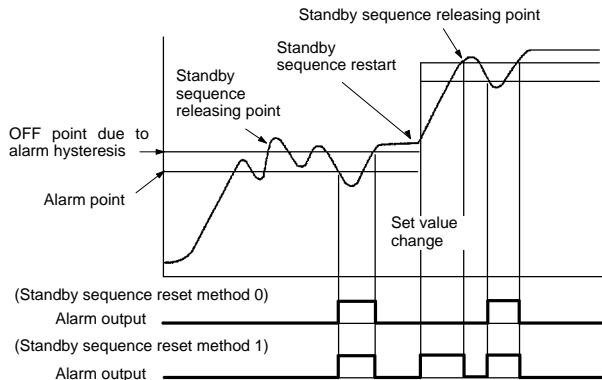


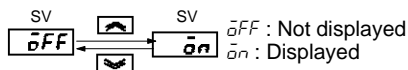
rE5t Standby Sequence Reset Method

It is possible to select the restart conditions of the standby sequence of the alarm attached with standby sequence. If this parameter is set to 0, the standby sequence will restart when the set point, alarm value, or input shift value is changed or the moment the E5□J starts operating including the moment the E5□J is turned on. If this parameter is set to 1, the standby sequence will restart only the moment the E5□J is turned on. The following timing chart is an example of a lower limit alarm attached with standby sequence.



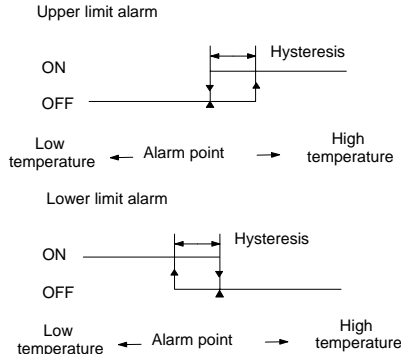
Input Shift Display

It is possible to select to display or not to display the input shift function on display level 1 with this parameter.



ALH1 Alarm 1 Hysteresis and ALH2 Alarm 2 Hysteresis

It is possible to adjust alarm sensitivity with both these parameters within a range of 0.1 to 999.9. Change the alarm sensitivity of the E5□J if the alarm output chatters.



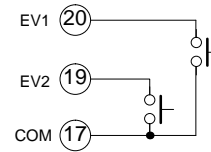
The alarm output will be OFF when the process value is within the alarm hysteresis range when the E5□J restarts (e.g., when the E5□J is turned on).

SL-L Set Point Lower Limit Value (°C/°F) and SL-UH Set Point Upper Limit Value (°C/°F)

It is possible to limit the set point changeable range with both these parameters. For example, if the set point lower limit value is set to 0°C and the set point upper limit value is set to 400°C, the set point can be changed only between 0°C and 400°C.

EU-2 Event Input 2 Type Selection

It is possible to select the function of event input 2. If 0 (set point value selection) is selected, SP-2 and SP-3 will be displayed on display level 1 and if 1 is selected RUN/STOP will be selected. When 0 is selected, the set point can be selected from the following.



EV1	EV2	Set point to be selected
Open	Open	SP0
Short-circuit	Open	SP1
Open	Short-circuit	SP2
Short-circuit	Short-circuit	SP3

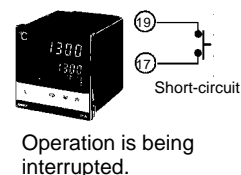
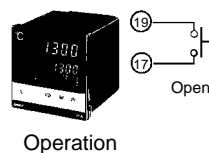
■ Starting Control Operation

The E5□J will start control operations as soon as power is turned on until power is turned off. Turn off the power and then turn it back on after setting the desired parameters.

By short-circuiting the EV2 terminals (terminals 17 and 19) of the E5AJ/E5EJ incorporating event input, control operation can be interrupted.

Note: Always turn on the Controller and the load simultaneously. Never turn on the load when the Controller is already turned on. Doing so will disable proper self-tuning and optimum control.

For example, when setting the parameters to the Controller with the load turned off, turn off the Controller once after completing the setting and then turn it on again simultaneously with the load. Or, switch event input 2 from STOP to RUN.



■ Error Messages

The Temperature controller is provided with self-diagnostic functions, and will display an error message on the PV display when an error is detected.

Message	Error	Error output status		Item to be checked
		Control output	Alarm output	
<i>S.Err</i> (S.Err)	Input error	OFF (2 mA max.)	Processes the error as an abnormally high temperature error.	1. Check if the input is outside the possible control range (i.e., $\pm 10\%$ of the set temperature range) (see note). 2. Check if the settings of the inputs are wrong. 3. Check if there is any wiring mistake, wire burnout, or short-circuit.
<i>E111</i> (E111)	Memory error	OFF (2 mA max.)	OFF	Turn off and then turn on the Temperature Controller. If the display does not change then, repairs are necessary.
<i>E333</i> (E333)	A/D converter error	OFF (2 mA max.)	OFF	If the display returns to normal, the Temperature Controller may have been influenced by noise. Check if noise is being generated.
<i>R.Err</i> (A.Err)	Calibration data error (displayed for 3 s when the Temperature Controller is turned on)	Normal operation (accuracy not guaranteed)		Re-calibration is necessary.

