

Temperature Controller E5CS-X

1/16 DIN Sized Controller Offers Selectable Control, Alarm Modes

- Accurate to $\pm 0.5\%$ of full scale.
- Multiple temperature scale ranges allow flexibility to match application.
- Field-selectable temperature ranges in $^{\circ}\text{F}$ and $^{\circ}\text{C}$.
- Selectable ON/OFF and PID control with auto-tuning of proportional band.
- 8-function alarm, standard.
- Tamper-proof setting, faulty sensor compensation and controller diagnostics.
- Easy-to-read 11 mm high LED display.
- Nonvolatile memory backup.
- 3-year warranty.



Ordering Information

Temperature Controllers

Stock Note: Shaded models are normally stocked.

Item		Model		
Sensor input type		Thermocouple (Types J and K)	Platinum RTD (Pt: 100 Ω , DIN and JIS standards)	Interchangeable thermistor (THE types)
Output	Contact	E5CS-R1KJX-F	E5CS-R1PJX-F	E5CS-R1GX-F
	Voltage	E5CS-Q1KJX-F	E5CS-Q1PJX-F	E5CS-Q1GX-F

Note: Items in the following table are sold in Canada only.

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	Voltage	E5CS-Q1KJX	E5CS-Q1PJX	E5CS-Q1GX

Accessories (Order Separately)

Stock Note: Shaded models are normally stocked.

Description		Model
Protective cover	Hard plastic; protects front panel against dust, dirt and water drops	Y92A-48
Panel mounting adapter	Replacement for one supplied with each unit	Y92F-30

Specifications

Model		E5CS-□1KJX	E5CS-□1PX	E5CS-□1GX
Sensor input type		Thermocouple Type J (IC) and Type K (CA)	Platinum RTD (Pt: 100Ω) DIN or JIS standard	Thermistor (interchangeable type)
Supply voltage		100 to 240 VAC, 50/60 Hz; operates on 85 to 110% of rated voltage		
Power consumption		Approx. 7 VA		
Control output	Contact	Type	SPDT relay	
		Max. load	3 A, 250 VAC (resistive load)	
	Voltage	Logic load	12 VDC, 20 mA with short-circuit protection	
	Hysteresis		0.2% of full scale during ON/OFF control action	
	Response time	Output	2 seconds for output to change	
		Display	2 seconds for displayed indication to change	
	Service life	Mechanical	10 million operation minimum with contact output	
Electrical		100,000 operations minimum with contact output		
Alarm output		Type	SPST-NO relay	
		Max. load	1 A, 250 VAC (resistive load)	
		Setting range	Absolute value alarm: Same as control output setting range Others: 0 to full scale	
Setting accuracy		Set value coincides with indicated value, so no relative error exists		
Indication accuracy		±0.5% of full scale, ±1 digit max.		
Display range		-999 to 999 (limited to input type)		
Control modes	Type	ON/OFF and PID with automatic tuning of proportional band, switch selectable		
	Proportional band	3% to 20% (in PID mode) automatically adjusted according to the rise time of the controlled system		
	Reset time	4 minutes (in PID mode)		
	Rate time	0.4 minutes (in PID mode)		
	Proportional period	2 or 20 seconds, switch selectable		
	Sampling period	500 ms		
Materials		Plastic case		
Mounting		Fits 1/16 DIN panel cutout; includes panel mounting adapter		
Connections		Screw terminals		
Weight		170 g (6 oz.) without mounting adapter		
Enclosure ratings	Front panel	IP50, NEMA 4 with optional Y92A-48N waterproof cover		
	Rear panel	IP30		
	Terminals	IP00		
Approvals	UL	Recognized, File Number E68481		
	CSA	Certified, File Number LR59623		
	CE	Conforms to EN61010-1		
Ambient temperature	Operating	-10°C to 55°C (14°F to 131°F)		
	Storage	-25°C to 65°C (-13°F to 149°F)		
Humidity		35 to 85% RH		
Insulation resistance		20 MΩ minimum at 500 VDC		
Dielectric strength		2,000 VAC, 50/60 Hz for 1 minute between current-carrying terminals of different polarity		
Vibration	Mechanical durability	10 to 55 Hz, 0.75 mm (0.03 in) double amplitude in X, Y, and Z directions for 2 hours each		
	Malfunction durability	2 to 55 Hz, 2 G in X, Y, and Z directions for 10 minutes each		
Shock	Mechanical durability	30 m/s ² , in 6 directions, 3 times each		
	Malfunction durability	100 m/s ² , in 6 directions, 3 times each		

