

Easy Setting Using DIP Switch and Simple Functions in DIN 48 × 48 mm-size Temperature Controllers

- Easy setting using DIP switch.
- Models with two alarms added to Series, ideal for temperature alarm applications.
- Multi-input (thermocouple/platinum resistance thermometer) models also available.
- Clearly visible digital display with character height of 13.5 mm.
- Models available with black in addition to white cases.
- RoHS compliant.



 Refer to *E5CS/E5CSV Operation*.

Model Number Structure

■ Model Number Legend

Models with Terminal Blocks

E5CSV-□□□□-□
1 2 3 4 5

1. Control Outputs

R: Relay
Q: Voltage for driving SSR

2. Alarm Outputs

Blank: No alarm
1: 1 alarm
2: 2 alarms

3. Input

KJ: Thermocouple
P: Platinum resistance thermometer
T: Thermocouple/platinum resistance thermometer (multi-input)

4. Power Supply Voltage

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

5. Case Color

Blank: Black
W: Light gray

Note: A functional explanation is provided here for illustration, but models are not necessarily available for all possible combinations. Refer to *Ordering Information* when ordering.

Examples

- Relay control output, without alarm, thermocouple input, light gray case: E5CSV-RKJ-W
- Relay control output, one alarm output, platinum resistance thermometer input, black case: E5CSV-R1P-W

Ordering Information

List of Models

**Case Color: Light Gray, Thermocouple or Platinum Resistance Thermometer,
Power Supply Voltage: 100 to 240 VAC**

Size	Type	Control modes	Alarms	Outputs	Model with thermocouple	Model with platinum resistance thermometer
E5CSV 48 × 48mm	Terminal block	ON/OFF or PID	1	Relay	E5CSV-R1KJ-W	E5CSV-R1P-W
				Voltage (for driving SSR)	E5CSV-Q1KJ-W	E5CSV-Q1P-W

Case Color: Light Gray, Multi-input, Power Supply Voltage: 100 to 240 VAC

Size	Type	Control modes	Alarms	Outputs	Model with multi-input (thermocouple or platinum resistance thermometer)
E5CSV 48 × 48mm	Terminal block	ON/OFF or PID	0	Relay	E5CSV-RT
				Voltage (for driving SSR)	E5CSV-QT
			1	Relay	E5CSV-R1T
				Voltage (for driving SSR)	E5CSV-Q1T
			2 (See note.)	Relay	E5CSV-R2T
				Voltage (for driving SSR)	E5CSV-Q2T

Note: Alarm type for alarm output 2 can be changed in the initial setting level (5). For details, refer to *E5CSV/E5CS-U Digital Temperature Controller User's Manual* (Cat. No. H140).

Accessories (Order Separately)

Protective Cover

Type	Model
Hard Protective Cover	Y92A-48B

Rubber Packing

Model
Y92S-29

Terminal Cover

Model
E53-COV10

Note: The Rubber Packing is provided with the Digital Controller.

Specifications

Ratings

Supply voltage	100 to 240 VAC, 50/60 Hz (auto select) (See note 2.)
Operating voltage range	85% to 110% of rated supply voltage
Power consumption	5 VA
Sensor input	Thermocouple input type: K, J, L Platinum resistance thermometer input type: Pt100, JPt100 Multi-input (thermocouple/platinum resistance thermometer) type: K, J, L, T, U, N, R, Pt100, JPt100
Control output	Relay output SPST-NO, 250 VAC, 3A (resistive load) Voltage output (for driving the SSR) 12 VDC, 21 mA (with short-circuit protection circuit)
Control method	ON/OFF or 2-PID (with auto-tuning)
Alarm output	SPST-NO, 250 VAC, 1A (resistive load)
Setting method	Digital setting using front panel keys
Indication method	7-segment digital display (character height: 13.5 mm) and deviation indicators
Other functions	<ul style="list-style-type: none"> Setting change prohibit (key protection) Input shift Temperature unit change (°C/°F) Direct/reverse operation Temperature range, Sensor switching (K/J/L, Pt100/JPt100) Switching is performed between a thermocouple and platinum resistance thermometer for multi-input models. Control period switching 8-mode alarm output Sensor error detection
Ambient operating temperature	-10 to 55°C (with no condensation or icing)
Ambient operating humidity	25% to 85%
Storage temperature	-25 to 65°C (with no condensation or icing)

Note: 1. Use not use an inverter output as the power supply. (Refer to *Safety Precautions for All Temperature Controllers*.)
2. Models for 24 VAC/DC can also be manufactured.

