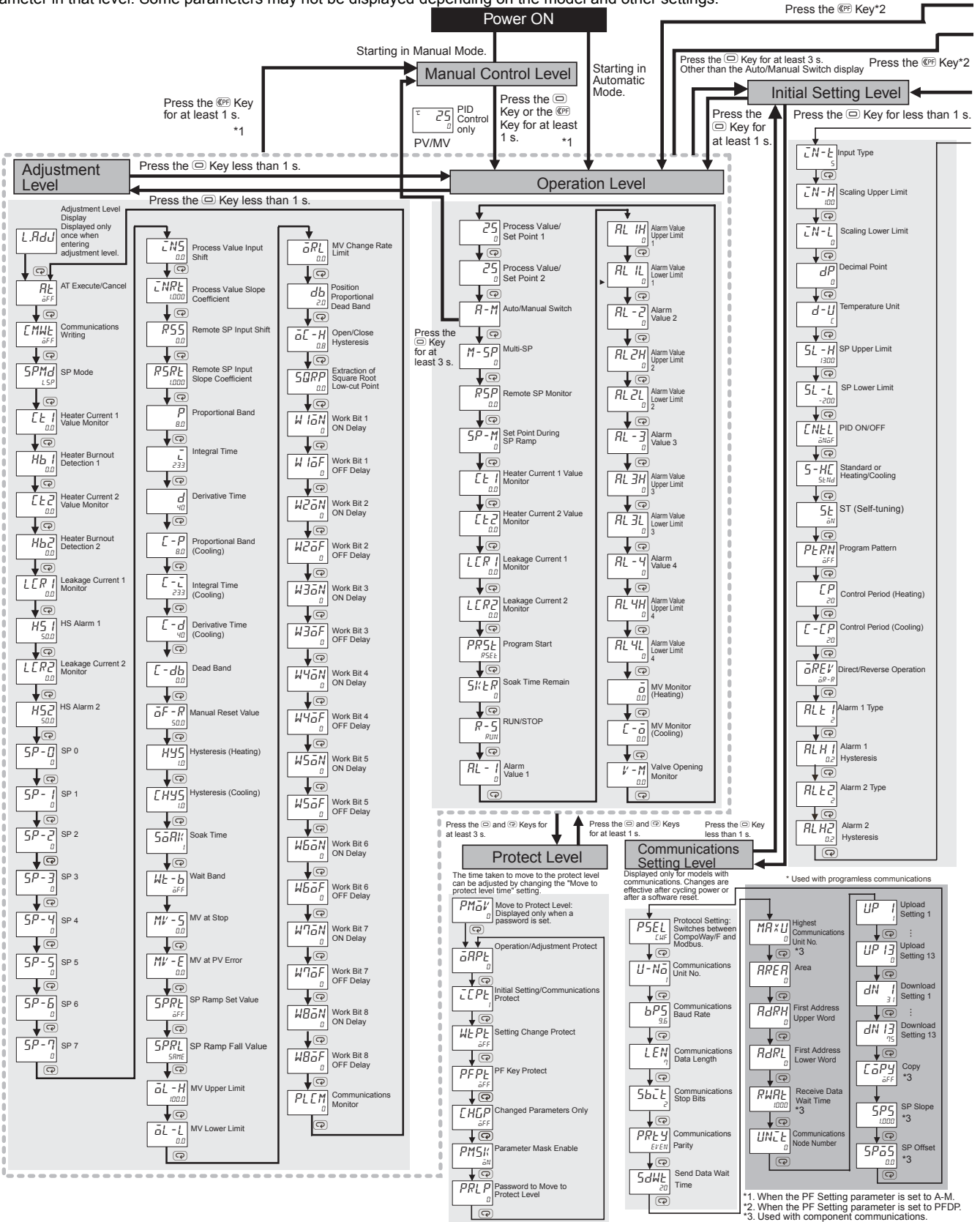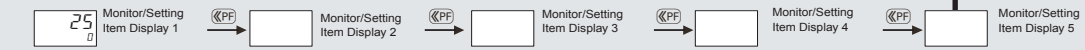- RLŁ2 (2) — Alarm 2 Type
- RLH2 (0.2) — Alarm 2 Hysteresis

Press the ⊙ Key less than 1 s.

Adjustment Level parameters:
- L.RdJ — Adjustment Level Display. Displayed only once when entering adjustment level.
- RŁ (oFF) — AT Execute/Cancel
- CMWŁ (oFF) — Communications Writing
- SPMd (LSP) — SP Mode
- CŁ1 (0.0) — Heater Current 1 Value Monitor
- Hb1 (0.0) — Heater Burnout Detection 1
- CŁ2 (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

Adjustment Level (middle column):
- ΓNS (0.0) — Process Value Input Shift
- ΓNRŁ (1.000) — Process Value Slope Coefficient
- RSS (0.0) — Remote SP Input Shift
- RSRŁ (1.000) — Remote SP Input Slope Coefficient
- P (8.0) — Proportional Band
- Γ (233) — Integral Time
- d (40) — Derivative Time
- C-P (8.0) — Proportional Band (Cooling)
- C-Γ (233) — Integral Time (Cooling)
- C-d (40) — Derivative Time (Cooling)
- C-db (0.0) — Dead Band
- oF-R (50.0) — Manual Reset Value
- HYS (1.0) — Hysteresis (Heating)
- CHYS (1.0) — Hysteresis (Cooling)
- SoRʞ (1) — Soak Time
- WŁ-b (oFF) — Wait Band
- MV-S (0.0) — MV at Stop
- MV-E (0.0) — MV at PV Error
- SPRŁ (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

Adjustment Level (right column):
- oRL (0.0) — MV Change Rate Limit
- db (2.0) — Position Proportional Dead Band
- oC-H (0.8) — Open/Close Hysteresis
- SQRP (0.0) — 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 (0) — Communications Monitor

Operation Level parameters:
- 25 / 0 — Process Value/Set Point 1
- 25 / 0 — Process Value/Set Point 2
- R-M — Auto/Manual Switch

Press the ⊙ Key for at least 3 s.