Temperature Ranges

Thermocouple Input Type

Input type	Type K						Type J					
Temperature range	0 to 200	0 to 300	0 to 400	0 to 500	0 to 600	0 to 999	0 to 999	0 to 200	0 to 300	0 to 400	0 to 500	
Scale indication	°C	°C	°C/°F	°C/°F	°C/°F	°C/°F	°F	°C	°C	°C/°F	°C/°F	
Unit of measure	1° C or F											

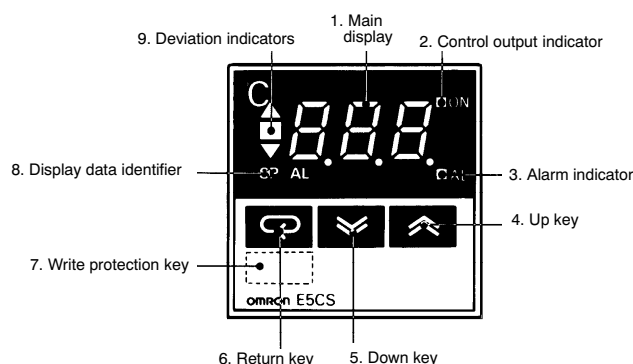
Platinum RTD Input Type

Temperature range	-50 to 50	0.0 to 50.0	-20 to 80	0.0 to 99.9	0 to 200	0 to 300	0 to 400	0 to 600	0 to 800
Scale indication	°C	°C	°C	°C/°F	°C/°F	°C	°C/°F	°F	°F
Unit of measure	1° C or F	0.1° C or F	1° C or F	0.1° C or F	1° C or F				

Thermistor Input Type

Temp. range	-50 to 50	0 to 100	50 to 150	100 to 200	150 to 300	-50 to 100	0 to 200	100 to 300	200 to 400	300 to 600	
Scale indication	°C						°F				
Unit of measure	1° C or F										

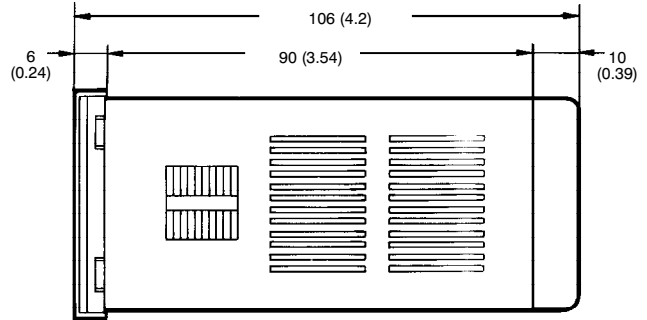
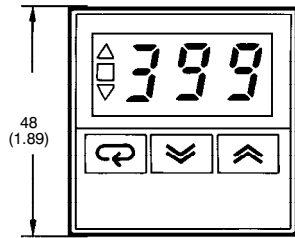
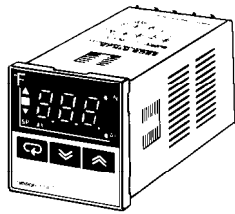
Nomenclature