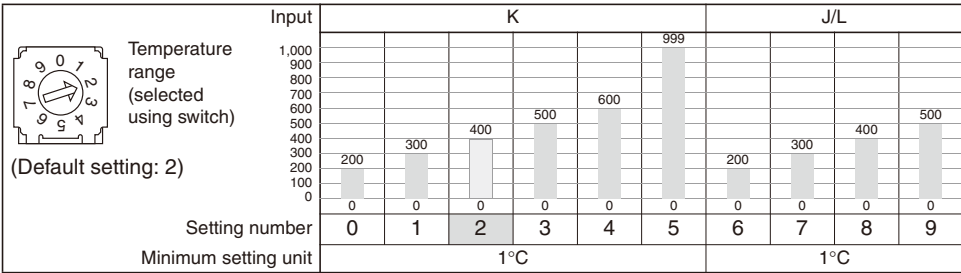
■ Characteristics

Setting accuracy	Thermocouple (See note 1.): $(\pm 0.5\%$ of indication value or $\pm 1^\circ\text{C}$, whichever is greater) ± 1 digit max. Platinum resistance thermometer (See note 2.): $(\pm 0.5\%$ of indication value or $\pm 1^\circ\text{C}$, whichever is greater) ± 1 digit max.	
Indication accuracy (ambient temperature of 23°C)		
Influence of temperature	R thermocouple inputs: $(\pm 1\%$ of PV or $\pm 10^\circ\text{C}$, whichever is greater) ± 1 digit max.	
Influence of voltage	Other thermocouple inputs: $(\pm 1\%$ of PV or $\pm 4^\circ\text{C}$, whichever is greater) ± 1 digit max. Platinum resistance thermometer inputs: $(\pm 1\%$ of PV or $\pm 2^\circ\text{C}$, whichever is greater) ± 1 digit max.	
Hysteresis (for ON/OFF control)	0.2% FS (0.1% FS for multi-input (thermocouple/platinum resistance thermometer) models)	
Proportional band (P)	1 to 999°C (automatic adjustment using auto-tuning/self-tuning)	
Integral time (I)	1 to 1,999 s (automatic adjustment using auto-tuning/self-tuning)	
Derivative time (D)	1 to 1,999 s (automatic adjustment using auto-tuning/self-tuning)	
Alarm output range	Absolute-value alarm: Same as the control range Other: 0 to input setting range full scale ($^\circ\text{C}$ or $^\circ\text{F}$) Alarm hysteresis: 0.2°C or $^\circ\text{F}$ (fixed)	
Control period	2/20 s	
Sampling period	500 ms	
Insulation resistance	20 M Ω min. (at 500 VDC)	
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min between current-carrying terminals of different polarity	
Vibration resistance	Malfunction	10 to 55 Hz, 20 m/s ² for 10 min each in X, Y, and Z directions
	Destruction	10 to 55 Hz, 0.75-mm single amplitude for 2 hr each in X, Y, and Z directions
Shock resistance	Malfunction	100 m/s ² min., 3 times each in 6 directions
	Destruction	300 m/s ² min., 3 times each in 6 directions
Life expectancy	Electrical	100,000 operations min. (relay output models)
Weight	Approx. 120 g (Controller only)	
Degree of protection	Front panel: Equivalent to IP66; Rear case: IP20; Terminals: IP00	
Memory protection	EEPROM (non-volatile memory) (number of writes: 1,000,000)	
EMC	EMI Radiated:	EN 55011 Group 1 Class A
	EMI Conducted:	EN 55011 Group 1 Class A
	ESD Immunity:	EN 61000-4-2: 4 kV contact discharge (level 2) 8 kV air discharge (level 3)
	Radiated Electromagnetic Field Immunity:	EN 61000-4-3: 10 V/m (80-1000 MHz, 1.4-2.0 GHz amplitude modulated) (level 3) 10 V/m (900 MHz pulse modulated)
	Conducted Disturbance Immunity:	EN 61000-4-6: 3 V (0.15 to 80 MHz) (level 2)
	Noise Immunity (First Transient Burst Noise):	EN 61000-4-4
	Burst Immunity:	2 kV power-line (level 3), 1 kV I/O signal-line (level 3)
	Surge Immunity:	EN 61000-4-5: Power line: Normal mode 1 kV; Common mode 2 kV Output line (relay output): Normal mode 1 kV; Common mode 2 kV
	Voltage Dip/Interrupting Immunity:	EN 61000-4-11 0.5 cycle, 100% (rated voltage)
Approved standards	UL 61010C-1 (listing) CSA C22.2 No.1010-1	
Conformed standards	EN 61326, EN 61010-1, IEC 61010-1 VDE 0106 Part 100 (finger protection), when the terminal cover is mounted.	

- Note:** 1. The following exceptions apply to thermocouples.
- U, L: $\pm 2^\circ\text{C}$ ± 1 digit max.
 - R: $\pm 3^\circ\text{C}$ ± 1 digit max. at 200°C or less
2. The following exceptions apply to platinum resistance thermometers.
Input set values 0, 1, 2, 3 for E5CSV: 0.5% FS ± 1 digit max.

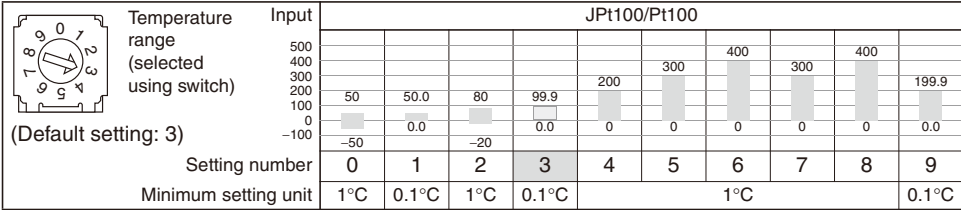
Temperature Range

Thermocouple Input Models



The shaded value indicates the default setting status.

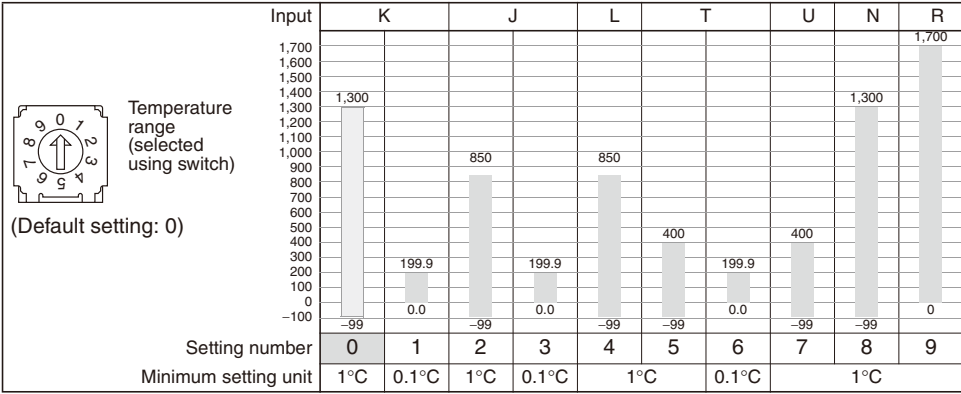
Platinum Resistance Thermometer Input Models



The shaded value indicates the default setting status.

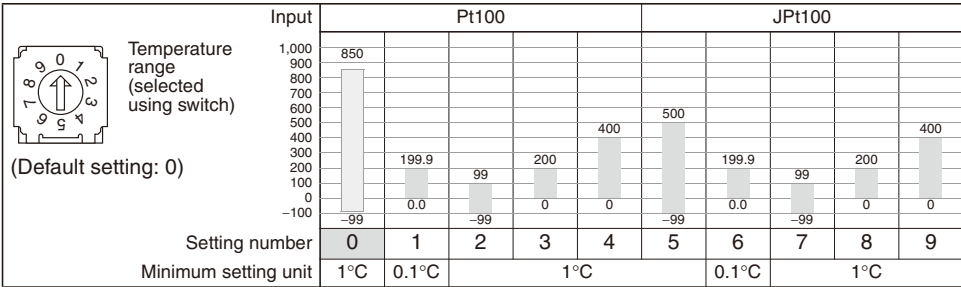
Multi-input (Thermocouple/Platinum Resistance Thermometer) Models

Using Thermocouple Sensors, Control Mode Switch 5: OFF



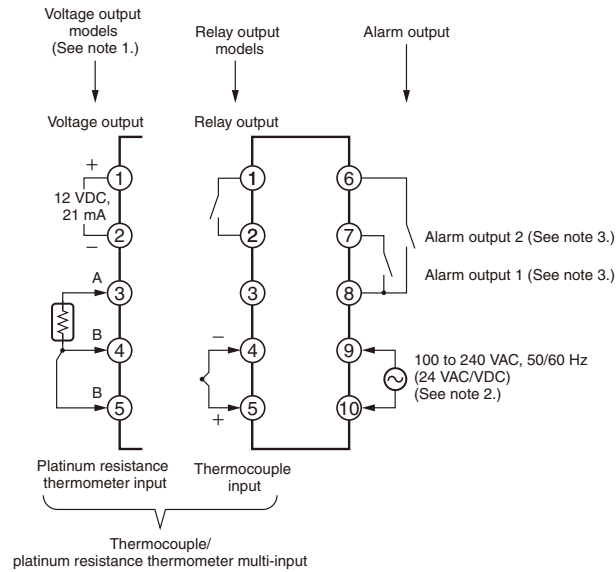
The shaded value indicates the default setting status.

Using Platinum Resistance Thermometers, Control Mode Switch 5: ON



The shaded value indicates the default setting status.

External Connection Diagram



- Note: 1.** The voltage output (12 VDC, 21 mA) is not electrically isolated from the internal circuits. When using a grounding thermocouple, do not connect output terminals 1 or 2 to ground. Otherwise, unwanted current paths will cause measurement errors.
- 2.** Models with 100 to 240 VAC and 24 VAC/VDC are separate. Models using 24 VDC have no polarity.
- 3.** The number of alarm outputs depends on the model.