- M-SP — Multi-SP
- RSP (0.0) — Remote SP Monitor
- SP-M — Set Point During SP Ramp
- CŁ1 — Heater Current 1 Value Monitor
- CŁ2 (0.0) — Heater Current 2 Value Monitor
- LCR1 (0.0) — Leakage Current 1 Monitor
- LCR2 (0.0) — Leakage Current 2 Monitor
- PRSŁ (PSEŁ) — Program Start
- SʞŁR (0) — Soak Time Remain
- R-S (RUN) — RUN/STOP
- RL-1 — Alarm Value 1

Operation Level (right column):
- RL1H — Alarm Value Upper Limit 1
- RL1L — Alarm Value Lower Limit 1
- RL-2 — Alarm Value 2
- RL2H — Alarm Value Upper Limit 2
- RL2L — Alarm Value Lower Limit 2
- RL-3 — Alarm Value 3
- RL3H — Alarm Value Upper Limit 3
- RL3L — Alarm Value Lower Limit 3
- RL-4 — Alarm Value 4
- RL4H — Alarm Value Upper Limit 4
- RL4L — Alarm Value Lower Limit 4
- o (0.0) — MV Monitor (Heating)
- C-o — MV Monitor (Cooling)
- V-M (0.0) — Valve Opening Monitor

Press the ⊙ and ⊘ Keys for at least 3 s.

Press the ⊙ and ⊘ Keys for at least 1 s.

Press the ⊙ Key less than 1 s.

Protect Level

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

- PMoV — Move to Protect Level: Displayed only when a password is set.
- oRPŁ (0) — Operation/Adjustment Protect
- ΓCPŁ (1) — Initial Setting/Communications Protect
- WŁPŁ (oFF) — Setting Change Protect
- PFPŁ (oFF) — PF Key Protect
- CHGP (oFF) — Changed Parameters Only
- PMSʞ (oN) — Parameter Mask Enable
- PRLP (0) — Password to Move to Protect Level

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 (0) — Communications Unit No.
- bPS (9.6) — Communications Baud Rate
- LEN (7) — Communications Data Length
- SbΓŁ (2) — Communications Stop Bits
- PRŁY (EVEN) — Communications Parity
- SdWŁ (20) — Send Data Wait Time

Used with programless communications:
- MR×U (0) — Highest Communications Unit No. *3
- RRER (0) — Area
- RdRH (0) — First Address Upper Word
- RdRL (0) — First Address Lower Word
- RWŁ (1000) — Receive Data Wait Time *3
- UNΓŁ (0) — Communications Node Number
- UP1 — Upload Setting 1
- UP13 — Upload Setting 13
- dN1 (31) — Download Setting 1
- dN13 (45) — Download Setting 13
- CoPY (oFF) — Copy *3
- SPS (1.000) — SP Slope *3
- SPoS (0) — SP Offset *3

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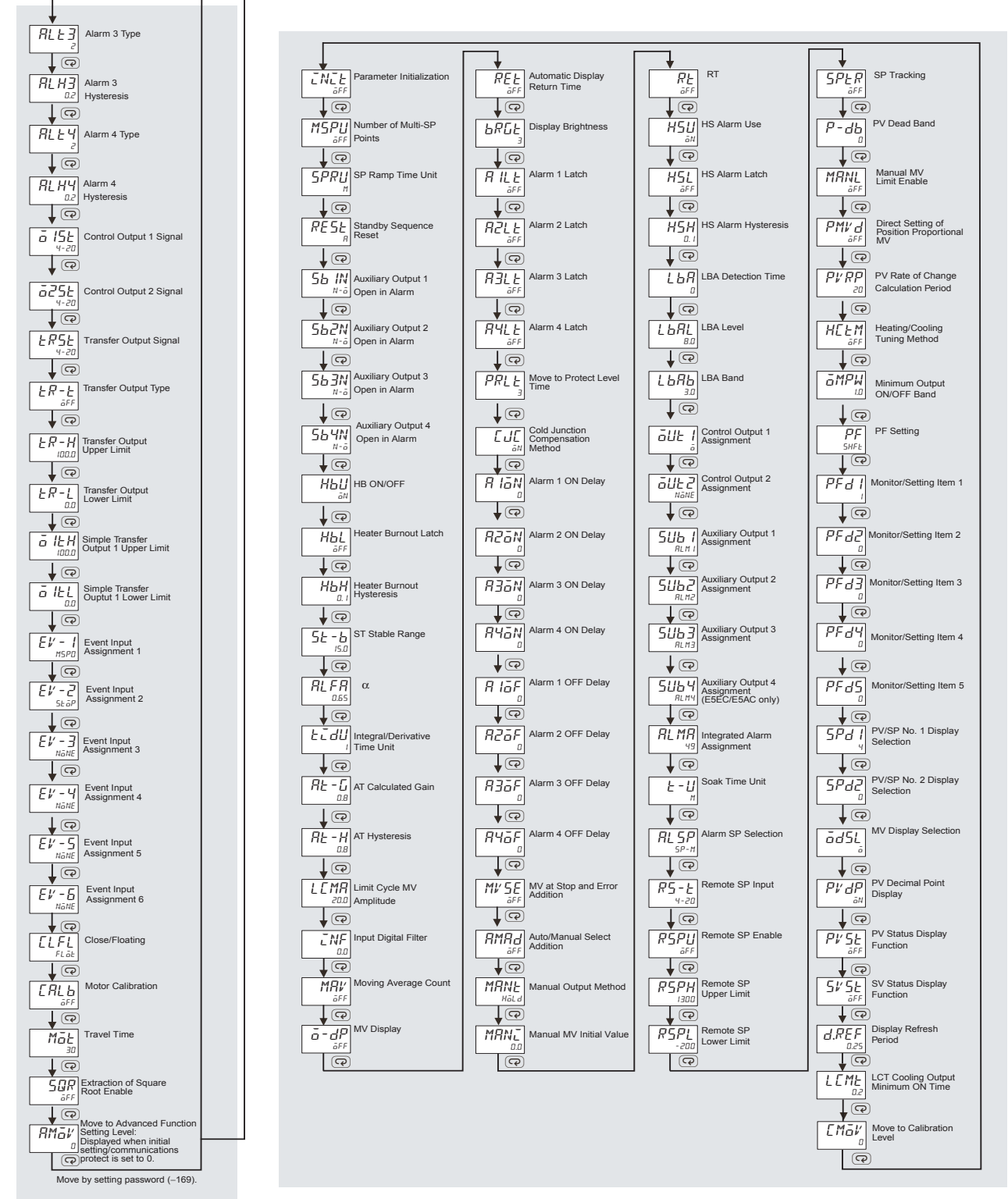*3. Used with component communications.