Note: When the input is within the possible control range but outside the possible display range (i.e., -1999 to 9999), *□□□□* will be displayed if the value is smaller than -1999 and *□□□□* will be displayed if the value is larger than 9999 , however, the control and alarm output functions of the Temperature Controller will work normally.

■ Fuzzy Self-tuning

Fuzzy self-tuning is a function that enables the E5□J to calculate the most suitable PID constants for the controlled object.

Features

The E5□J judges by itself when to perform fuzzy self-tuning.

Fuzzy Self-tuning Function

The fuzzy self-tuning function has three modes.

In SRT (step response tuning) mode, the PID constants are tuned using a step response method at the time the set point is changed.

In DT (disturbance tuning) mode, the PID constants are amended so that the controlled temperature will be within the target range set in advance when there is external disturbance.

In HT (hunting tuning) mode, when hunting occurs, the PID constants are amended to suppress the hunting.

Note: Be sure to turn on the power supply to the load either before or simultaneously with the start of Temperature Controller operation.

Dead time will be measured from the time the Temperature Controller starts operating. If a load such as a heater is turned on after the Temperature Controller is turned on, dead time longer than the actual value will be measured and inappropriate PID constants will be obtained. If an extremely large amount of dead time is measured, the control amount will be set to 0% for a short period of time before being returned to 100%, and the constants will then be re-tuned. Retuning is performed only for large amounts of dead time, so be sure to follow the precaution given above when starting operation.

Startup Conditions of SRT

SRT will start if the following conditions are satisfied simultaneously when the E5□J is turned on or the set point is changed.

At the time the E5□J starts operating	At the time set point is changed
1. The set point at the time the E5□J starts operating is different from the set point used at the time SRT was last executed (see note).	1. The new set point is different from the set point used at the time SRT was last executed (see note).
2. The difference between the set point and the process value at the time the E5□J starts operating is larger than the present proportional band value (P) x 1.27+4.	2. The set point changing range is larger than the present proportional band value (P) x 1.27+4.
3. The process value at the time the E5□J starts operating is smaller than the set point in reverse operation and larger than the set point in normal operation.	3. The process value is in stable condition before the set point is changed.
	4. A larger set point value is set in reverse operation and a smaller set point is set in normal operation.

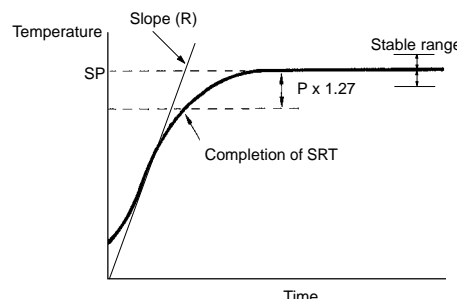
Note: The last SRT-executed set point is set to 0 before shipping and when changing from 2-PID control to 2-PID control with fuzzy self-tuning.

Imposition Completion Condition of Step Control Amount

In order to prevent overshooting, the step controlled amount must be imposed continuously only while the present deviation is the same as or greater than the value obtained from the proportional band (P) x 1.27. The step control will not be applied when the deviation becomes smaller than this value.

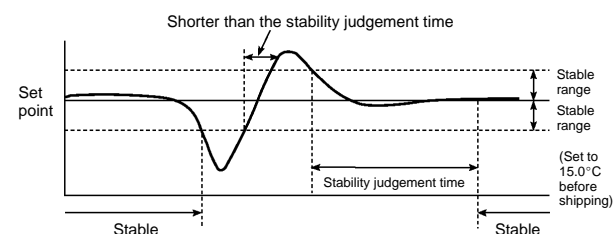
PID Constant Refreshing Conditions

If the step control amount is applied before the maximum temperature slope (R) is obtained, SRT will not renew any PID constant. If the proportional band obtained from the R and L values that were measured before the imposition had been completed is larger than the present proportional band, the PID constants will be renewed because the measured value is in the direction towards the suitable proportional band value, and the set point at that time will be the SRT-executed set point.



Stable Temperature Status

If the temperature is within the stable range for a certain time, it is deemed that the temperature is stable. This time is called stability judgement time. Like PID constants, stability judgement time is adjusted with fuzzy self-tuning according to the characteristics of the object to be controlled. Fuzzy self-tuning will not be activated if the temperature is stable because the Temperature Controller deems that temperature control is smooth.



Balanced Status

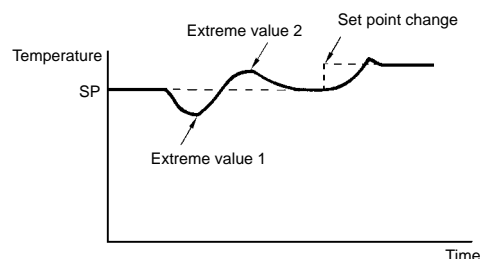
If the process value is within the stable range for 60 s when there is no output, it is deemed that the the temperature is balanced.

Startup Conditions of DT

1. DT will start if the temperature that has been stable varies due to external disturbance and the deflection of the temperature exceeds the stable range, and then the temperature becomes stable, provided that the number of maximum temperature values is less than four.

