

# E5CB

## Temperature Controller

### EN Instruction Manual

Thank you for purchasing the OMRON E5CB Temperature Controller. This manual describes the functions, performance, and application methods needed for optimum use of the product.

Please observe the following items when using the product.

- This product is designed for use by qualified personnel with a knowledge of electrical systems.
- Before using the product, thoroughly read and understand this manual to ensure correct use.
- Keep this manual in a safe location so that it is available for reference whenever required.

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1654624-5C (CB)

### Warning Symbols

**CAUTION**

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

Do not allow pieces of metal, wire clippings, or fine metallic shavings or filings from installation to enter the product. Doing so may occasionally result in electric shock, fire, or malfunction.

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

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 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.

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

Tighten the terminal screws to between 0.74 and 0.90 N·m. Loose screws may occasionally result in fire.

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

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

### Suitability for Use

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of the products in the customer's application or use of the product. Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used. Know and observe all prohibitions of use applicable to this product.

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

See also product catalog for Warranty and Limitation of Liability.

### Precautions for Safe Use

- Be sure to observe the following precautions to prevent operation failure, malfunction, or adverse effects on the performance and functions of the product. Do not do so may occasionally result in unexpected events.
- The product is designed for indoor use only. Do not use the product outdoors or in any of the following locations.
    - 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.
  - Use/store within the rated temperature and humidity ranges. Provide forced-cooling if required.
  - To allow heat to escape, do not block the area around the product. Do not block the ventilation holes on the product.
  - Be sure to wire properly with correct polarity of terminals.
  - Use specified size (M3.5, width 7.2 mm or less) crimped terminals for wiring. To connect bare wires to the terminal block, use copper braided or solid wires with a rated temperature of over 70°C and a gauge of AWG24 to AWG14 (equal to a cross-sectional area of 0.205 to 2.081 mm<sup>2</sup> (The stripping length is 5 to 6 mm.)) Up to two wires of same size and type, or two crimped terminals can be inserted into a single terminal.
  - Do not wire the terminals which are not used.
  - Allow as much space as possible between the controller and devices that generate a powerful high-frequency or surge. Separate the high-voltage or large-current power lines from other lines, and avoid parallel or common wiring with the power lines when you are wiring to the terminals.
  - Use this product within the rated load and power supply.
  - 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.
  - Make sure that the 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.
  - A switch or circuit breaker should be provided close to this unit. The switch or circuit breaker should be within easy reach of the operator, and must be marked as a disconnecting means for this unit.
  - Do not use paint thinner or similar chemical to clean with. Use standard grade alcohol.
  - Design system (control panel, etc) considering the 2 second of delay that the controller's output is set after power ON.
  - The output may turn OFF when shifting to certain levels. Take this into consideration when performing control.
  - The number of non-volatile memory write operations is limited.
  - The voltage output (control output) is not electrically isolated from the internal wiring. One or the other of the control output terminals must therefore be left ungrounded when using a grounded thermocouple thermometer. (If both are grounded, measurements will be unreliable due to sneak current.)
  - Do not continue to use the product if the front surface peels or becomes cracked.

### Specifications

Power supply voltage	100 to 240 VAC, 50/60Hz or 24 VAC, 50/60Hz or 24 VDC
Operating voltage range	85% to 110% of the rated voltage
Power consumption	Approx. 3.5VA (100 to 240 VAC) Approx. 3.5VA (24 VAC) Approx. 2.5W (24 VDC)
Sensor type	Thermocouple: K, J, T, R, or S (JIS C 1602-1985 and IEC 60584-1) Platinum resistance thermometer: Pt100 (JIS C 1604-1997 and IEC 60751)
Indication accuracy (ambient temperature: 23°C)	(±0.5% of indication value or ±1°C, whichever is greater) ±1 digit max. R,S thermocouple at 200°C or less: ±3°C ±1 digit max. K,T thermocouple at -100°C or less: ±2°C ±1 digit max.
Control output	Relay output: 250 VAC, 3 A (resistive load) Voltage output (for driving SSR): 12 VDC +25%/-15%, 21 mA
Alarm output	Relay output: 250 VAC, 1 A (resistive load)
Control method	ON/OFF or 2-PID control
Electrical life of relay	100,000 operations
Sampling period	250 ms
Malfunction vibration	10 to 55 Hz, 20 m/s <sup>2</sup> for 10 min each in X, Y and Z directions
Vibration resistance	10 to 55 Hz, 20 m/s <sup>2</sup> for 2 h each in X, Y and Z directions
Malfunction shock	200 m/s <sup>2</sup> , 3 times each in X, Y, and Z directions
Shock resistance	300 m/s <sup>2</sup> , 3 times each in X, Y, and Z directions
Ambient temperature	-10 to 55°C (with no condensation or icing)
Ambient 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
Weight	Approx. 100 g (Controller only)
Degree of protection	Front panel: IP66 Rear case: IP20, Terminal section: IP00
Installation environment	Installation category II, pollution degree 2 (as per IEC 61010-1)
Memory protection	Non-volatile memory (number of write operations: 100,000)

### Safety Precautions

#### Key to Warning Symbols

**CAUTION** Indicates a potentially hazardous situation which, if not avoided, is likely to result in minor or moderate injury or property damage. Read this manual carefully before using the product.

