E5CSL/E5CWL

OMRON

Temperature Controller

EN Instruction Manual

Thank you for purchasing the OMRON E5CSL/E5CWL 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.

OMRON CORPORATION

2113603-9A (CL1)

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.

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.	⊘
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 affects on the performance and functions of the product. Not doing so may occasionally result in unexpected events.

(1) 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.

(2) Use/store within the rated temperature and humidity ranges.
Provide forced-cooling if required.
(3) To allow heat to escape, do not block the area around the product.
Do not block the ventilation holes on the product.
(4) Be sure to wire properly with correct polarity of terminals.
(5) 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 mm²). (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.
(6) Do not wire the terminals which are not used.
(7) 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.
(8) Use this product within the rated load and power supply.
(9) 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.
(10) 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.
(11) 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.
(12) Do not use paint thinner or similar chemical to clean with. Use standard grade alcohol.
(13) Design system (control panel, etc) considering the 2 second of delay that the controller's output to be set after power ON.
(14) The output may turn OFF when shifting to certain levels. Take this into consideration when performing control.
(15) The number of non-volatile memory write operations is limited.

Specifications

Power supply voltage	100 to 240 VAC, 50/60 Hz
Operating voltage range	85% to 110% of the rated voltage
Power consumption	Approx. 3.5 VA
Sensor type	Thermocouple: K, J, T, R, or S (JIS C 1602-1995 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/s² for 10 min each in X, Y and Z directions
Vibration resistance	10 to 55 Hz, 20 m/s² for 2 h each in X, Y and Z directions
Malfunction shock	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
Ambient temperature	−10 to 55°C (with no freezing or condensation)
Ambient humidity	25% to 85%
Storage temperature	−25 to 65°C (with no freezing or condensation)
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: IP50, 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)

Wiring

Model Number Legends

Models with Single Display E5CSL-□□ (1 3)

Models with Dual Display E5CWL-□1□ (1 2 3)

1 Control output

R	Relay output: 250 VAC, 3 A
Q	Voltage output (for driving SSR): 12 VDC, 21 mA

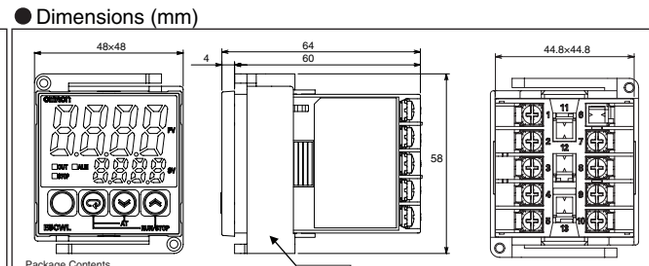
2 Alarm (E5CWL only)

1	Relay output: 250 VAC, 1 A (resistive load)

3 Sensor type

TC	Thermocouple (K, J, T, R, or S)
P	Platinum resistance thermometer (Pt100)

Dimensions (mm)

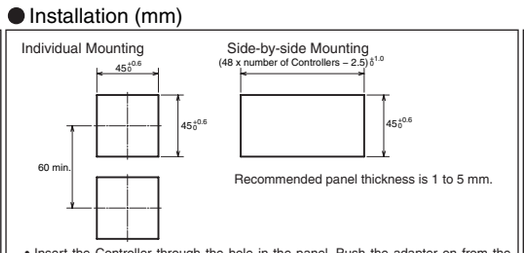


Package Contents
- Temperature Controller
- Adapter
- Instruction Manual

*The dimensions are the same for the E5CSL.

- Solderless terminal size: M3.5
- Terminal Cover: E53-COV19 (sold separately)
- Front Panel: E53-COV20 (sold separately)

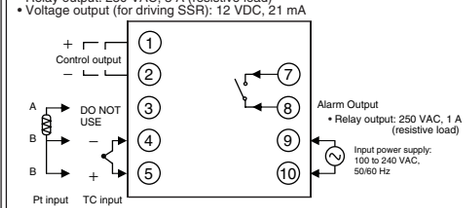
Installation (mm)



- Insert the Controller through the hole in the panel. Push the adapter on from the rear to secure the Controller.
- Make sure that the surrounding temperature does not exceed the allowable operating temperature given in the specifications, especially when two or more Controllers are mounted.