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

Left column (Monitor/Setting):
- 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
- tR-H / 100.0 — Transfer Output Upper Limit
- tR-L / 0.0 — Transfer Output Lower Limit
- o1tH / 100.0 — Simple Transfer Output 1 Upper Limit
- o1tL / 0.0 — Simple Transfer Ouput 1 Lower Limit
- EV-1 / MSP0 — 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
- EV-6 / NoNE — Event Input Assignment 6
- CLFL / FLot — 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).

Advanced column 1:
- CNt / 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
- tcdU / 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

Advanced column 2:
- 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
- MANC / 0.0 — Manual MV Initial Value

Advanced column 3:
- 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/E5AC 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

Advanced column 4:
- 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 / 1 — PV/SP No. 1 Display Selection
- SPd2 / 0 — PV/SP No. 2 Display Selection
- odSL / o — MV Display Selection
- PVdP / o — PV Decimal Point Display
- PVSt / oFF — PV Status Display Function
- SVSt / oFF — SV Status Display Function
- d.REF / 0.25 — Display Refresh Period
- LCMt / 0.2 — LCT Cooling Output Minimum ON Time
- CMoV / 0 — Move to Calibration Level

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Temperature High/Low Limit Controller

This document is an addendum to the E5☐C User's Manual (H174-E1-xx). Please refer to this document for installation, specifications, wiring, etc. The purpose of this document is to show the programming steps to set the specified controllers up for FM temperature high limit monitoring.

This set up will assign Alarm 1 Output as the limit output for all dedicated FM approved units. If the unit is equipped with an event input this can be used to cancel the alarm latched condition. If it is not so equipped the use of the "PF" key on the front of the unit can also be used for this purpose. Some of the controllers also have the option for a transfer output which can be used to transfer the process value to a chart recorder for recording purposes.

Limit Control Function (Limit Output)

When a Temperature Controller is controlling the temperature of a furnace or other heating device, a malfunction in the Temperature Controller may cause the furnace temperature to rise, resulting in damage to the heated product or the furnace itself. When this situation occurs with the Limit Controller and the temperature rises above the preset limit temperature the Alarm limit output will OPEN ("SUB1" LED indication ON) and the heater system circuit will be shut down to stop the heat source. In addition, the limit output will remain OPEN even when the temperature returns to the normal range. A safer system can be constructed because the limit output will remain OPEN until it is reset manually. With the Limit Controllers, it is possible to establish a lower limit instead of an upper limit so that the limit function operates when the temperature falls below the limit setting value (Cooling Application). When an input error occurs, the Limit output will OPEN ("SUB1" LED indication ON) and will remain in this condition until the sensor error is fixed and a reset is provided.

Using the Limit Controller Function

When the measured temperature (PV) exceeds the limit setting value, the limit output relay OPENS and the SUB1 operation indicator turns ON. If the limit output relay OPENS (limit alarm is ON), the limit output relay will remain OPEN until the operator checks operation and performs the resetting operation.
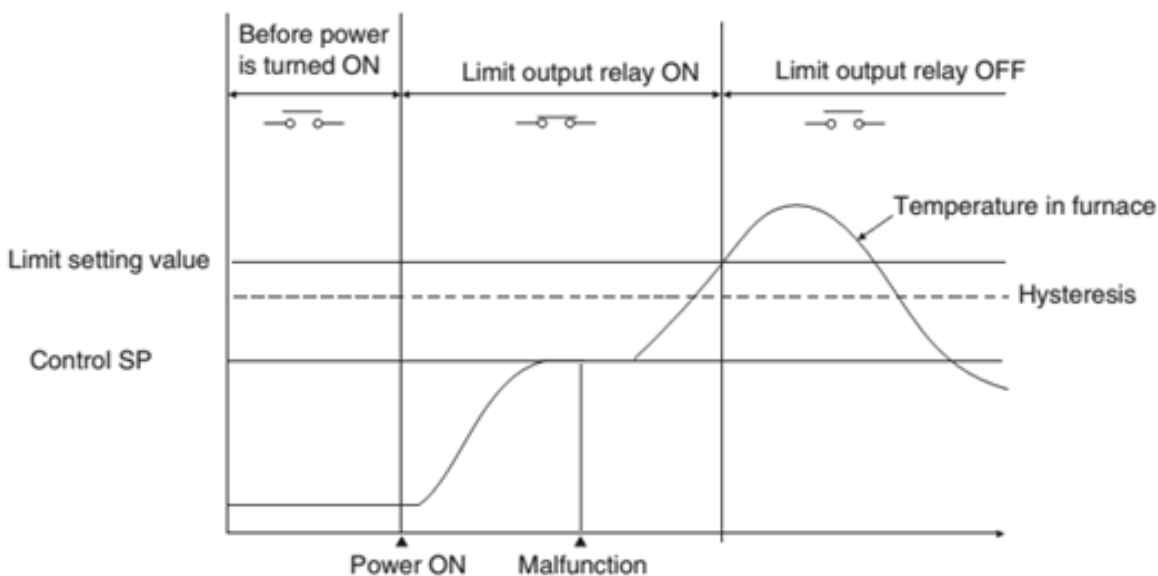
Selecting Upper/Lower Limit:
The upper/lower limit selection setting enables switching between upper limit and lower limit operation.

Resetting Limit Outputs:
Depending on how the unit is configured the limit outputs can be reset by pressing the PF key for 1 second min. or providing a switched input to an event input.