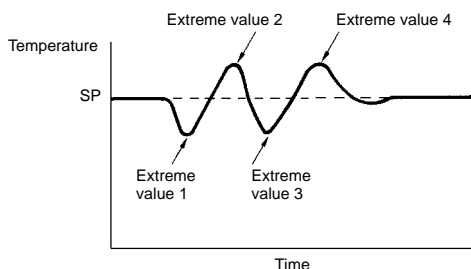
2. DT will start if the set point is changed under the condition that SRT does not start and the temperature becomes stable, provided that the number of maximum temperature values is less than four.

If there are four or more maximum temperature values, HT will start.



Startup Conditions of HT

HT will be ON when there is hunting with four or more maximum temperature values (extreme values) while SRT is not being executed.



Note: In specific applications where temperature varies periodically due to disturbance, internal parameters need to be adjusted. For details, refer to *E5□J Operation Manual*.

■ Auto-tuning

Starting Auto-tuning

Auto-tuning can be started by using the following procedure. Use this procedure when appropriate results are not achieved via fuzzy self-tuning.

1. Turn ON pin 3 of the function selector switch to select the 2-PID control mode (refer to *page 8*).
2. Press the Level Key and the Display Key simultaneously for 1 s or longer to start auto-tuning.

Conditions that Prevent Auto-tuning

You will not be able to start auto-tuning when any of the following conditions exist.

- When the control mode is set for ON/OFF control or 2-PID control with fuzzy self-tuning.
- When an engineering level parameter is displayed.
- When the key protection switch is set to \overline{SP} or ALL.
- When the remote/local setting is set to remote.
- When the RUN/STOP setting is set to STOP.
- When a sensor error, memory error, or A/D converter error has occurred.

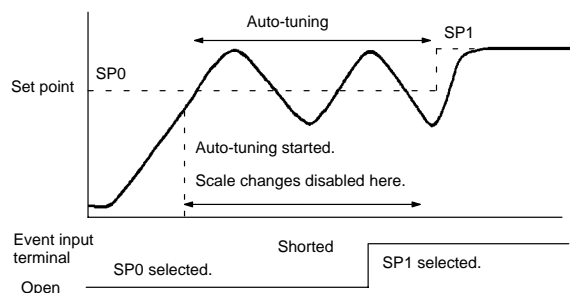
Force-ending Auto-tuning

Auto-tuning will be forced to end for any of the following conditions.

- When the Temperature Controller is turned off.
- When the RUN/STOP setting is changed to STOP.
- When a sensor error occurs.
- When the Level Key and the Display Key are pressed simultaneously for 1 s or longer.

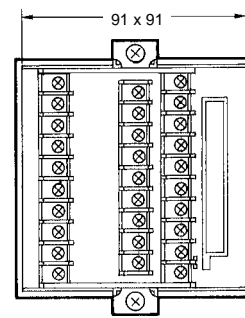
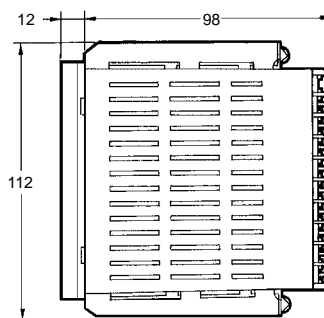
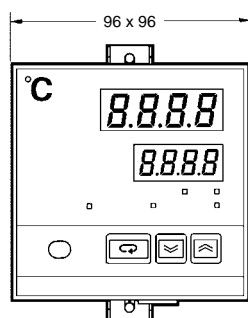
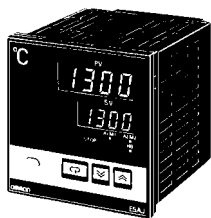
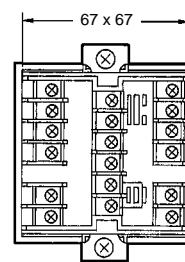
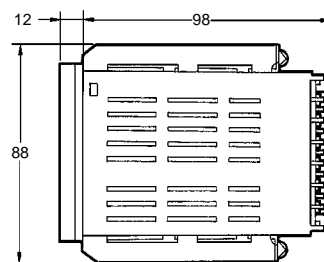
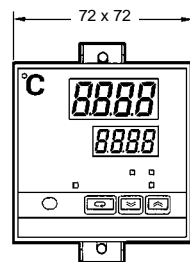
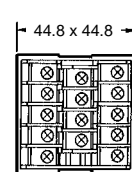
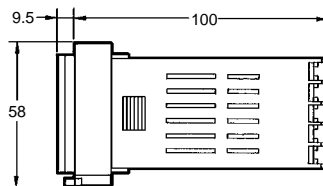
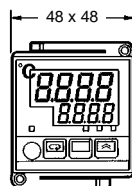
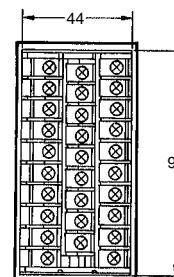
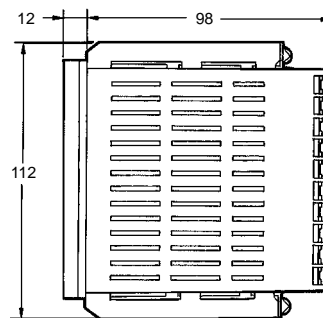
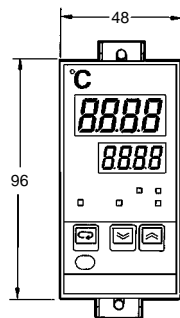
Changing Parameters during Auto-tuning

- Parameters cannot be changed during auto-tuning, but the remote/local setting can be changed.
- The SP also cannot be changed via the event input during auto-tuning, but the event input status can be changed and the SP will be changed after auto-tuning has been completed.