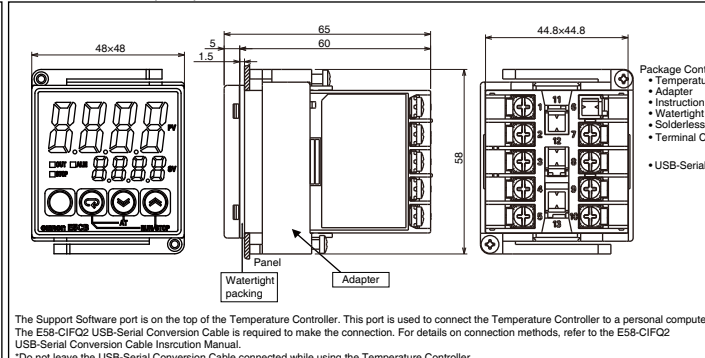
### Wiring

#### Model Number Legends

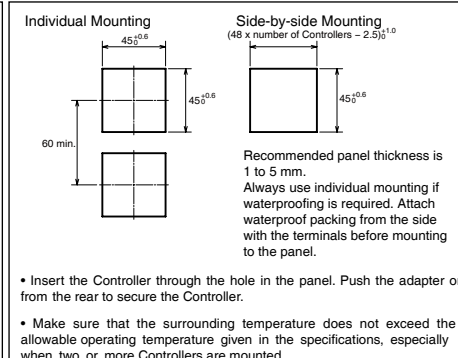
Models with Dual Display: E5CB - **1** **2** **3** **4**

<b>1</b> Control output
R Relay output: 250 VAC, 3 A (resistive load)
Q Voltage output (for driving SSR): 12 VDC, 21 mA
<b>2</b> Alarm
1 Relay output: 250 VAC, 1 A (resistive load)
<b>3</b> Sensor type
TC Thermocouple (K, J, T, R, or S)
P Platinum resistance thermometer (Pt100)
<b>4</b> Power Supply
--- 100 to 240 VAC
D 24 VAC/VDC

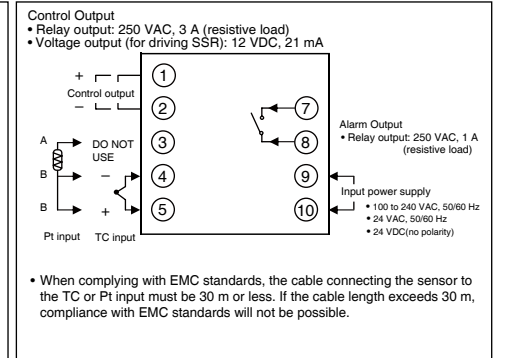
#### Dimensions (mm)



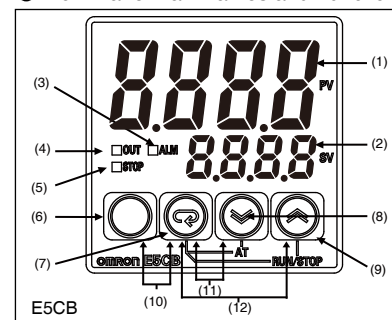
#### Installation (mm)



#### Connections



#### Front Panel Part Names and Functions



- Display No. 1: Displays the process value (PV) or parameter.
- Display No. 2: Displays the set point (SP) or parameter setting.
- ALM: Lit while the alarm is ON. Not lit while the alarm is OFF.
- OUT: Lit while the control output is ON. Not lit while the control output is OFF.
- STOP: Not lit during operation. Lit while operation is stopped.
- Level Key: Changes the setting level.
- Mode Key: Changes the parameter within the setting level.
- Down Key: Reduces the setting.
- Up Key: Increases the setting.

- Press these keys for at least 3 seconds in Operation Level or Adjustment Level to go to Protect Level. Press these keys for at least 1 second in Protect Level to return to Operation Level.
  - Press these keys for at least 2 seconds to start or stop autotuning.\*1
  - Press these keys for at least 2 seconds to start or stop operation.\*2
- \*1: These keys are disabled when starting and stopping autotuning has been disabled with operation control key protection.  
\*2: These keys are disabled when starting and stopping operation has been disabled with operation control key protection.