Example of Typical Use:

E5☐C-600

Appearance:

E5CC Limit Controller
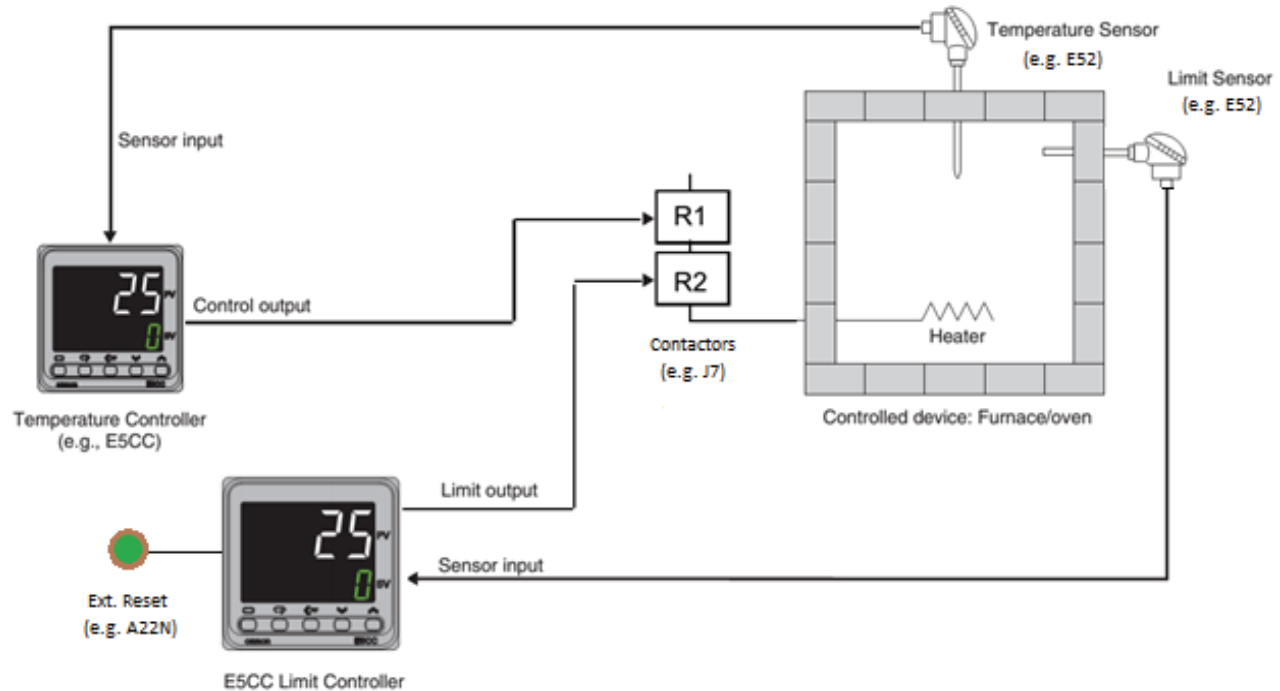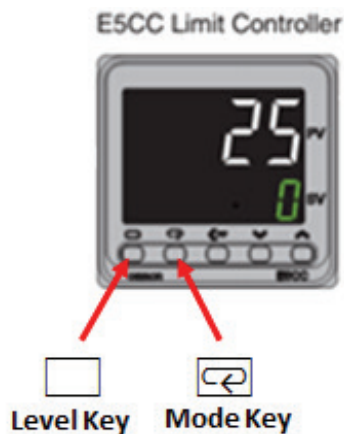
Level Key   Mode Key

Setting Procedure:

Once the unit is powered up, Press and hold both the ☐ Level Key and the ⏎ Mode key for three seconds. This will get the unit to Protect Level.

1. The first parameter is the Operation Level Protect/Adjustment Level Protect (*o̅APt*). Verify that this is set to 0. Use the Up/Down arrow keys to adjust the value.

2. Tap on the ⏎ Mode key to get to the next parameter Initial Setting/Communication Level Protect (*i̅CPt*). This needs to be changed to 0. Use the Up/Down arrow keys to adjust the value.

Press and hold both the ☐ Level Key and the ⏎ Mode key for three seconds to get back to the Operation Level.

Press and hold the ☐ Level key for three seconds. This will get the unit into the Initial Setting level.

1. Tap on the ⏎ Mode key several times until the (*AMo̅V*) parameter is displayed. Enter -169 using the down arrow key. Allow the unit to sit for a couple of seconds and it will automatically switch to the Advanced Function Level. The first parameter shown should be (*i̅Ni̅t*).

2. Tap on the ⏎ Mode key several times until the (*Sb IN*) parameter is displayed. This needs to be changed from (*N-o̅*) to (*N-C*). Use the Up/Down arrow keys to adjust the value. This changes the output from normally open to normally close.

3. Tap on the ⏎ Mode key several times until the (*o̅Ut 1*) parameter is displayed. This needs to be changed from (*o̅*) to (*No̅NE*). Use the Up/Down arrow keys to adjust the value. This will reassign the control output to no function.

4. Tap on the ⏎ Mode key once to get to the next parameter (*SUb 1*). This needs to be changed to (*ALM 1*). Use the Up/Down arrow keys to adjust the value. This will assign the sub1 output for the Limit Alarm.

5. Tap on the ⏎ Mode key several times until the (*A ILt*) parameter is displayed. This needs to be changed from (*o̅FF*) to (*o̅N*). Use the Up/Down arrow keys to adjust the value. This will latch the alarm if an alarm condition is reached.

6. **Note:** If the PF key will be used to reset the alarm condition set this next parameter:
Tap on the ⏎ Mode key several times until the (*PF*) parameter is displayed. This needs to be

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changed from (*5HFL*) to (*L RL*). Use the Up/Down arrow keys to adjust the value. This will reassign the PF key to Alarm Latch Cancel.

Press and hold the ☐ Level key for three seconds. This will get the unit back to the Initial Setting level.

1. The first parameter in the initial setting level is the (*ĪN-L*). This is the input type parameter use the instruction sheet or user manual to determine the correct setting based on the input type is applied to the unit for the application. Use the Up/Down arrow keys to adjust the value.

2. Tap on the ⮂ Mode key once to get to the next parameter (*d-U*). Select the units to be displayed ether °C or °F. Use the Up/Down arrow keys to adjust the value.

3. Tap on the ⮂ Mode key once to get to the next parameter (*5L-H*). This is used to determine the upper set point limit. Use the Up/Down arrow keys to adjust the value. The value set here will be the highest value of the set point in the operation level.

4. Tap on the ⮂ Mode key once to get to the next parameter (*5L-L*). This is used to determine the lower set point limit. Use the Up/Down arrow keys to adjust the value. The value set here will be the lowest value of the set point in the operation level.