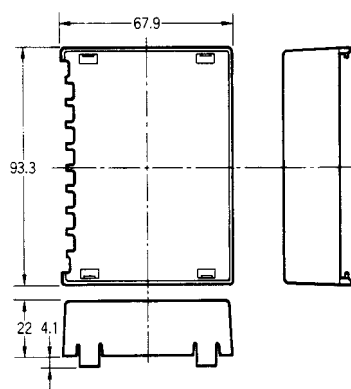
Dimensions

Note: All units are in millimeters unless otherwise indicated.

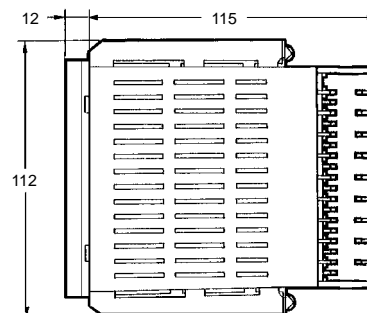
E5AJ**E5BJ****E5CJ****E5EJ**

Terminal Covers

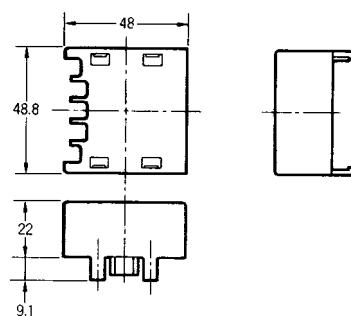
E53-COV02



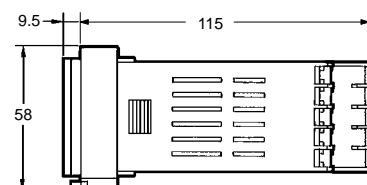
E5AJ with Terminal Cover



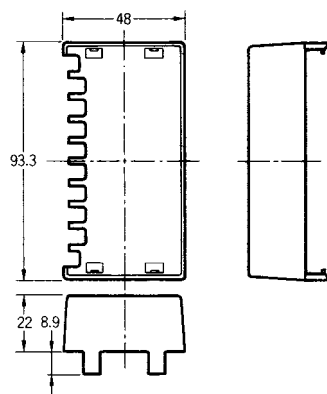
E53-COV04



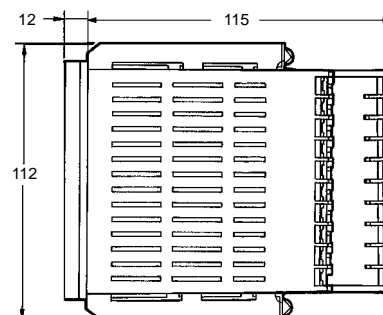
E5CJ with Terminal Cover



E53-COV03

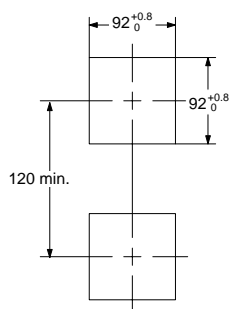


E5EJ with Terminal Cover

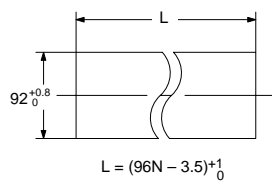


Panel Cutout

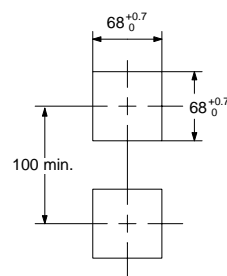
E5AJ



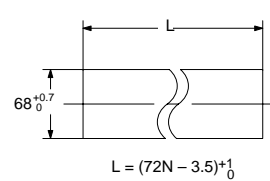