**Conformance to EN/IEC Standards**

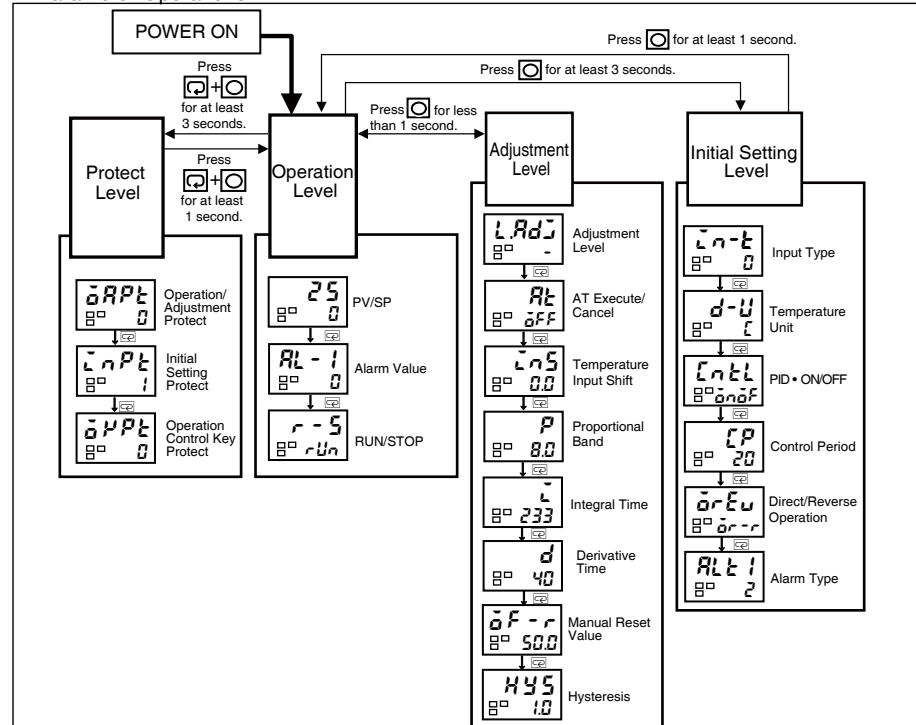
This is a class A product. In residential areas it may cause radio interference, in which case the user may be required to take adequate measures to reduce interference.

**Conformance to Safety Standards**

Reinforced insulation is provided between input power supply, relay outputs, and between other terminals.

### Operation Menu

#### Parameter Operations



#### Alarms

Setting	Alarm type	Positive alarm value (X)	Negative alarm value (X)	Deviation/absolute value alarm
0	No alarm	Output OFF	Output OFF	Output OFF
1	Deviation upper/lower limit	ON OFF	ON OFF	Deviation alarm
2	Deviation upper limit	ON OFF	ON OFF	Deviation alarm
3	Deviation lower limit	ON OFF	ON OFF	Deviation alarm
4	Deviation upper/lower range	ON OFF	ON OFF	Deviation alarm
* 5	Deviation upper/lower limit standby sequence ON	ON OFF	ON OFF	Deviation alarm
* 6	Deviation upper limit standby sequence ON	ON OFF	ON OFF	Deviation alarm
* 7	Deviation lower limit standby sequence ON	ON OFF	ON OFF	Deviation alarm
8	Absolute value upper limit	ON OFF	ON OFF	Absolute value alarm
9	Absolute value lower limit	ON OFF	ON OFF	Absolute value alarm
* 10	Absolute value upper limit standby sequence ON	ON OFF	ON OFF	Absolute value alarm
* 11	Absolute value lower limit standby sequence ON	ON OFF	ON OFF	Absolute value alarm
12	Do not set.			

The default alarm type is 2.

**Deviation Alarm**

Use a deviation alarm to link the alarm to the SP. If the SP is changed, the alarm operating point will also change.

Set this difference. Alarm operating point SP. Linked. Set the difference (deviation) from the SP.

**Absolute Value Alarm**

Use an absolute value alarm when the alarm is not linked to the SP.

Set the alarm operating point as the temperature (absolute value). Alarm operating point Fixed. Set the temperature (absolute value) at which to output an alarm.

\* Alarms with a Standby Sequence

The alarm is blocked until the first safe-state is reached. Unwanted alarm during start-up are prevented.

Example: Deviation Lower Limit Standby Sequence ON

The standby sequence is cleared when the alarm OFF condition has been met. The standby sequence is started again when any of the following conditions is met.

- Operation is started (power is turned ON or operation is switched from stop to run).
- The alarm value is changed.
- The temperature input offset is changed.
- The set point is changed.