5. Tap on the ⮂ Mode key several times to get to the (*RLL I*) parameter. This is used to determine if the unit is set up for High Limit control (Heating) or Low Limit control (Cooling). Use the Up/Down arrow keys to adjust the value. A selection of (*2*) will set the unit for High Limit control and a selection of (*3*) will set the unit for Low Limit control.

6. **Note:** If the unit is equipped with more than 1 alarm and these are not being used by the application setting additional alarms (*RLL2*) and (*RLL3*) to a value of (*0*) will disable these output indications on the front display. To disable these tap on the ⮂ Mode key until (*RLL2*) and (*RLL3*) appear and adjust them using the Up/Down arrow keys to a value of (*0*).

7. **Note:** If the Event Input will be used to reset the alarm condition set this next parameter: Tap on the ⮂ Mode key several times to get to the (*EV-I*) parameter. This needs to be changed from (*M5PD*) to (*L RL*). Use the Up/Down arrow keys to adjust the value. This will reassign the Event Input to Alarm Latch Cancel.

Press and hold the ☐ Level key for three seconds. This will get the unit back to the Operation Setting level.

At this point the controller is set up for commissioning:

1. Verify that the Process Value is reading correctly.

2. **Tap on the ⮂ Mode key to get to (*RL-I*) this must be set to a value of (*0*). If this is not set to (*0*) the controller will add this value to the set value and may cause damage to the system.**

3. Tap on the ⮂ Mode key until the controller is reading the process value and set point.

High Limit Control testing:

If the set point is adjusted below the actual process value the SUB1 LED should be ON and the system should not run. Raise the set point using the Up arrow key and set the high limit for the application. Verify that the SUB1 LED is still ON and that the system cannot be started. Apply a reset to the Limit controller via event input or PF key. The SUB1 LED should go off and the system should be able to be started.

At this time it is also recommended to verify that the set point upper and set point lower limits work correctly. Lower the set value by using the down arrow until the set point reaches the lower set point limit. Assure the set point stops at this limit. Raise the set point value using the up arrow test that the set point stops at the upper limit. Assure the set point stops at this limit. If the above does not work correctly review the settings in the controller as well as the wiring of the system.

Low Limit Control testing:

If the set point is adjusted above the actual process value the SUB1 LED should be ON and the system should not run. Lower the set point using the Up arrow key and set the low limit for the application. Verify that the SUB1 LED is still ON and that the system cannot be started. Apply a reset to the Limit controller via event input or PF key. The SUB1 LED should go off and the system should be able to be started.

At this time it is also recommended to verify that the set point upper and set point lower limits work correctly. Lower the set value by using the down arrow until the set point reaches the lower set point limit. Assure the set point stops at this limit. Raise the set point value using the up arrow test that the set point stops at the upper limit. Assure the set point stops at this limit. If the above does not work correctly review the settings in the controller as well as the wiring of the system.

Limit controller Protection set up:

Since this is a monitoring device to protect the system from over or under temperature conditions it is highly recommended to add a level of protection on the unit to avoid accidental changing of settings. The unit has the ability to lock out various levels/settings by use of the protect level. Make sure the controller is set up correctly for the application before applying protection. Below is two typical ways to set protection on the unit. If different levels of protection are required please consult the User manual for further explanation:

Locking the unit completely so no changes can be made:

Press and hold both the ☐ Level Key and the ☞ Mode key for three seconds. This will get the unit to Protect Level.

1. The first parameter is the Operation Level Protect/Adjustment Level Protect (ōAPt). This needs to be changed to (3). Use the Up/Down arrow keys to adjust the value.

2. Tap on the ☞ Mode key to get to the next parameter Initial Setting/Communication Level Protect (ĪCPt). This needs to be changed to (2). Use the Up/Down arrow keys to adjust the value.

Press and hold both the ☐ Level Key and the ☞ Mode key for three seconds. This will get the unit back to the Operation Level. Verify that none of the keys work on the unit. The unit should not be able to go into any levels other than the Operation Level.

Locking the unit so only the Set Point can be changed:

Press and hold both the ☐ Level Key and the ☞ Mode key for three seconds. This will get the unit to Protect Level.

1. The first parameter is the Operation Level Protect/Adjustment Level Protect (ōAPt). This needs to be changed to (2). Use the Up/Down arrow keys to adjust the value.

2. Tap on the ⏎ Mode key to get to the next parameter Initial Setting/Communication Level Protect (*CCPL*). This needs to be changed to (*2*). Use the Up/Down arrow keys to adjust the value.

Press and hold both the ☐ Level Key and the ⏎ Mode key for three seconds. This will get the unit back to the Operation Level. Verify that none of the keys work on the unit other than the Up/Down arrows and the set point can be changed. The unit should not be able to go into any levels other than the Operation Level.

A password can be entered into the unit for further protection but the password needs to be recorded. **If the password is lost the unit would need to be replaced.** Please consult the User Manual for further information on protection via password.

Transfer Output Option:
This option can be used to transfer the process value to a chart recorder. If the unit is so equipped please consult the user manual for setting this option.

Heater Burnout Option:
Since this unit is not being used for controlling the temperature of the system this option cannot be used when using the controller for "Temperature High/Low Limit Controller" applications.

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

S.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, MV at reset, or MV at error is set, the control output is determined by the set value.

cccc ⴑⴑⴑⴑ	Display range exceeded	Below -1,999 Above 9,999	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 Temperature Controllers User's Manual (Cat. No. H174) or the E5□C-T Digital Temperature Controllers Programmable Type User's Manual (Cat. No. H185) for information on the controllable range.
E333	A/D converter error	There is an error in the internal circuits.		After checking the input error, turn the power OFF then back ON again. 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.

Safety Precautions

● **Be sure to read the precautions for all E5□C-600 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.
🚫	Used 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 listed*1 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. *2
d. Caution: To reduce the risk of fire or electric shock, do not interconnect the outputs of different Class 2 circuits. *3

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.

Even if you replace only the Main Unit of the E5DC, check the condition of the Terminal Unit.
If corroded terminals are used, contact failure in the terminals may cause the temperature inside the Digital Temperature Controller to increase, possibly resulting in fire.
If the terminals are corroded, replace the Terminal Unit as well.