Side-by-side Mounting of N Controllers



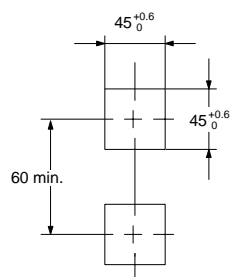
E5BJ



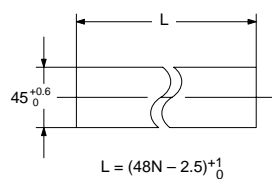
Side-by-side Mounting of N Controllers



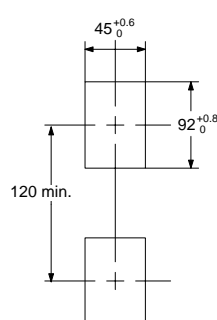
E5CJ



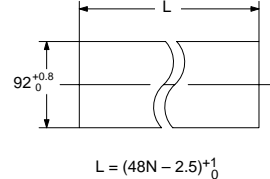
Side-by-side Mounting of N Controllers



E5EJ



Side-by-side Mounting of N Controllers

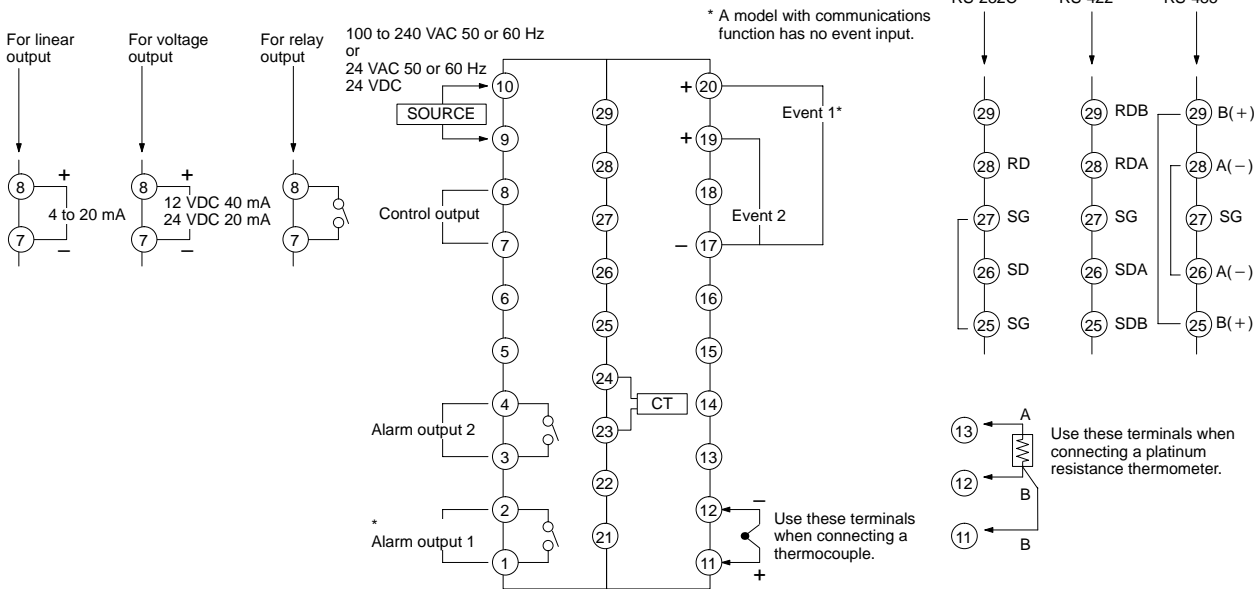


- Note:**
1. Recommended panel thickness is 1 to 4 mm for the E5CJ and 1 to 8 mm for the E5AJ, E5BJ, and E5EJ.
 2. Close side-by-side mounting is possible (in a horizontal direction).

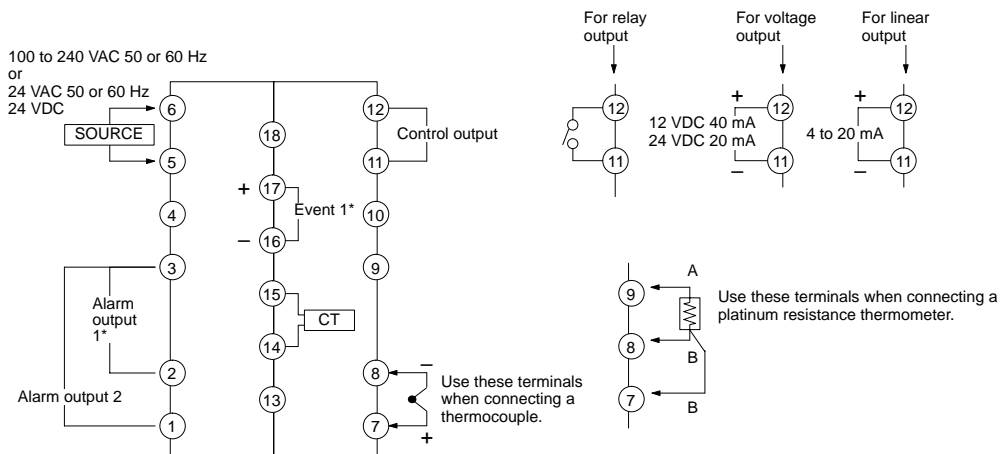
Installation

Note: No event input is insulated from the voltage or current output.