#### Parameter Tables

**Step 1 Initial Setting Level: Used to set basic specifications.**

Display	Parameter name	Description	Setting/monitoring range	Default
Ln-t	Input Type	Set the input sensor type.	*Refer to table on the right	0 or 8
d-U	Temperature Unit	Set the unit for temperature input to Celsius (°C) or Fahrenheit (°F).	°C (°C)/°F (°F)	°C
Ln-t	PID-ON/OFF	Set either 2-PID control or ON/OFF control.	On/Off, P, I, D	ON/OFF
CP	Control Period	Set the time-proportional control period for the control output. (Displayed only when PID control is selected.)	0.5, 1 to 99	20 or 2 (s)
Dr-r	Direct/Reverse Operation	Set either reverse option (heating control) or direct operation (cooling control).	Dr-r (reverse control) Dr-d (direct control)	Dr-r (reverse control)
AL-t	Alarm Type	Set the alarm type.	*Refer to table on the right	2 (Deviation upper limit)

**Step 2 Operation Level: Used to monitor the process value and to set the set point, alarm value, etc.**

Display	Parameter name	Description	Setting/monitoring range	Default
-	PV/SP	Monitor the process value and set the set point.	-	SV: 0 (°C)
AL-1	Alarm value	Set the alarm value. The location of the decimal point depends on the sensor type.	-1999 to 9999	0 (°C)
r-S	RUN/STOP	Start and stop control operation.*1	r-UN/STOP	RUN

**Step 3 Adjustment Level: Used to tune parameters and set control parameters.**

Display	Parameter name	Description	Setting/monitoring range	Default
L Ad	Adjustment Level	This display indicates that you have moved to Adjustment Level.		--
Rt	AT Execute/Cancel	Starts and stops autotuning. (Displayed only when PID control is selected.)**2	On/Off	Off
LnS	Temperature Input Shift	Set a compensation value for the temperature input in increments of 0.1°C or 0.1°F.	-199.9 to 999.9	0.0 (°C)
P	Proportional Band	Set the proportional band in increments of 0.1°C or 0.1°F. (Displayed only when PID control is selected.)	0.1 to 999.9	8.0 (°C)
I	Integral Time	Set the integral time in increments of 1 s. (Displayed only when PID control is selected.)	0 to 999.9	233 (s)
d	Derivative Time	Set the derivative time in increments of 1 s. (Displayed only when PID control is selected.)	0 to 999.9	40 (s)
F-r	Manual Reset Value	Set the manipulated value to use for P or PD control (I = 0). The offset will be canceled.	0.0 to 100.0	50.0 (%)
HYS	Hysteresis	Set the hysteresis to use to achieve stable operation when switching the control output ON/OFF during ON/OFF control. (Displayed only when ON/OFF control is selected.)	0.1 to 999.9	1.0 (°C)

**Step 4 Protect Level: Used to set parameters to restrict key operations.**

Display	Parameter name	Description	Setting/monitoring range	Default
DrP	Operation/Adjustment Protect	Set protection for Operation Level and Adjustment Level.	*Refer to table on the right.	0
LnP	Initial Setting Protect	Set protection for Initial Setting Level.	*Refer to table on the right.	1
DrP	Operation Control Key Protect	Set protection for the AT Key and RUN/STOP Key (operation control keys).	*Refer to table on the right.	0

#### Input type: Thermocouple

Input	Setting	Setting range (°C)	Setting range (°F)
K	0	-200 to 1300	-300 to 2300
	1	-20.0 to 500.0	0.0 to 900.0
J	2	-100 to 850	-100 to 1500
	3	-20.0 to 400.0	0.0 to 750.0
T	4	-200 to 400	-300 to 700
	5	-199.9 to 400.0	-199.9 to 700.0
R	6	0 to 1700	0 to 3000
S	7	0 to 1700	0 to 3000

The default alarm type is 0.

#### Input type: Platinum Resistance Thermometer

Input	Setting	Setting range (°C)	Setting range (°F)
Pt100	8	-200 to 850	-300 to 1500
	9	-199.9 to 500.0	-199.9 to 900.0

The default alarm type is 8.

#### Troubleshooting

Display	Meaning	Action
SERR (S.ERR)	Input error*1	Check the wiring of inputs, disconnections, short circuits and input type.
E11 (E11)	RAM memory error	Turn the power OFF then back ON again.*2
E11/SUM (E111)/SUM*3	Non-volatile memory memory error	Press the [ADJ] and [SET] Keys for at least 3 seconds to initialize the settings and clear the non-volatile memory error.*2

- The control output and the alarm output will turn OFF when an error occurs. (For SERR, the alarm output will be processed for a high temperature error.)
- If the input value exceeds the display limit (-1999 to 9999) but it is still within the control range, cccc will be displayed for values under -1999. Under these conditions, the control output and alarm output will operate normally.

\*1: This error is displayed only when the process value and set point are displayed.  
\*2: If the display does not change, the Controller needs to be repaired. If operation returns to normal, then noise may have caused the problem. Check for noise.  
\*3: E11 will be displayed on display No. 1 and SUM will be displayed on display No. 2.

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