Tighten the terminal screws to the rated torque of between 0.43 and 0.58 N•m. *4
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.

*1. E5CC and E5DC Digital Temperature Controllers that were shipped through November 2013 are UL recognized.
*2. An SELV (separated extra-low voltage) system is one with a power supply that has double or reinforced insulation between the primary and the secondary circuits and has an output voltage of 30 V r.m.s. max. and 42.4 V peak max. or 60 VDC max.
*3. A class 2 circuit is one tested and certified by UL as having the current and voltage of the secondary output restricted to specific levels.
*4. The specified torque is 0.5 N·m for the E5CC-U.

E5□C-600

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. Do not handle the Digital Temperature Controller in ways that exceed the ratings.

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 signal name and polarity of terminals.
5. Use the specified size of crimped terminals (M3, width of 5.8 mm or less) to wire the E5CC or E5DC. To connect bare wires to the terminal block of the E5CC or E5DC, use copper braided or solid wires with a gage of AWG24 to AWG18 (equal to a cross-sectional 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 crimped terminals can be inserted into a single terminal.
   Use the specified size of crimped terminals (M3.5, width of 7.2 mm or less) to wire the E5CC-U. To connect bare wires to the terminal block of the E5CC-U, use copper braided or solid wires with a gage of AWG24 to AWG14 (equal to a cross-sectional area of 0.205 to 2.081 mm^2). (The stripping length is 5 to 6 mm.) Up to two wires of the same size and type, or two crimped terminals can be inserted into a single 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 with E5□C, 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. Always touch a grounded piece of metal before touching the Digital Temperature Controller to discharge static electricity from your body.
19. Use suitable tools when taking the Digital Temperature Controller apart for disposal. Sharp parts inside the Digital Temperature Controller may cause injury.
20. For compliance with Lloyd's standards, the E5CC, E5CC-U, and E5DC must be installed under the conditions that are specified in *Shipping Standards*.
21. For the Digital Temperature Controller with two Setup Tool ports (E5DC) do not connect cables to both ports at the same time. The Digital Temperature Controller may be damaged or may malfunction.
22. 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.
23. Do not disconnect the Communications Conversion Cable or the USB-Serial Conversion Cable while communications are in progress. Damage or malfunction may occur.
24. Do not touch the external power supply terminals or other metal parts on the Digital Temperature Controller.
25. Refer to the E5□C Digital Temperature Controllers User's Manual (Cat. No. H174) for information on the communications distances and cables for the E5□C.
26. Do not bend the communications cables past their natural bending radius. Do not pull on the communications cables.
27. 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.
28. 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.
29. Connectors may be damaged if they are inserted with excessive force. When connecting a connector, always make sure that it is oriented correctly. Do not force the connector if it does not connect smoothly.
30. 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.
31. For the E5DC, when you attach the Main Unit to the Terminal Unit, make sure that the hooks on the Main Unit are securely inserted into the Terminal Unit.
32. For the E5CC-U, when you attach the Main Unit to the socket, make sure that the hooks on the socket are securely inserted into the Main Unit.
33. Install the DIN Track vertically to the ground.
34. For the E5DC, always turn OFF the power supply before connecting the Main Unit to or disconnecting the Main Unit from the Terminal Unit, and never touch nor apply shock to the terminals or electronic components. When connecting or disconnecting the Main Unit, do not allow the electronic components to touch the case.

OMRON

35. Observe the following precautions when you remove the terminal block.
    - Always follow the instructions provided in the E5□C Digital Temperature Controllers User's Manual (Cat. No. H174).
    - Turn OFF the power supply before you start and never touch nor apply shock to the terminals or electric components. When you insert the interior body of the Digital Temperature Controller, do not allow the electronic components to touch the case.
    - Check for any corrosion on the terminals.
    - When you insert the interior body into the rear case, confirm that the hooks on the top and bottom are securely engaged with the case.

Shipping Standards

The E5CC, E5CC-U and E5DC comply with Lloyd's standards. When applying the standards, the following installation requirements must be met in the application.

Application Conditions

● Installation Location

The E5CC, E5CC-U,and E5DC 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 (Not applicable to the E5CC-U/E5DC.)

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. 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. When using self-tuning, turn ON power for the load (e.g., heater) at the same time as or before supplying power to the Digital Temperature Controller. If power is turned ON for the Digital Temperature Controller before turning ON power for the load, self-tuning will not be performed properly and optimum control will not be achieved.
   When starting operation after the Digital Temperature Controller has warmed up, turn OFF the power and then turn it ON again at the same time as turning ON power for the load. (Instead of turning the Digital Temperature Controller OFF and ON again, switching from STOP mode to RUN mode can also be used.)
2. Avoid using the Digital Temperature 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.
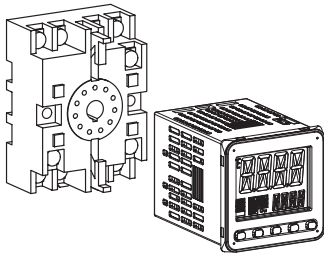
● Mounting
Mounting to a Panel

E5CC

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

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

Terminal Cover
(E53-COV23)

Water Proof Packing

Panel
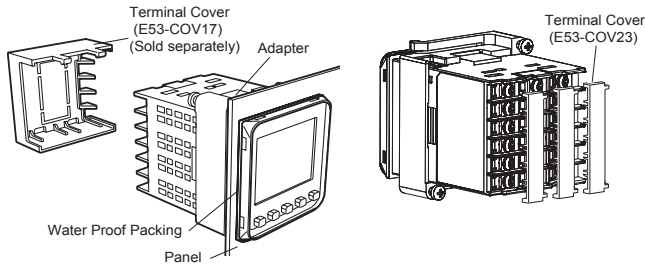
E5CC-U

For the Wiring Socket for the E5CC-U, purchase the P2CF-11 or
PG3A-11 separately.

1. For waterproof mounting, waterproof packing must be installed on the
    Digital Temperature Controller. Waterproofing is not possible when
    group mounting several Digital Temperature Controllers. Waterproof
    packing is not necessary when there is no need for the waterproofing
    function.
    The E5CC-U cannot be waterproofed even if the Waterproof Packing
    is inserted.
2. Insert the E5CC/E5CC-U 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.