Nomenclature

E5CSV Models with Terminal Blocks

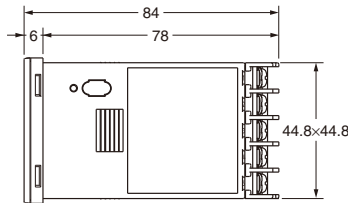
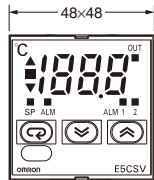


Dimensions

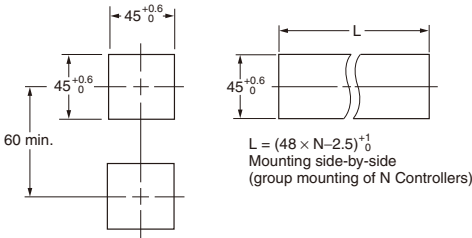
Note: All units are in millimeters unless otherwise indicated.

Controller

E5CSV

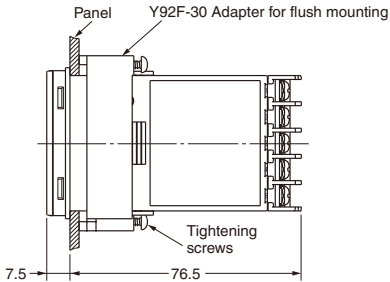
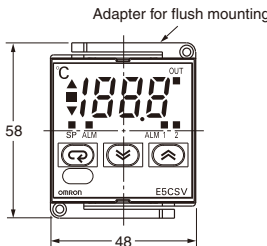
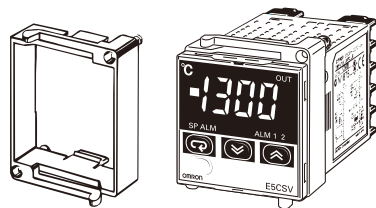


Panel Cutout Dimensions



Note: Terminals cannot be removed.

E5CSV + Adapter for Flush Mounting (Provided)



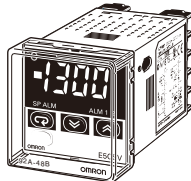
- Note: 1. The recommended panel thickness is 1 to 4 mm.
- 2. Group mounting is possible in one direction only.

Accessories (Order Separately)

Hard Protective Cover

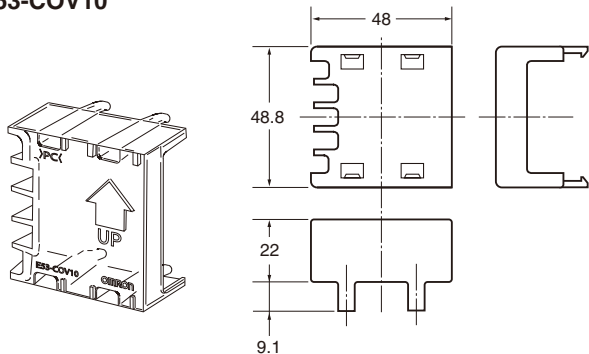
The Y92A-48B Protective Cover (hard type) is available for the following applications.

- To protect the set from dust and dirt.
- To prevent the panel from being accidentally touched causing displacement of set values.
- To provide effective protection against water droplets.



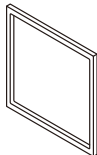
Terminal Cover

E53-COV10



Rubber Packing

Y92S-29 (for DIN48 x 48)



Order the Rubber Packing separately if it becomes lost or damaged. The Rubber Packing can be used to achieve an IP66 degree of protection for models with terminal blocks.

(Deterioration, shrinking, or hardening of the rubber packing may occur depending on the operating environment. Therefore, periodic replacement is recommended to ensure the level of waterproofing specified in NEMA4. The time for periodic replacement depends on the operating environment. Be sure to confirm this point at your site. Consider one year a rough standard. OMRON shall not be liable for the level of water resistance if the customer does not perform periodic replacement.)

The Rubber Packing does not need to be attached if a waterproof structure is not required.

Precautions for Correct Use

Refer to *Safety Precautions for All Temperature Controllers*. Refer to *E5CS/E5CSV Operation*.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

In the interest of product improvement, specifications are subject to change without notice.

E5CS/E5CSV Operation

Nomenclature

E5CS-U

Deviation indicators

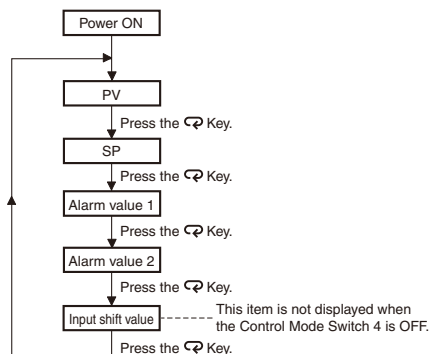
The \triangle indicator lights when the PV is greater than the SP and the ∇ indicator lights when the PV is less than the SP. The \square indicator (green) lights when the deviation is less $\pm 1\%$ FS ($\pm 0.25\%$ FS for multi-input models). These indicators flash during ST (self-tuning)/AT (auto-tuning).

Mode indicators

The SP indicator lights when the setting temperature is being displayed. The ALM indicator lights when the alarm value 1 is being displayed and flashes when the alarm value 2 is being displayed.

Mode Key

When the power is turned ON, normally the display will use the display items in the following order each time the Mode Key is pressed.



PV, SP, Alarm Value, Input Shift Display

The display switches each time the \curvearrowright Key is pressed.

Output indicator

Lights when the control output is ON.

Alarm indicators

ALM1 (Alarm 1): Lights when the alarm 1 output is ON.
ALM2 (Alarm 2): Lights when the alarm 2 output is ON.

Front door opening/closing groove

Down Key

Pressing the Down Key decreases the SP/alarm value display. Keeping the Down Key pressed continues to decrease the display value.
When the internal protect switch is ON, the setting keys cannot be used.

Up Key

Pressing the Up Key increases the SP/alarm value display. Keeping the Up Key pressed continues to increase the display value.
When the internal protect switch is ON, the setting keys cannot be used.

Protect Switch

Turn ON to prevent changes to the setting temperature (alarm value).

INIT Switch

This switch is for factory inspection purposes. Never touch this switch setting.

Control Mode Switches

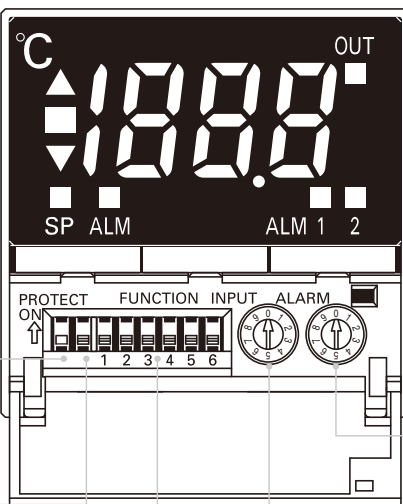
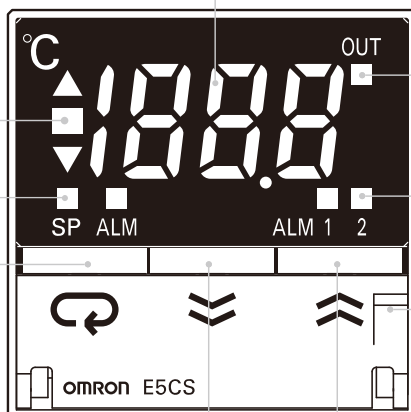
Switches for ON/OFF control and PID control settings.