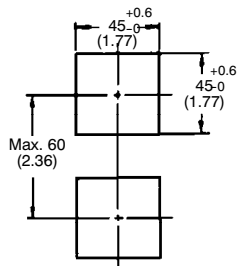
Key	Description	Key	Description
1	Main display sequentially displays the present temperature, set temperature, and an alarm value each time the return key is pressed.	7	The hidden write protection key provides protection against unauthorized setting of temperature and is used in conjunction with the internal "protection" switch. If the internal protection switch is set to ON, then to obtain Up and Down operation, the hidden key must be pressed simultaneously with the Up and Down keys. If the internal protection switch is set to OFF, changes can be made simply by pressing the Up and Down keys.
2	Control output indicator lights when the output is ON.		
3	Alarm indicator lights when the alarm output is ON.		
4	Up key increases the set temperature or alarm value when pressed. Increases the value quickly when held down.	8	Display data identifier lights SP when the set temperature is displayed on the main display and AL when an alarm value is displayed.
5	Down key decreases the set temperature or alarm value when pressed. Decreases the value quickly when held down.		
6	Return key changes the value displayed on the main display each time pressed.	9	Red deviation indicators light up an arrow when the present temperature is higher than the set temperature and light a down arrow when the present value is lower than the set temperature. The green block indicates the temperature deviation is within $\pm 1\%$ of the full scale.

Dimensions

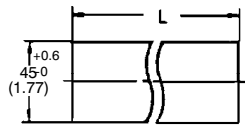
Unit: mm (inch)



Panel Cutout



Side-by-side Mounting of Several Temperature Controllers



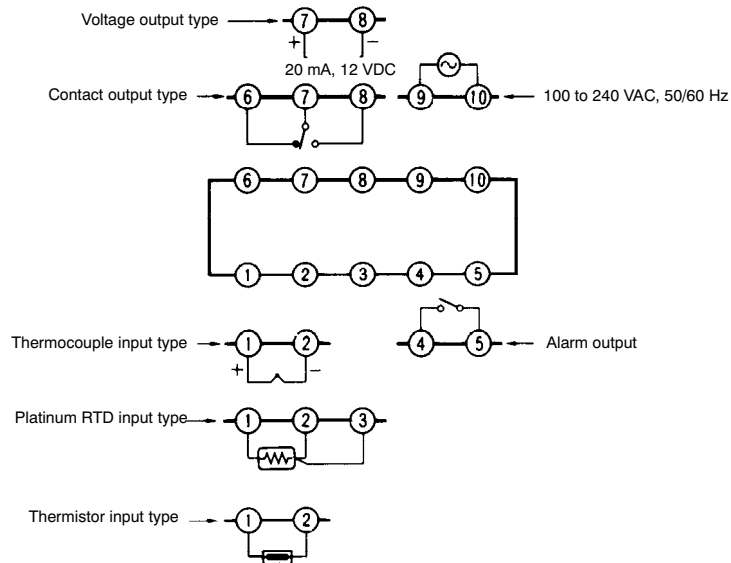
$$L = 48 \times \text{number of units} - 2.5$$

$$(1.89 \times \text{number of units} - 0.1)$$

Controllers	2	3	4	5	6
L	93.5 ⁺¹ ₋₀ (3.68)	141.5 ⁺¹ ₋₀ (5.57)	189.5 ⁺¹ ₋₀ (7.46)	237.5 ⁺¹ ₋₀ (9.35)	285.5 ⁺¹ ₋₀ (11.24)

- Note: 1. Recommended panel thickness is 1 to 8 mm (0.04 to 0.31 in).
 2. Because mounting brackets are attached to the top and bottom of a temperature controller, tight side-by-side mounting is possible.