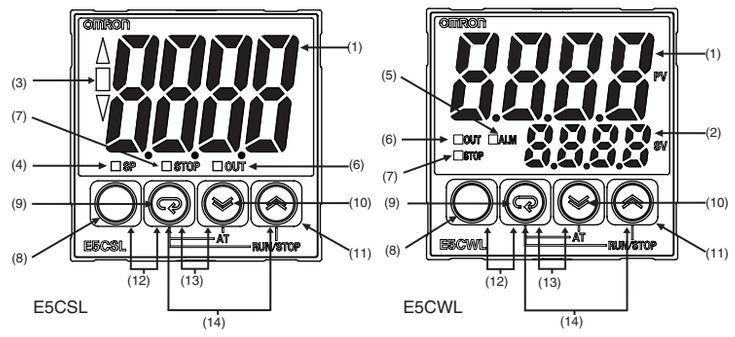
Connections

Control Output
- Relay output: 250 VAC, 3 A (resistive load)
- Voltage output (for driving SSR): 12 VDC, 21 mA



- 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.)

Front Panel Part Names and Functions

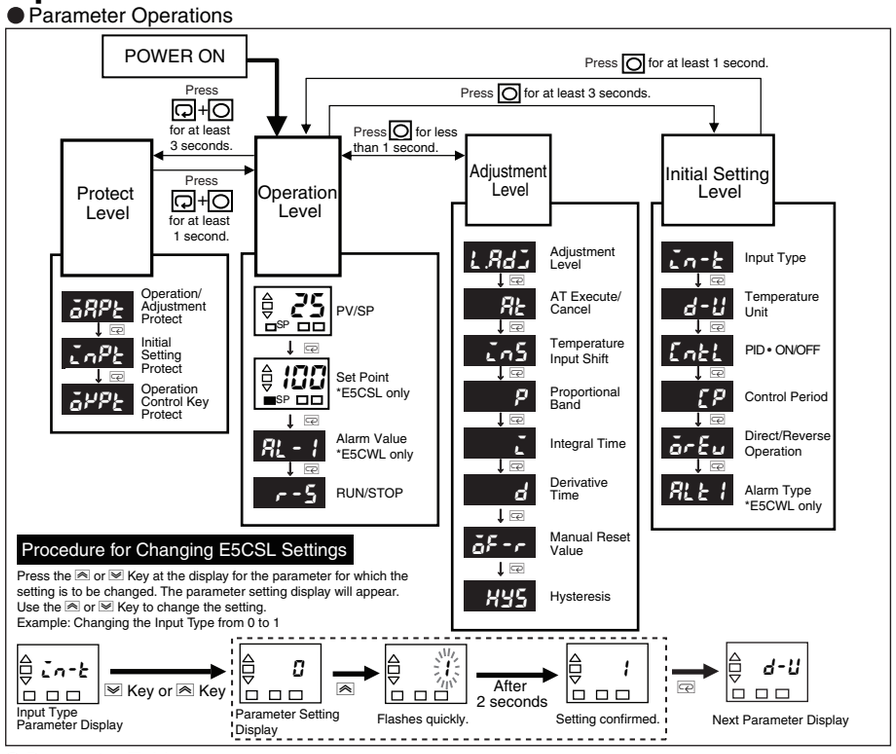


(1) Display No. 1	Displays the process value (PV) or parameter. For the E5CSL, the set point or parameter setting is also displayed.
(2) Display No. 2	Displays the set point (SP) or parameter setting.
(3) Deviation Indicators	Show the relation between the process value and the set point. ▲ Lit: The process value is more than 5°C/°F higher than the set point. ▼ Lit: The process value is more than 5°C/°F lower than the set point. ■ Lit: The process value is within 5°C/°F of the set point. The relevant deviation indicator will flash during autotuning.
(4) SP	Lit while the set point is displayed on display No. 1 (E5CSL only).
(5) ALM	Lit while the alarm is ON. Not lit while the alarm is OFF.
(6) OUT	Lit while the control output is ON. Not lit while the control output is OFF.
(7) STOP	Not lit during operation. Lit while operation is stopped.
(8)	Level Key: Changes the setting level.
(9)	Mode Key: Changes the parameter within the setting level.
(10)	Down Key: Reduces the setting.
(11)	Up Key: Increases the setting.
(12) +	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.
(13) +	Press these keys for at least 2 seconds to start or stop autotuning.*1
(14) +	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.