Alarm Mode Switch

(This switch is not provided on models without alarms. Alarm output 2 is always set to upper-limit alarm mode. An alarm output 2 mode switch is not provided.)

Temperature Range Switch

Changes the temperature range.



E5CSV

Deviation indicators

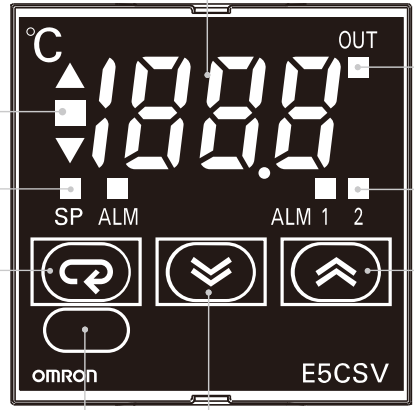
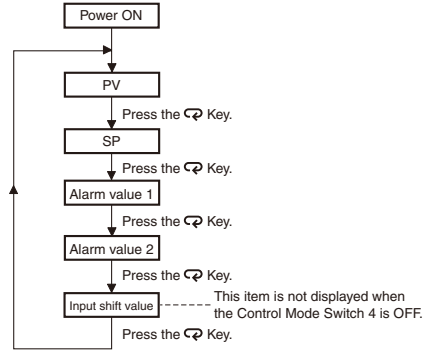
The Δ indicator lights when the PV is greater than the SP and the ∇ indicator lights when the PV is less than the SP. The \square indicator (green) lights when the deviation is $\pm 1\%$ FS ($\pm 0.25\%$ FS for multi-input models). These indicators flash during ST (self-tuning)/AT (auto-tuning).

Mode indicators

The SP indicator lights when the setting temperature is being displayed. The ALM indicator lights when the alarm value 1 is being displayed and flashes when the alarm value 2 is being displayed.

Mode Key

When the power is turned ON, normally the display will use the display items in the following order each time the Mode Key is pressed.



PV, SP, Alarm Value, Input Shift Display

The display switches each time the Mode Key is pressed.

Output indicator

Lights when the control output is ON.

Alarm indicators

ALM1 (Alarm 1): Lights when the alarm 1 output is ON.
 ALM2 (Alarm 2): Lights when the alarm 2 output is ON.

Up Key

Pressing the Up Key increases the SP/alarm value display. Keeping the Up Key pressed continues to increase the display value. When the internal protect switch is ON, press the Up Key while holding down the Lock Release Key.

Down Key

Pressing the Down Key decreases the SP/alarm value display. Keeping the Down Key pressed continues to decrease the display value. When the internal protect switch is ON, press the Down Key while holding down the Lock Release Key.

Lock Release Key

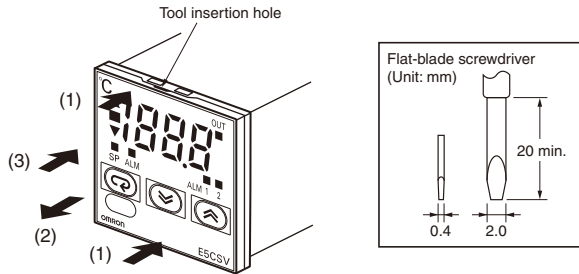
When the protect switch is ON, the set value can be changed by pressing the Up and Down Keys while holding down the Lock Release Key.

Settings before Turning ON the Power

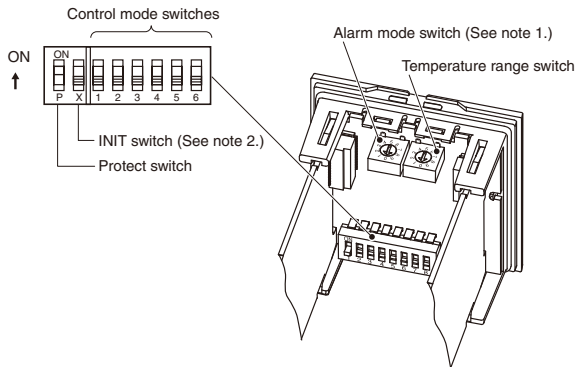
E5CSV

Remove the E5CSV from the case to make the settings.

1. Insert the tool into the two tool insertion holes (one on the top and one on the bottom) and release the hooks.



2. Insert the tool in the gap between the front panel and rear case, and pull out the front panel slightly. Hold the top and bottom of the front panel and carefully pull it out toward you, without applying unnecessary force.
3. When inserting the E5CSV, check to make sure that the sealing rubber is in place and push the E5CSV toward the rear case until it snaps into position. While pushing the E5CSV into place, push down on the hooks on the top and bottom surfaces of the rear case so that the hooks are securely locked in place. Be sure that electronic components do not come into contact with the case.



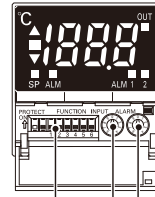
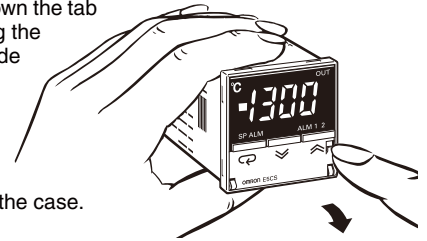
- Note:**
1. The alarm mode switch is not provided on models without alarms.
Alarm 2 is always set to the upper limit in models with two alarms.
A setting switch is not provided for alarm 2.
 2. The INIT switch is always OFF during normal operation.

E5CS-U

Opening the Front Door

Using your nail, press down the tab in the groove for opening the front door on the right side of the panel and pull the door open.

Note: The E5CS-U controller cannot be removed from the case.



Control mode switches Temperature range switch and alarm mode switch

1. Sensor Type Specification

Select the number on the temperature range switch to change the temperature range.

Thermocouple (The default is 2.)

Input	K					J/L				
	0	1	2	3	4	5	6	7	8	9
SP range	200	300	400	500	600	999	200	300	400	500
Setting number	0	1	2	3	4	5	6	7	8	9

The control range is -10% to +10% FS for each temperature range.

Note: The input indication range is the range that can be displayed for the control range (-99 to 1999). If the input is within the control range but exceeds the display range (-99 to 1999), values below -99 will be displayed as "ccc" and values above 1,999 will be displayed as "kkk."

Platinum Resistance Thermometer (The default is 3.)

Input	JPt100/Pt100									
	0	1	2	3	4	5	6	7	8	9
SP range	50	50.0	80	99.9	200	300	400	300	400	199.9
Setting number	0	1	2	3	4	5	6	7	8	9

The control range is -10% to +10% FS for each temperature range.