Connections



Operation

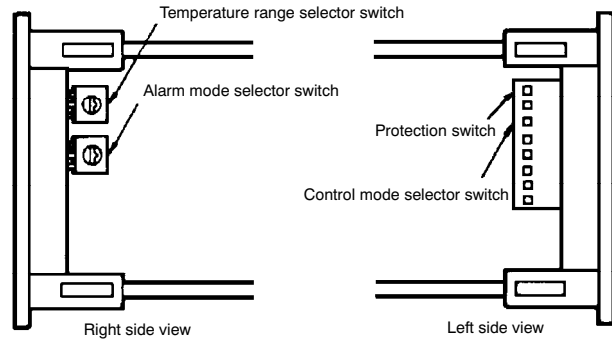
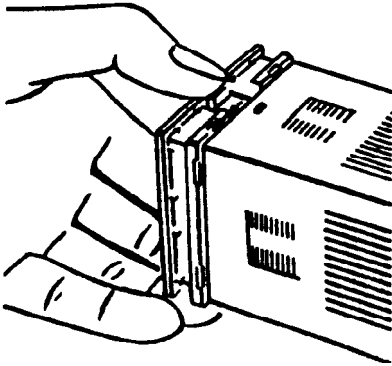
Settings Before Applying Power

Note: Always turn off the power supply to the temperature controller before changing any switch settings.

Before applying power to the temperature controller, set the following selector switches to specify the temperature range, functions and alarm mode.

Access to Internal Switches and Selectors

Push the tab on the underside of the front panel as you draw out the internal mechanism from the housing. The temperature range selector, and the alarm mode selector must all be set. A protection switch can also be set to protect settings. The following diagrams show the locations of these switches on the internal mechanism.



Select the desired temperature range by using the temperature range selector switch (rotary DIP type). The other rotary DIP switch is used to select one of eight alarm functions. Be sure the set temperature and alarm values are within the new range. Otherwise, the temperature controller automatically shifts these values to the maximum or minimum of the newly-set temperature range.

The protection switch may be used in conjunction with the front panel "hidden key" to prevent unauthorized changes to temperature settings. The switch is ON when it is pushed inwards in the direction of the white arrow.

The function selector switch is a 8-pin in-line DIP switch on the other side of the internal mechanism. Use it to select ON/OFF or PID control action, proportional period, control output, input shift function, temperature sensor input standard and scale indication for dual-scale temperature ranges.

When All Functions Have Been Selected

To Set Temperature

Press the return key until the SP indicator lights. Then set the desired temperature value by using the Up and Down keys.

To Set Alarm Value

Press the return key until the AL indicator lights. Then set the desired alarm value in units of °F or °C. If the present temperature exceeds the set alarm value, the alarm output will be issued.

Neither the set alarm value is displayed nor the AL indicator lights with the integral alarm mode setting switch set to 0 or 9. Be sure to check the alarm mode setting switch, located inside the housing, for proper setting.

In Case of Sensor Failure

The error message "FFF" or "---" will appear on the main display if the temperature sensor short-circuits or breaks.

Precautions

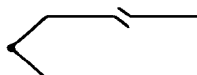
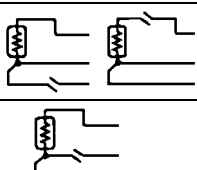

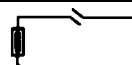

The E5CS-X temperature controller has self-diagnostic functions that display the following error messages to simplify troubleshooting.

Message	Cause	Control output
FFF	(1) Temperature has risen beyond temperature scale range (2) Thermistor has been short-circuited	OFF during heating (reverse) operation ON during cooling (normal) operation
---	(1) Temperature has fallen below temperature scale range (2) Thermistor has broken	ON during heating (reverse) operation OFF during cooling (normal) operation
FFF (blinks)*	(1) Failure has occurred in thermocouple or platinum RTD (2) Temperature has risen much beyond scale range	OFF
--- (blinks)*	(1) Failure has occurred in platinum RTD (2) Polarities (positive and negative) of thermocouple are reversed (3) Temperature has fallen much below scale range	OFF
E11 or E33*	(1) Memory failure (E11) display (2) Analog-to-digital converter failure (E33) display Temperature controller must be repaired if recovery is not made by turning power off once and on again.	Both control outputs and the alarm output are OFF

Note: *Key operations are disabled.

When the alarm outputs are used, an alarm output occurs when the “FFF” and “---” messages appear in the display. These displays indicate when the temperature has risen beyond or fallen below the temperature scale range.