Operation Menu

Parameter Operations



Procedure for Changing E5CSL Settings

Press the or Key at the display for the parameter for which the setting is to be changed. The parameter setting display will appear.
Use the or Key to change the setting.
Example: Changing the Input Type from 0 to 1

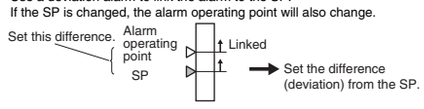
Alarms

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

The default alarm type is 2.

Deviation Alarm

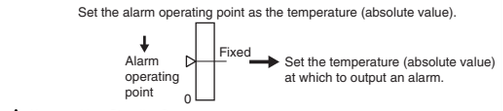
Use a deviation alarm to link the alarm to the SP.
If the SP is changed, the alarm operating point will also change.



Absolute Value Alarm

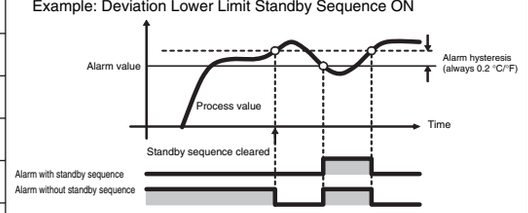
Use an absolute value alarm when the alarm is not linked to the SP.

Set the alarm operating point as the temperature (absolute value).



* 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
In-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
CntL	PID • ON/OFF	Set either 2-PID control or ON/OFF control.	onOF/PId	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)
orEv	Direct/Reverse Operation	Set either reverse option (heating control) or direct operation (cooling control).	or-r (reverse control) or-d (direct control)	Or-r (reverse control)
ALt1	Alarm Type	Set the alarm type.*E5CWL only.	*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 input type. *E5CWL only.	-1999 to 9999	0 (°C)
r-S	RUN/STOP	Start and stop control operation. *1	run/StoP	RUN

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

Display	Parameter name	Description	Setting/monitoring range	Default
LAdJ	Adjustment Level	This display indicates that you have moved to Adjustment Level.	—	—
At	AT Execute/Cancel	Starts and stops autotuning. (Displayed only when PID control is selected.) *1*2	oFF/on	OFF
InS	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 3999	233 (s)
d	Derivative Time	Set the derivative time in increments of 1 s. (Displayed only when PID control is selected.)	0 to 3999	40 (s)
oF-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
oAPt	Operation/Adjustment Protect	Set protection for Operation Level and Adjustment Level.	*Refer to table on the right.	0
InPt	Initial Setting Protect	Set protection for Initial Setting Level.	*Refer to table on the right.	1
oAPt	Operation Control Key Protect	Set protection for the AT Key and RUN/STOP Key (operation control keys).	*Refer to table on the right.	0

*1: Displayed only when Operation Control Key Protection is set to 4.
*2: The setting cannot be changed during autotuning. Autotuning will be stopped if you move to Initial Setting Level or stop control operation.
- Displays during Autotuning
E5CSL: The current deviation indicator will flash.
E5CWL: The AT Execute/Cancel characters on display No. 1 and the PV/SP characters on display No. 2 will flash.

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 input 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 input type is 8.

Troubleshooting

Display	Meaning	Action
S.Err (S.ERR)	Input error*1	Check the wiring of inputs, disconnections, short circuits and input type.
E111 (E111)	RAM memory error	Turn the power OFF then back ON again.*2
E111/SUM (E111)/(SUM) *3	Non-volatile memory error	Press the and 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 S.Err, 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: On the E5CSL, E111 and SUM will alternate on the display at 1-second intervals.
On the E5CWL, E111 will be displayed on display No. 1 and SUM will be displayed on display No. 2.

Protection

• Operation/Adjustment Protection

Level		Setting 0	1	2	3
Operation Level	Process value	○	○	○	○
	PV/SP	◎	◎	◎	○
	Others (Alarm Value)	◎	◎	×	×
Adjustment Level		◎	×	×	×

Default: 0
◎: Can be displayed and changed.
○: Can only be displayed.
×: Display or changing to another level is not possible.

• Initial Setting Protection

Level	Setting 0	1	2
Initial Setting Level	Do not set.	◎	×

Default: 1
◎: Can be displayed and changed.
×: Display or changing to another level is not possible.

• Operation Control Key Protection

Operation Control	Setting 0	1	2	3	4
AT Execute/Cancel (+)	○	×	○	×	△
RUN/STOP (+)	○	○	×	×	△

Default: 0
○: Operation control keys are enabled but operation control using parameters is disabled.
△: Operation control keys are disabled but operation control using parameters is enabled.
×: Operation control keys and operation control using parameters are disabled.

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