- Note: 1. The input indication range is the range that can be displayed for the control range (-99 to 1999). If the input is within the control range but exceeds the display range (-99 to 1999), values below -99 will be displayed as "ccc" and values above 1,999 will be displayed as "kkk."
 2. If the range is changed from one in 0.1-degree units (e.g., 0.0 to 199.9 or 0.0 to 99.9) to a range in 1-degree units, the SP and alarm values will be multiplied by 10 (e.g., 0.5 will become 5). If the unit is changed in the reverse direction, the values will be divided by 10. Always set the SP and alarm values again after changing the range.
 3. The temperature range for setting numbers 5 and 6 are the same as for 7 and 8, respectively.

Thermistor (The default is 1.)

Input	G									
	6 kΩ (0°C)	6 kΩ (0°C)	30 kΩ (0°C)	550 Ω (200°C)	4 kΩ (200°C)	6 kΩ (0°C)	6 kΩ (0°C)	30 kΩ (0°C)	550 Ω (200°C)	4 kΩ (200°C)
SP range	50	100	150	200	300	50	100	150	200	300
Setting number	0	1	2	3	4	5	6	7	8	9

- Note: 1. The control range and the input indication range are -50 to 60°C for setting numbers 0 and 5, 0 to 160°C for setting numbers 2 and 7, 0 to 210°C for setting numbers 3 and 8, and 25 to 315°C for setting numbers 4 and 9. The ranges are -10% to +10% FS for each temperature range for other setting numbers.
 2. If the setting number is changed and the temperature range exceeds 0°C, the minimum value of the setting temperature range will automatically be set as the SP. When the power is turned ON, the SP will be displayed.
 3. Temperature ranges 0, 1, 2, 3, and 4 are the same as 5, 6, 7, 8, and 9, respectively.

Multi-input (Thermocouple/Platinum Resistance Thermometer) Models

Using Thermocouple Sensors, Control Mode Switch 5: OFF

Input	K	J	L	T	U	N	R
	SP range	1,300	199.9	850	199.9	850	199.9
Setting number	0	1	2	3	4	5	6

The control range is -20 to +20°C of the input temperature range.

- Note: 1. The input indication range is the range that can be displayed for the control range (-99 to 1999). If the input is within the control range but exceeds the display range (-99 to 1999), values below -99 will be displayed as "ccc" and values above 1,999 will be displayed as "kkk."
 2. If unit is changed to 1 degree when the SP and alarm value for the temperature range are displayed in 0.1-units from 0.0 to 199.9 or 0.0 to 99.9, the values will be multiplied by 10 (e.g., 0.5 becomes 5). If the unit is changed in the reverse direction, the values will be divided by 10. After changing the range, set the SP and alarm value again.

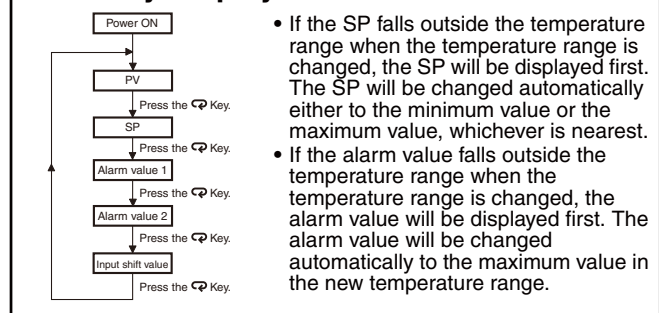
Using Platinum Resistance Thermometers, Control Mode Switch 5: ON

Input	Pt100					JPt100				
	0	1	2	3	4	5	6	7	8	9
SP range	850	199.9	99	200	400	500	199.9	99	200	400
Setting number	0	1	2	3	4	5	6	7	8	9

The control range is -20 to 20°C of the input temperature range.

- Note: 1. The input indication range is the range that can be displayed for the control range (-99 to 1999). If the input is within the control range but exceeds the display range (-99 to 1999), values below -99 will be displayed as "ccc" and values above 1,999 will be displayed as "kkk."
 2. If unit is changed to 1 degree when the SP and alarm value for the temperature range are displayed in 0.1-units from 0.0 to 199.9 or 0.0 to 99.9, the values will be multiplied by 10 (e.g., 0.5 becomes 5). If the unit is changed in the reverse direction, the values will be divided by 10. After changing the range, set the SP and alarm value again.

Mode Key Display Order



- If the SP falls outside the temperature range when the temperature range is changed, the SP will be displayed first. The SP will be changed automatically either to the minimum value or the maximum value, whichever is nearest.
- If the alarm value falls outside the temperature range when the temperature range is changed, the alarm value will be displayed first. The alarm value will be changed automatically to the maximum value in the new temperature range.

2. Operation Settings

Use the control mode switches () to change the control mode. (All switches are OFF for the default settings.)




Function selection		1	2	3	4	5	6	
ON/OFF PID	PID control	ON						
	ON/OFF control	OFF						
Control period	2 s		ON					
	20 s		OFF					
Direct/reverse operation	Direct operation (cooling)			ON				
	Reverse operation (heating)			OFF				
Input shift display	Enabled				ON			
	Disabled				OFF			
Temperature Sensor selection	Thermocouple	K, L				ON		
		K, J				OFF		
	Platinum resistance thermometer	Pt100					ON	
		JPt100					OFF	
	Multi-input (thermocouple/platinum resistance thermometer)	Platinum resistance thermometer input					ON	
		Thermocouple input					OFF	
Temperature unit	°F						ON	
	°C						OFF	

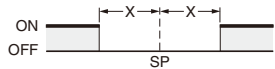
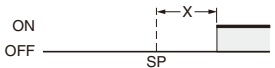



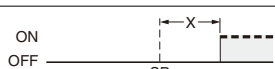
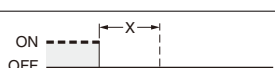
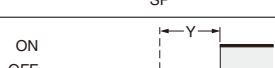
Note: The previous name Pt100 has been changed to JPt100 in accordance with revisions to JIS. The previous name J-DIN has been changed to L in accordance with revisions to DIN standards.

Note: Turn OFF the power before changing the DIP switch settings on the E5CS-U. Each of the switch settings will be enabled after the power is turned ON.

For details on the position of the temperature range switch, control mode switches, and alarm mode switch, refer to page 9.

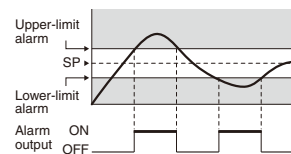
3. Alarm Modes

Select the number of the alarm mode switch () when changing the alarm mode. (The default is 2).

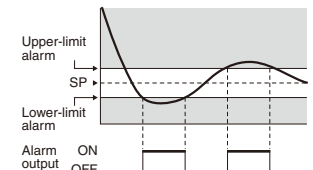
Set value	Alarm type	Alarm output operation
0, 9	Alarm function OFF	OFF
1	Upper- and lower-limit	
2	Upper-limit	
3	Lower-limit	
4	Upper- and lower-limit range	
5	Upper- and lower-limit with standby sequence (See note 2.)	
6	Upper-limit with standby sequence (See note 2.)	
7	Lower-limit with standby sequence (See note 2.)	
8	Absolute-value upper-limit	

- Note:** 1. No alarm. The alarm value (alarm operation display) will not be displayed when the setting is 0 or 9 even if the selection key is pressed.
Alarm Setting Range
X: 0 to FS (full scale); Y: Within temperature range
The value of X is the deviation setting for the SP (set point).
2. Standby Sequence Function (The standby sequence operates when the power is turned ON.)