E5DC

Adapter Panel

Terminal Unit
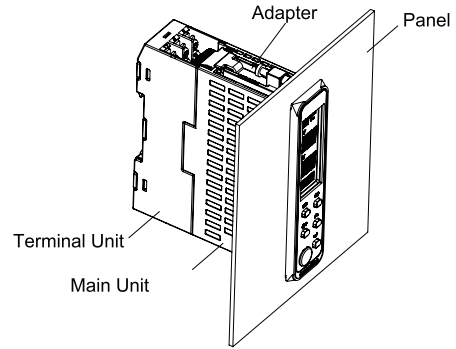
Main Unit

1. Insert the E5DC into the mounting hole in the panel. (Attach the
    Terminal Unit after you insert the Main Unit.)
2. Push the Adapter from the Terminal Unit up to the panel, and
    temporarily fasten the E5DC.
3. 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 to and Removing from DIN Track
E5DC

- Mounting a Unit
  Pull down the DIN Track hook on the Terminal Unit and catch the
  top hook on the DIN Track.
  Press the Unit onto the DIN Track until the DIN Track hooks are
  locked in place.

2. Catch the top hook on
   the DIN Track.

3. Press the Unit onto
   the DIN Track.

1. Pull down the hook.

4. Make sure that the hooks
   are locked in place.

- Removing a Unit
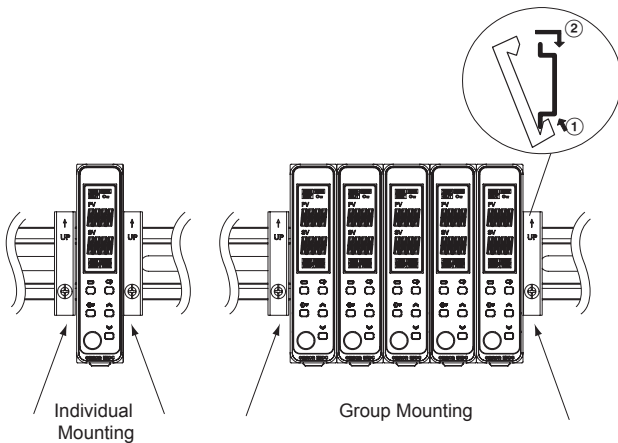 Pull down on the DIN Track Hook with a flat-blade screwdriver and lift up the Unit.
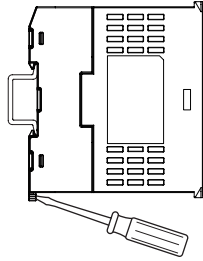
Removing the Main Unit
Press in the two hooks on the Main Unit and remove the Main Unit from the Terminal Unit.

(1)

(2)

(1)
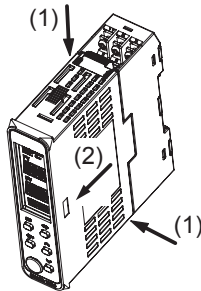
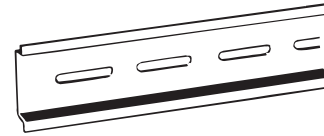**End Plate Installation**
Make sure to attach PFP-M End Plates to the ends of the Units.

②

①

Individual Mounting

Group Mounting

Mounting the DIN Track
Attach the DIN Track to the inside of the control panel with screws to at least three locations.
- DIN Track (sold separately)
  PFP-50N (50 cm) and PFP-100N (100 cm)

Install the DIN Track vertically to the ground.

Vertical: OK

Horizontal: NG

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

UP

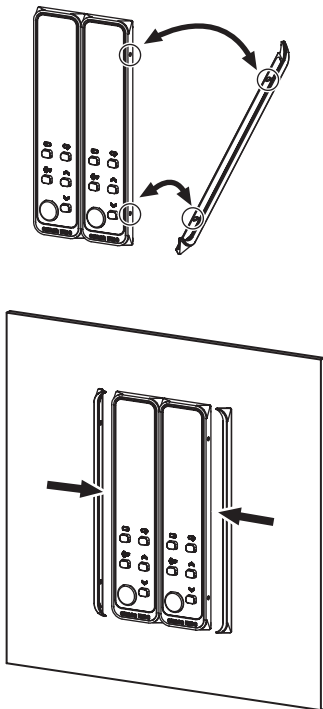Terminal Cover (E53-COV17) (Sold separately)

Adapter

Enlarged illustration of Terminal Section
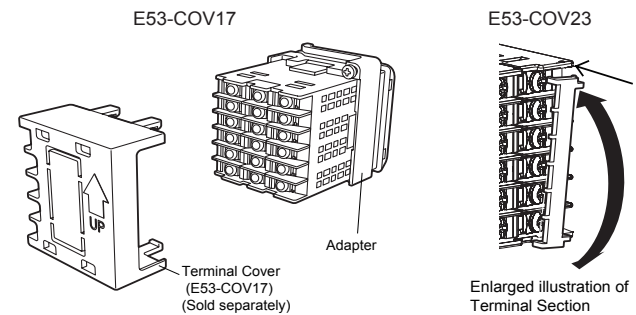
Attaching the End Cover
E5DC

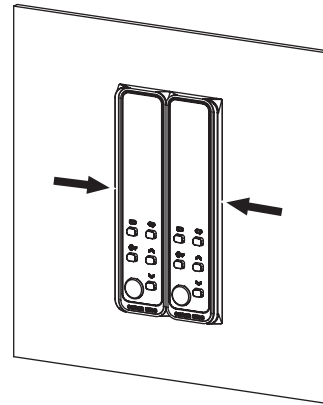**1.** Install the E5DC in a panel.
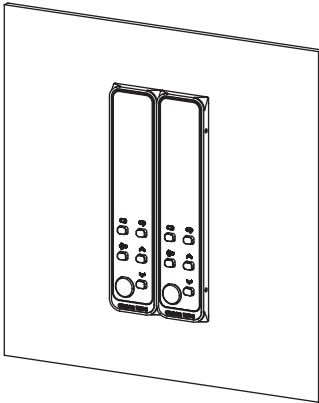
2. Peel off the release paper from the double-sided tape on the End Cover.
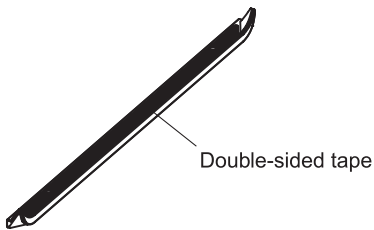
Double-sided tape

**3.** Align the tabs on the End Cover with the depressions on the E5DC and attach the End Cover.

**4.** Secure the End Cover so that the double-sided tape is firmly attached.

● 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 a shielded, AWG24 to AWG14 (cross-sectional area of 0.205 to 2.081 mm^2) twisted-pair cable for the E5CC-U. The stripping length is 6 to 8 mm for the E5CC, or E5DC, and 5 to 6 mm for the E5CC-U.
- 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. The specified torque is 0.5 N·m for the E5CC-U.
- For the E5GC, E5CC, or E5DC, use the following types of crimp terminals for M3 screws.