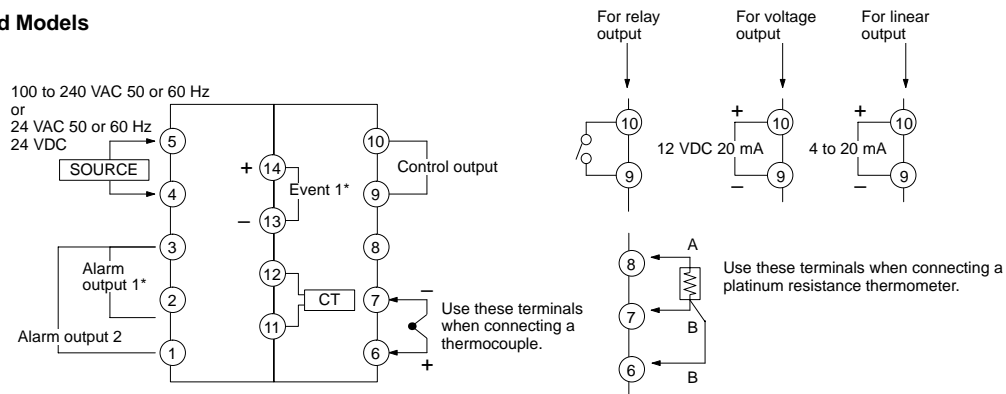
E5AJ/E5EJ



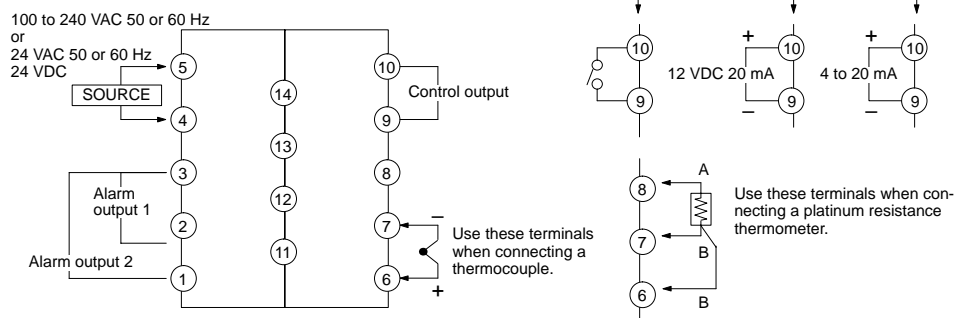
E5BJ



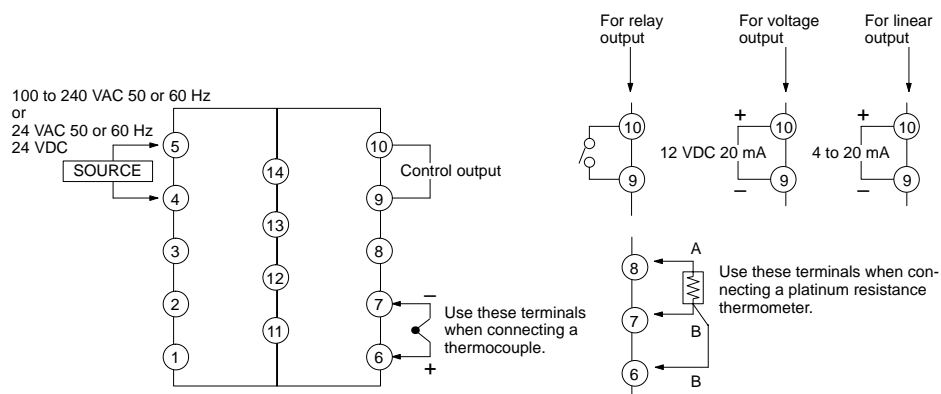
E5CJ-□2□B Standard Models



E5CJ-□2 Simple Models



E5CJ-□ Simple Models



Note: Always turn on the Controller and the load simultaneously. Never turn on the load when the Controller is already turned on. Doing so will disable proper self-tuning and optimum control.

For example, when setting the parameters to the Controller with the load turned off, turn off the Controller once after completing the setting and then turn it on again simultaneously with the load. Or, switch event input 2 from STOP to RUN.

- * The alarm output 1 and heater burnout alarm are integrated into one general alarm.
- * The event input is not electrically isolated from the voltage output or current output.

Precautions

Mounting

The dimensions of the Temperature Controller conform to DIN 43700. Recommended panel thickness is 1 to 8 mm for the E5AJ, E5BJ, and E5EJ, and 1 to 4 mm for the E5CJ.

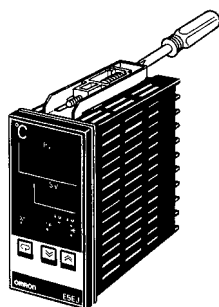
The mounted Temperature Controller must be horizontally level.

Do not install the Temperature Controller in a location exposed to excessive dust or corrosive gases. Moreover, avoid locations subject to heavy vibration or shock, water or oil spray, or high temperatures. Any of these conditions will affect product life.

Isolate the Temperature Controller from equipment that generates strong, high-frequency noises such as high-frequency welders, because such equipment may prevent proper operation.

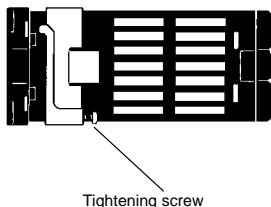
E5AJ/E5BJ/E5EJ

Two mounting brackets are provided with the Temperature Controller. Mount one of the brackets to the top and the other one to the bottom of the Temperature Controller. Turn the ratchets of the mounting brackets clockwise with a Phillips screwdriver until they snap. Insert the unit back into the case by pushing the unit until it clicks into place.



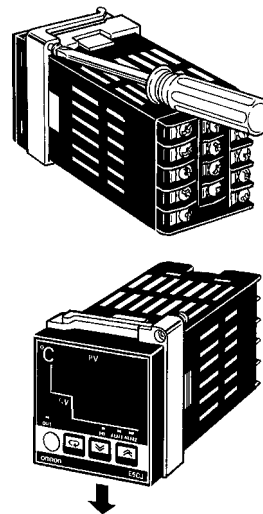
E5CJ

Insert the Temperature Controller into the square hole of the panel and insert an adapter from the backside so that there will be no space between the Temperature Controller and the panel. Then secure the Temperature Controller with a screw.