Rising Temperature



Dropping Temperature

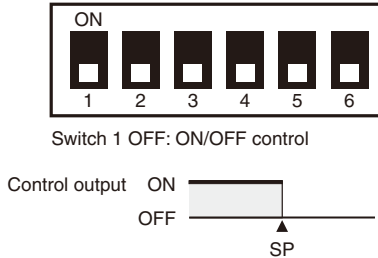


4. Using the Control Mode Switches

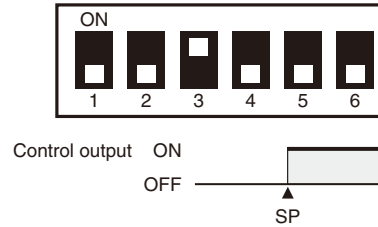
(1) Using ON/OFF Control and PID Control

ON/OFF Control

The control mode is set to ON/OFF control as the default setting.

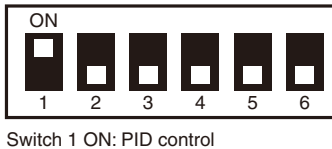


To perform cooling control of freezers, etc., turn ON switch 3.



PID Control

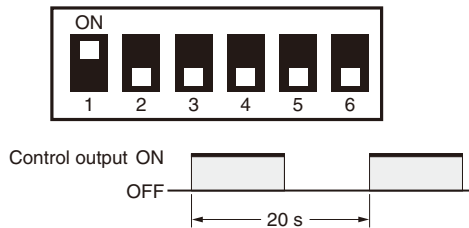
Turn ON switch 1 to use PID control.



1. Set the control period.

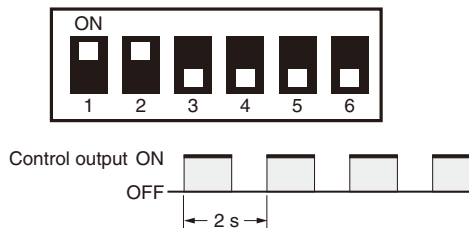
Performing Control via Relay Output, External Relay, or Conductor

Switch 2: OFF (control period: 20 s)



Quick Control Response Using an SSR

Switch 2: ON (control period: 2 s)



2. Set direct/reverse operation for the output.

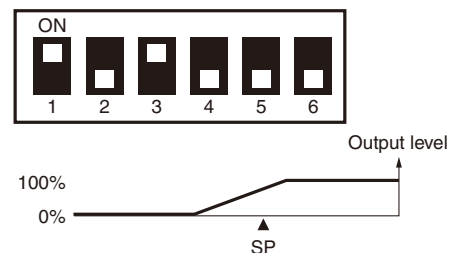
Performing Heating Control for Heaters

Switch 3: OFF



Performing Cooling Control for Freezers

Switch 3: ON

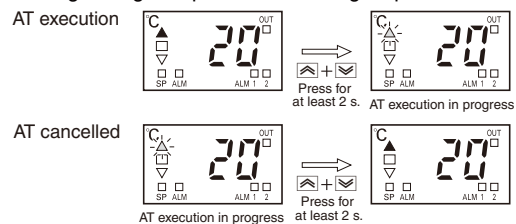


ST (Self-tuning) Features

ST (self-tuning) is a function that finds PID constants by using step response tuning (SRT) when Controller operation begins or when the set point is changed. Once the PID constants have been calculated, ST is not executed when the next control operation is started as long as the set point remains unchanged. When the ST function is in operation, be sure to turn ON the power supply of the load connected to the control output simultaneously with or before starting Controller operation.

Executing AT (Auto-tuning)

AT (auto-tuning) is executed by pressing the Up and Down Keys for at least 2 s while the PV is displayed. The deviation indicators flash during auto-tuning (AT) execution. AT will be cancelled by performing the same operation that AT is executing during AT operation. Flashing stops when AT is completed.



Note: One of the deviation indicators () will flash.

(2) Using the E5CS-U in Devices for Fahrenheit-scale Users

(Displaying in °F)

Turn ON switch 6 to display temperatures in °F.



Note: Attached the enclosed °F label.

Temperature Range for °F

The temperature is set to °F using the same temperature range switch as °C.

Thermocouple

Set-ting	°F
0	K 0 to 200
1	0 to 300
2	0 to 400
3	0 to 500
4	0 to 600
5	0 to 999
6	J/L 0 to 999
7	0 to 300
8	0 to 400
9	0 to 500

Platinum Resistance Thermometer

Set-ting	°F
0	Pt100 or JPt100 -50 to 50
1	0.0 to 50.0
2	-20 to 80
3	0.0 to 99.9
4	0 to 200
5	0 to 300
6	0 to 400
7	0 to 600
8	0 to 800
9	0.0 to 199.9

Thermistor

Set-ting	°F
0	G -50 to 100
1	0 to 200
2	100 to 300
3	200 to 400
4	300 to 600
5	-50 to 100
6	0 to 200
7	100 to 300
8	200 to 400
9	300 to 600

Multi-input (Thermocouple/Platinum Resistance Thermometer)

Control mode switch 5: OFF

Set-ting	°F
0	K -99 to 1999
1	0.0 to 199.9
2	J -99 to 1500
3	0.0 to 199.9
4	L -99 to 1500
5	T -99 to 700
6	0.0 to 199.9
7	U -99 to 700
8	N -99 to 1999
9	R 0 to 1999

Multi-input (Thermocouple/Platinum Resistance Thermometer)

Control mode switch 5: ON

Set-ting	°F
0	Pt100 -99 to 1500
1	0.0 to 199.9
2	-99 to 99
3	0 to 200
4	0 to 400
5	JPt100 -99 to 900
6	0.0 to 199.9
7	-99 to 99
8	0 to 200
9	0 to 400

Note: The control range for a thermocouple input or platinum resistance thermometer input is -10% to +10% FS of each temperature range. The control range for thermistors is 35 to 320°F for setting numbers 2 and 7, 35 to 420°F for setting numbers 3 and 8 and 80 to 630°F for setting numbers 4 and 9. The control range for thermistors is -5% to +10% FS of each temperature range for other setting numbers. The control range for multi-input (thermocouple/platinum resistance thermometer) models is -40 to +40°F of each temperature range.

Using K, L/Pt100 Thermometers

Turn ON switch 5 when using K, L/Pt100 Thermometers.



Note: The previous name J-DIN has been changed to L in accordance with revisions to DIN standards.

(3) Setting Input Shift

Turn ON switch 4, and after turning ON the power, press the Mode Key until $h0$ (indicates input shift of 0) is displayed. Press the Up and Down Keys to set the shift value.