5.8 mm max.

5.8 mm max.
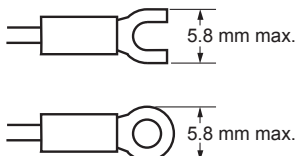
- For the E5CC-U, use the following types of crimp terminals for M3.5 screws.

7.2 mm max.

7.2 mm max.
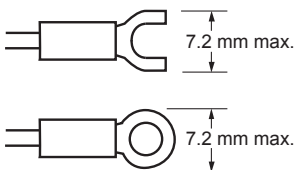
- If you use crimp terminals for the E5DC, use crimp terminals with insulation sleeves. If you use a bare crimp terminal with no insulation, the terminal may short with the terminal above or below it. If you use bare crimp terminals, cover the crimped sections with insulating marking tubes. Secure the marking tubes so that they do not move.

NA

OK
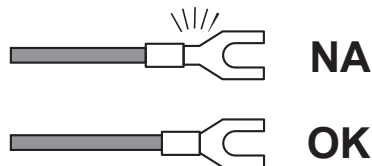
Although you can connect two crimp terminals with insulation sleeves to one terminal, you cannot do so if the diameter of the insulation sleeves is too large.

Recommended Crimp Terminals with Insulation Sleeves for the E5DC

Manufacturer	Model number
J.S.T. Mfg. Co.	V1.25-B3A V0.5-3A

Three-year Guarantee
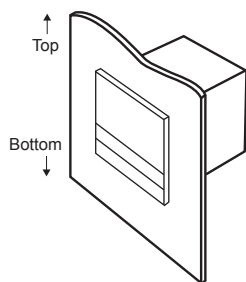
● Period of Guarantee

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.

Top

Bottom

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.

Terms and Conditions of Sale

1. Offer; Acceptance. These terms and conditions (these "Terms") are deemed part of all quotes, agreements, purchase orders, acknowledgments, price lists, catalogs, manuals, brochures and other documents, whether electronic or in writing, relating to the sale of products or services (collectively, the "Products") by Omron Electronics LLC and its subsidiary companies ("Omron"). Omron objects to any terms or conditions proposed in Buyer's purchase order or other documents which are inconsistent with, or in addition to, these Terms.
2. Prices; Payment Terms. All prices stated are current, subject to change without notice by Omron. Omron reserves the right to increase or decrease prices on any unshipped portions of outstanding orders. Payments for Products are due net 30 days unless otherwise stated in the invoice.
3. Discounts. Cash discounts, if any, will apply only on the net amount of invoices sent to Buyer after deducting transportation charges, taxes and duties, and will be allowed only if (i) the invoice is paid according to Omron's payment terms and (ii) Buyer has no past due amounts.
4. Interest. Omron, at its option, may charge Buyer 1-1/2% interest per month or the maximum legal rate, whichever is less, on any balance not paid within the stated terms.
5. Orders. Omron will accept no order less than $200 net billing.
6. Governmental Approvals. Buyer shall be responsible for, and shall bear all costs involved in, obtaining any government approvals required for the importation or sale of the Products.
7. Taxes. All taxes, duties and other governmental charges (other than general real property and income taxes), including any interest or penalties thereon, imposed directly or indirectly on Omron or required to be collected directly or indirectly by Omron for the manufacture, production, sale, delivery, importation, consumption or use of the Products sold hereunder (including customs duties and sales, excise, use, turnover and license taxes) shall be charged to and remitted by Buyer to Omron.
8. Financial. If the financial position of Buyer at any time becomes unsatisfactory to Omron, Omron reserves the right to stop shipments or require satisfactory security or payment in advance. If Buyer fails to make payment or otherwise comply with these Terms or any related agreement, Omron may (without liability and in addition to other remedies) cancel any unshipped portion of Products sold hereunder and stop any Products in transit until Buyer pays all amounts, including amounts payable hereunder, whether or not then due, which are owing to it by Buyer. Buyer shall in any event remain liable for all unpaid accounts.
9. Cancellation; Etc. Orders are not subject to rescheduling or cancellation unless Buyer indemnifies Omron against all related costs or expenses.
10. Force Majeure. Omron shall not be liable for any delay or failure in delivery resulting from causes beyond its control, including earthquakes, fires, floods, strikes or other labor disputes, shortage of labor or materials, accidents to machinery, acts of sabotage, riots, delay in or lack of transportation or the requirements of any government authority.
11. Shipping; Delivery. Unless otherwise expressly agreed in writing by Omron:
    a. Shipments shall be by a carrier selected by Omron; Omron will not drop ship except in "break down" situations.
    b. Such carrier shall act as the agent of Buyer and delivery to such carrier shall constitute delivery to Buyer;
    c. All sales and shipments of Products shall be FOB shipping point (unless otherwise stated in writing by Omron), at which point title and risk of loss shall pass from Omron to Buyer; provided that Omron shall retain a security interest in the Products until the full purchase price is paid;
    d. Delivery and shipping dates are estimates only; and
    e. Omron will package Products as it deems proper for protection against normal handling and extra charges apply to special conditions.
12. Claims. Any claim by Buyer against Omron for shortage or damage to the Products occurring before delivery to the carrier must be presented in writing to Omron within 30 days of receipt of shipment and include the original transportation bill signed by the carrier noting that the carrier received the Products from Omron in the condition claimed.
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