Dismounting

Loosen the screw of the adapter for dismounting.



Connection Example

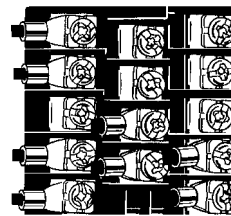
With Solderless Terminal

Use M3.5 x 8 solderless terminals with the Temperature Controller's M3.5 self-rising pressure plate screws.

Solder-dipped Leads

Strip 6 to 8 mm of the lead wires and carefully arrange the wire tips. Do not tighten the terminal screw with excessive force, because doing so may damage them. The terminal block of the Temperature Controller is constructed so that the lead wires can be connected to all the terminals from the same direction.

Example: E5CJ



Input Type Connection

To reduce inductive noise influence, the lead wires connecting the input type to the Temperature Controller must be separated from the power lines and load lines.

Use the specified compensating conductors for thermocouples. Use lead wires having a small resistance for platinum resistance thermometers.

Sequenced Circuits

Several seconds are required until the relay is turned ON after power has been supplied to the Temperature Controller. Therefore, take this time delay into consideration when designing sequenced circuits which incorporate a Temperature Controller.

■ Watertight Cover

- Four sizes (96 x 96, 72 x 72, 48 x 96, 48 x 48) are available.
- Conforms to IP66 or NEMA4 (indoors).

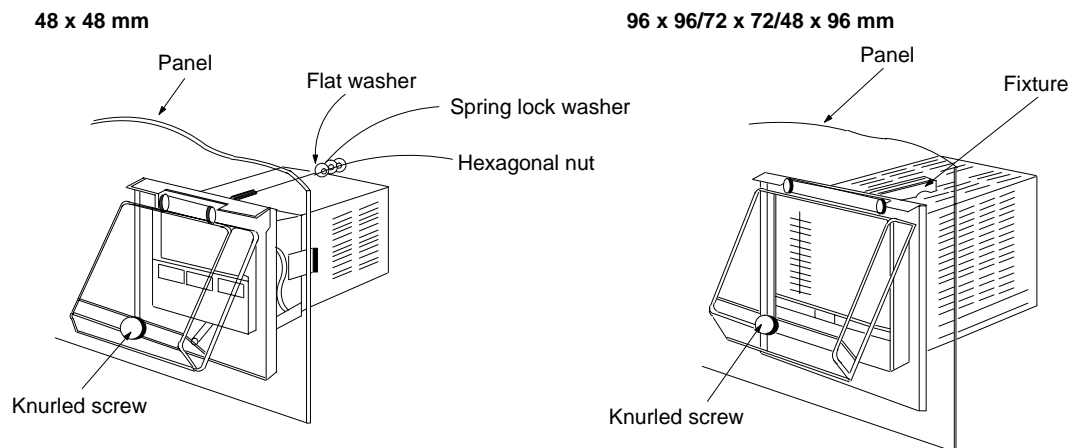
Ordering Information

Size	96 x 96 mm	72 x 72 mm	48 x 96 mm	48 x 48
Model	Y92A-96N	Y92A-72N	Y92A-49N	Y92A-48N

Materials

Front cover	94V-2 polycarbonate
Packing	Chloroprene rubber
Panel	SUS304

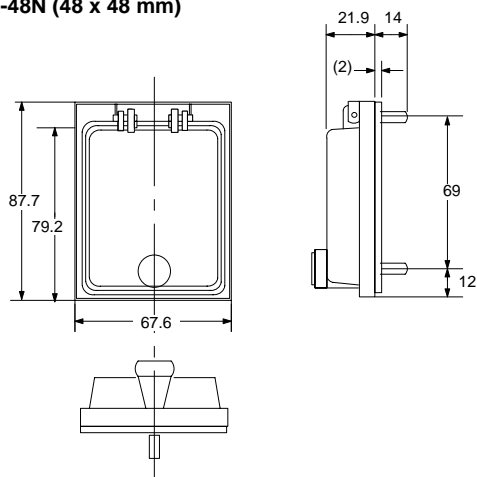
Nomenclature



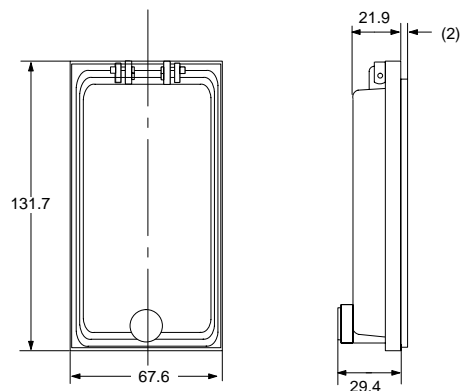
Note: Tighten the knurled screw to a torque of 0.03 N • m (3 kgf • cm) and the hexagonal nut to a torque of 0.05 N • m (5 kgf • cm).