Shift Example

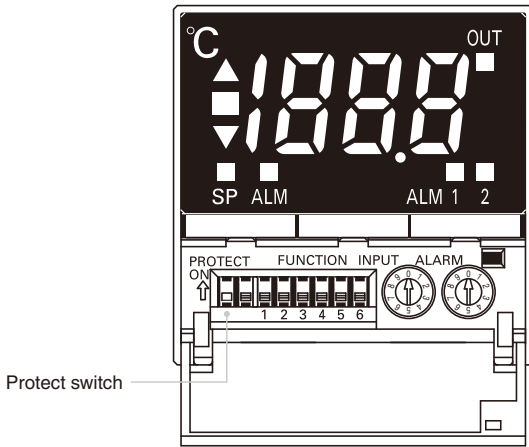
Input shift display	Measured temperature	Temperature display
$h0$ (no shift)	100°C	100°C
$h9$ (+9°C shift)	100°C	109°C
$l9$ (-9°C shift)	100°C	91°C

Note: When control mode switch 4 is turned OFF (no input shift display), the input shift is not displayed but the shift value is enabled. To disable input shift, set the input shift value to $h0$. The shift range depends on the setting unit.

Setting unit	1°C	0.1°C
Compensation range	-99 to +99°C	-9.9 to +9.9°C
Input shift display	L99 to H99	L9.9 to H9.9

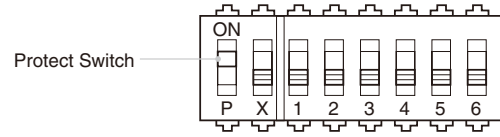
5. Protect Switch

E5CS



When the protect switch is ON, Up Key and Down Key operations are prohibited to prevent setting mistakes.

E5CSV



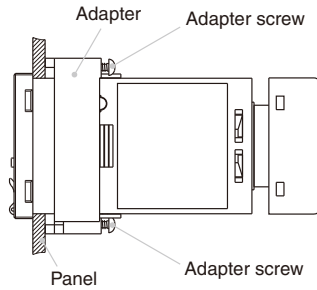
When the protect switch is ON, Up Key and Down Key operations are prohibited to prevent setting mistakes.

Installation

- All models in the E5CS-U Series conform to DIN 43700 standards.
- The recommended panel thickness is 1 to 4 mm.
- Be sure to mount the E5CS-U horizontally.

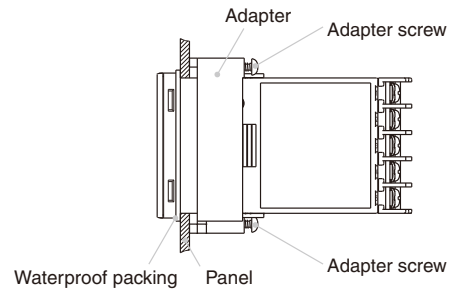
Mounting the E5CS-U

1. Insert the Controller into the mounting hole in the panel.
2. Attach the adapter from the end with the terminals and press the adapter forward until it comes into contact with the panel to temporarily hold the Controller.
3. Tighten the two adapter screws, tightening them alternately a little at a time to maintain balance between them. The tightening torque is 0.29 to 0.39 N·m.



Mounting the E5CSV

1. For waterproof mounting, waterproof packing must be installed on the Controller. Waterproofing is not possible when group mounting several Controllers.
2. Insert the Controller into the mounting hole in the panel.
3. Attach the adapter from the end with the terminals and press the adapter forward until it comes into contact with the panel to temporarily hold the Controller.
4. Tighten the two adapter screws, tightening them alternately a little at a time to maintain balance between them. The tightening torque is 0.29 to 0.39 N·m.



Error Displays and Causes

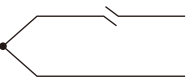
In addition to the alarm indicator, errors notification is provided on the display. Be sure to remove the cause of the error promptly.

Display status	Cause	Control output
PV displayed as <i>FFF</i>	(1) The PV is higher than the control temperature range (overflow). (2) Thermistor input: The Sensor is short-circuited.	Heating control (reverse operation): OFF Cooling control (direct operation): ON
PV displayed as ---	(1) The PV is lower than the control temperature range (underflow). (2) Thermistor input: The Sensor is burnt out.	Heating control (reverse operation): ON Cooling control (direct operation): OFF
<i>FFF</i> flashing	(1) Thermocouple or Pt input model: The PV is higher than the overflow temperature or a Sensor error has occurred. (2) Multi-input model: The PV is higher than the control temperature range or a Sensor error has occurred.	OFF
--- flashing	(1) Thermocouple or Pt input model: The PV is lower than the underflow temperature or a Sensor error has occurred. (2) Thermocouple model: The polarity is reversed. (3) Multi-input model: The PV is lower than the control temperature range or a Sensor error has occurred.	OFF
<i>E !!</i> displayed	A memory error (E11) has occurred. Turn the power ON again. If the display remains the same, the Controller must be repaired.	The control outputs and alarm outputs turn OFF.

Note: In models with an alarm, *FFF* appears or flashes on the display to indicate that the temperature has exceeded the maximum display temperature and the output is set according to the alarm mode. In the same way, --- appears or flashes on the display to indicate that the temperature has exceeded the minimum display temperature and the output is set according to the alarm mode.

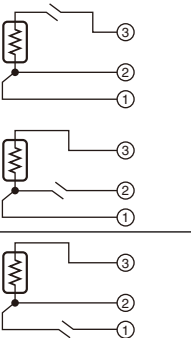
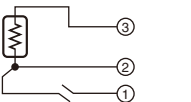
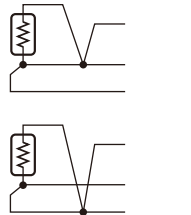
Sensor Error Displays and Causes

Thermocouple

Status	Display	Control output
Burnout 	<i>FFF</i> flashing	OFF

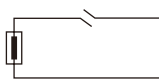

Note: The room temperature is displayed if an input short-circuit occurs.

Platinum Resistance Thermometer

Status	Display	Control output
Burnout 	<i>FFF</i> flashing	OFF
Wire 2 or 3 disconnected 	--- flashing	OFF
Short-circuit 	--- flashing	OFF

Note: The resistance value for platinum resistance thermometers is 100 Ω at 0°C and 140 Ω at 100°C.

Thermistor

Status	Display	Control output
Burnout 	--- (See note.)	Heating control (reverse operation): ON Cooling control (direct operation): OFF
Short-circuit 	<i>FFF</i> (See note.)	Heating control (reverse operation): OFF Cooling control (direct operation): ON

Note: The display does not flash.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

In the interest of product improvement, specifications are subject to change without notice.

Safety Precautions for All Temperature Controllers

Refer to the precautions of individual product for more specific details.

Warning

The following products contain lithium batteries. Do not disassemble, deform under pressure, heat to over 100°C, or incinerate these products. The lithium battery may ignite or explode. Applicable models: E5ZE, E5LD, and E5LC.



Caution

Do not touch any of the terminals while the power is being supplied. Doing so may result in electric shock.



Do not allow pieces of metal or wire cuttings to get inside the Temperature Controller. Doing so may result in electric shock, fire, or malfunction.



Do not attempt to disassemble, repair, or modify the Temperature Controller. Any attempt to do so may result in electric shock, fire, or malfunction.



Do not use the Temperature Controller in locations subject to flammable or explosive gases. Doing so may result in an explosion.



The switching capacity and switching conditions will significantly affect the longevity of the output relays. Use the Temperature Controller within the rated load, and do not use the Temperature Controller beyond the number of operations specified under electrical life. Using the Temperature Controller beyond its electrical life may result in contact welding or burning.