■ Sensor Failure Indication

Condition	Display	Control output
Thermocouple sensor		
Break in sensor 	FFF blinks	OFF
Short-circuit	Ambient temperature	OFF
Platinum RTD sensor		
Break in sensor 	FFF blinks	OFF
	--- blinks	OFF
	Disconnection of two or three wires FFF blinks	OFF
Short-circuit 	--- blinks	OFF
Thermistor sensor		
Break in sensor 	---	ON during heating (reverse) action OFF during cooling (normal) action
Short-circuit 	FFF	ON during heating (reverse) action OFF during cooling (normal) action

Note: The resistance of the platinum RTD is 100 Ω at 0°C and increases to 140 Ω at 100°C.

Installation

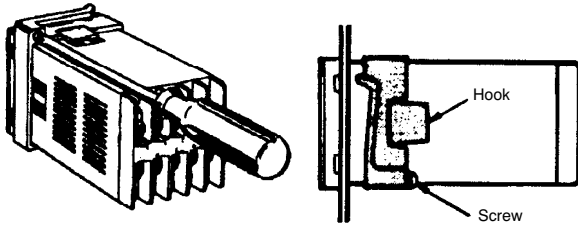
■ Mounting

All E5CS-X models conform to DIN 43700 standard. Recommended panel thickness is 1 to 4 mm (0.04 to 0.16 in).

Insert the temperature controller, back end first, into the panel cutout. Mount the adapter (Y92F-30) supplied with each unit by pushing it forward from the back of the temperature controller. Push the adapter as close as possible to the front panel of the temperature controller to eliminate the gap between them. Then, secure the adapter with screws as shown.

Removal

Loosen the screws on the adapter and push the hook open to remove the adapter.

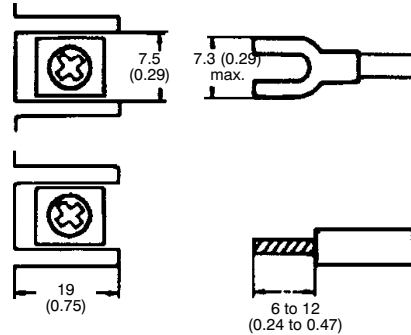


■ Connections

Connection Examples

Use M3.5 solderless terminals with the temperature controller's M3.5 self-rising pressure plate screws.

For solder-dipped leads, strip the lead wire 6 to 12 mm (0.24 to 0.47 in) and carefully insert the wire tip. Do not tighten the terminal screw with excessive force.



Precautions

■ Environment

Do not install the temperature controller in a location where there is a lot of dust or corrosive gases. Also avoid a location where the temperature controller is subjected to heavy vibration, shock, splashes of water or oil, and high temperatures.

Separate the temperature controller from equipment that generates strong, high-frequency electrical noise such as welding equipment.

Sensor Input Connections

The lead wires connecting the platinum RTD to the temperature controller must be separated from the power lines and the load lines, wherever possible, to prevent them from being inducted by electrical noise.

Use the specified compensating conductors for the thermocouple input type temperature controllers.

Use lead wires having a small resistance for the platinum RTD type temperature controllers.

Sequence Circuit

Several seconds are required until the relay is turned ON after the power has been applied to the temperature controller. Be sure to take this time lag into consideration when designing a sequence circuit which incorporates this temperature controller.

■ Recalibration

The E5CS-X temperature controller can be recalibrated by a factory-authorized repair service. Contact Omron for the location near you.

Unauthorized recalibration of the controller will void the warranty and may lead to erratic operation.

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ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

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

OMRON[®]**OMRON ELECTRONICS LLC**

One Commerce Drive
Schaumburg, IL 60173

847-843-7900

For US technical support or other inquiries:

800-556-6766**OMRON CANADA, INC.**

885 Milner Avenue
Toronto, Ontario M1B 5V8

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Global - <http://www.omron.com>
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