Use Temperature Controller settings that are appropriate for the controlled system. Failure to do so may cause unexpected operation resulting in damage to equipment or personal injury.



Prepare a circuit with an overheating prevention alarm and implement other safety measures to ensure safe operation in the event of a malfunction. Loss of operational control due to malfunction may result in a serious accident.



Tighten the terminal screws to the following torque:

M3.5 screws: 0.74 to 0.90 N·m

M3 screws: 0.40 to 0.56 N·m

E5GN: Terminals 1 to 6: 0.23 to 0.25 N·m

Terminals 7 to 9: 0.12 to 0.14 N·m



Failure to tighten terminal screws to the correct torque may result in fire or malfunction.

Make sure there will be no adverse affects from the device connected to the Temperature Controller before using the hardware test mode. Devices connected to the Temperature Controller may reach a dangerous state during the test.



Operating Environment Precautions

- Do not use the Temperature Controller in the following locations:
 - Locations exposed to radiated heat from heating devices
 - Locations subject to exposure to water or oil
 - Locations subject to direct sunlight
 - Locations subject to dust or corrosive gases (in particular, sulfide gas and ammonia gas)
 - Locations subject to severe changes in temperature
 - Locations subject to icing or condensation
 - Locations subject to excessive shock or vibration
- Use and store the Temperature Controller within the rated temperature or humidity range specified for each model. When two or more Temperature Controllers are mounted horizontally close to each other or vertically next to one another, the internal temperature will increase due to the heat they radiate and the service life of the products will decrease. In such cases, forced cooling by fans or other means of air ventilation will be required to cool down the Temperature Controllers.
- Allow enough space around the Temperature Controller to ensure proper heat dissipation. Do not block the ventilating holes.
- Be sure to wire properly with correct polarity of terminals.
- To wire the E5AN, E5EN, or E5CN using crimp terminals, use crimp terminals designed for M3.5 screws and with a width of 7.2 mm max.



- When wiring the E5GN, use a cable gauge of AWG24 (0.205 mm²) to AWG14 (2.081 mm²) for terminals 1 to 6, and use a cable gauge of AWG28 (0.081 mm²) to AWG22 (0.326 mm²) for terminals 7 to 9. The exposed current-carrying part to be inserted into terminals must be 5 to 6 mm.
- After wiring is completed, do not pull on or bend a terminal block lead wire with a force of 30 N or higher.
- Do not connect anything to unused terminals.
- Make sure that the power supply voltages and loads are within specification and rating ranges before using the Temperature Controller.
- To avoid inductive noise, keep the wiring for the Temperature Controller's terminal board away from power cables carrying high voltages or large currents. Also, do not wire power lines together with or parallel to Temperature Controller wiring. Using shielded cables to separate pipes and ducts is recommended. Attach surge absorbers or noise filters to peripheral devices that generate noise (e.g., motors, transformers, solenoids, magnetic coils, or other equipment that has an inductance element). If using a noise filter with the power supply, be sure to confirm the voltage and the current, and then mount the power supply as near as possible to the Temperature Controller. Set up the Temperature Controller, along with its power supply, as far away as possible from devices that generate strong, high-frequency waves, such as high-frequency welders and high-frequency machines, and from devices that generate surges.
- Make sure that the rated voltage is attained within two seconds of turning the power ON.
- Allow at least 30 seconds for the Temperature Controller to warm up.
- When using self-tuning, turn ON power for the load (e.g., heater) at the same time as or before supplying power to the Temperature Controller. If power is turned ON for the Temperature Controller before turning ON power for the load, self-tuning will not be performed properly and optimum control will not be achieved.

Precautions for Correct Use

14. In order that power can be turned OFF in an emergency by the person operating the Temperature Controller, install the appropriate switches and circuit breakers, and label them accordingly.
15. Turn OFF the power before drawing out the Temperature Controller body. Do not touch or apply excessive force to the terminals or electronic parts. When inserting the body, make sure that electronic parts do not come in contact with the case.
16. When the terminal block for the E5GN is detached, do not touch or apply excessive force to any electronic parts.
17. Use alcohol to clean the Temperature Controller. Do not use thinner or other solvent-based substances.
18. Inverters with an output frequency of 50/60 Hz are available, but they may cause the internal temperature of Temperature Controller to rise, possibly resulting in smoke or burning. Do not use an inverter output to supply power to a Temperature Controller.

● Service Life

1. Use the Temperature Controller within the specified temperature and humidity ranges. If the product is installed inside a control panel, the temperature around the Temperature Controller and not the temperature around the control panel must be kept within the specified temperature range.
2. The service life of electronic devices such as Temperature Controllers is determined not only by the number of switching operations performed by the relay, but also by the service life of the internal electronic components. The service life of these components depends on the ambient temperature: it will be shorter if the ambient temperature is high and longer if the ambient temperature is low. For this reason, the service life of the product can be extended by keeping the internal temperature of the Temperature Controller low.
3. If several Temperature Controllers are mounted side-by-side or are arranged vertically, the heat generated by them may cause the internal temperature of the products to rise, thus reducing their service life. To prevent this, take steps to ensure that the Temperature Controllers are cooled, such as installing fans. When providing forced cooling, however, be careful not to cool down the terminal sections alone to avoid measurement errors.

● Measurement Accuracy

1. When extending the lead wires for thermocouples, use a compensating conductor appropriate for the type of thermocouple use.
2. When extending the lead wires for platinum resistance thermometers, use lead wires with low resistance, and make the resistance in the 3 lead wires equal.
3. The type of Temperature Sensor and the input type for the Temperature Controller must be set the same.
4. There are two types of platinum resistance thermometers: Pt and JPt. Accurate measurement will not be possible if the input type for the Temperature Sensor is not set correctly.
5. Mount the Temperature Controller horizontally.
6. If significant errors occur, check to see if the input shift has been set correctly.

● Waterproofing

Sections without any specification on their degree of protection or those with IP□0 specifications are not waterproof.

● EN/IEC Compliance

Installing the following fuse in the power supply terminal block is recommended if the Temperature Controller is used in applications requiring EN/IEC compliance.

Recommended fuse: A T2A, 250-VAC, time lag fuse with low breaking capacity

● Operating Precautions

1. It takes approximately five seconds for the outputs to turn ON from the moment the power is turned ON. Due consideration must be given to this time when incorporating Temperature Controllers in a sequence circuit.
2. When using the self-tuning capability of the E5□N, E5□K, or E5□J, supply power to the load (e.g., heater) at the same time as or before supplying power to the Temperature Controller. If power is turned ON for the Temperature Controller before turning ON power for the load, self-tuning will not be performed properly and optimum control will not be achieved. When starting operation after the 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 Temperature Controller OFF and ON again, switching from STOP mode to RUN mode can also be used in this case.)
3. The reception of the Temperature Controller may be affected if it is used close to radios, television sets or wireless devices.

Parameter Displays

The following displays are used to represent the characters for parameter names on the Temperature Controller.

● Seven-segment Digital Display

A	b	C	d	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

● Eleven-segment Digital Display

A	b	C	d	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

In the interest of product improvement, specifications are subject to change without notice.

Read and Understand This Catalog

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

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

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Application Considerations

SUITABILITY FOR USE

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

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

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