Dimensions

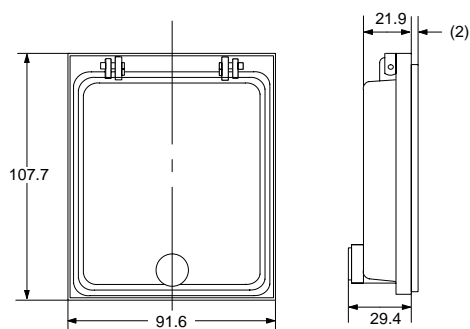
Y92A-48N (48 x 48 mm)



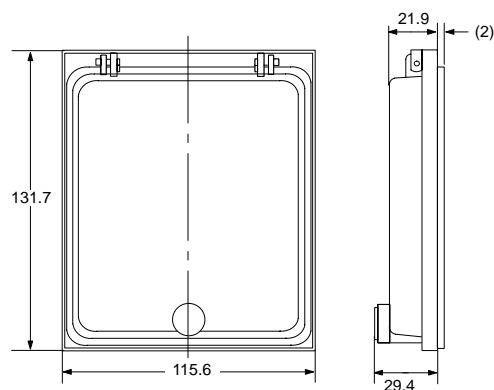
Y92A-49N (48 x 96 mm)



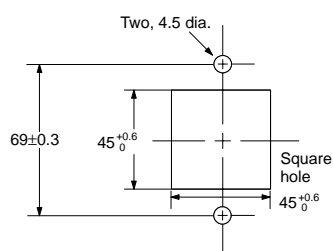
Y92A-72N (72 x 72 mm)



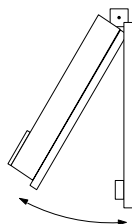
Y92A-96N (96 x 96 mm)

**Panel Cutout**

Y92A-48N (48 x 48 mm)

**Precautions**

It is possible to open or close the front cover by untightening or tightening the knurled screw.



Be sure to take the space required for the opening and closing of the front cover into consideration when installing the Watertight Cover.

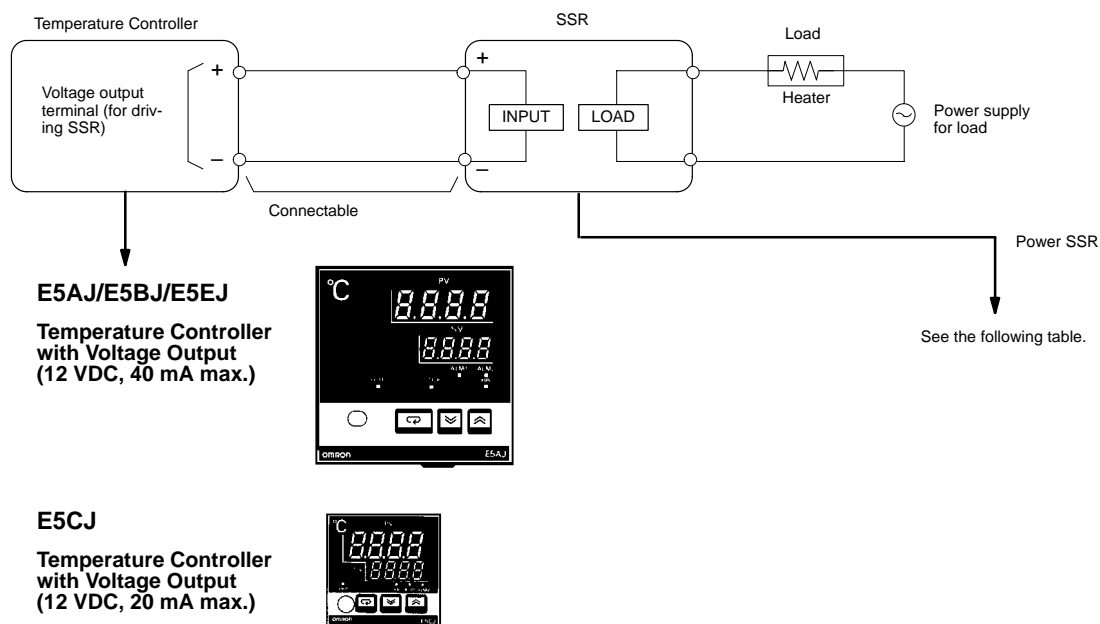
The front cover is made of polycarbonate, which can be cleaned using water, methanol, or ethanol.

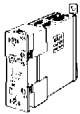

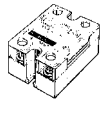
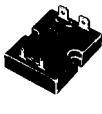

Regularly check the packing, the quality of which will deteriorate over the process of time.

The front cover can be mounted in any direction.

■ SSR

Connection Example of Temperature Controller and SSR



Model	G3PA-VD 240 V: 10 A, 20 A, 40 A, 60 A 480 V: 20 A, 30 A	G3NH 75 A, 150 A	G3NA 240 V: 5 A, 10 A, 20 A, 40 A 480 V: 10 A, 20 A, 40 A	G3NE 5 A, 10 A, 20 A	G3B 5 A
Appearance					
SSRs connected in parallel	E5AJ/BJ/EJ: 5 pcs. (8 pcs.) E5CJ: 3 pcs. (4 pcs.) (see note)	E5AJ/BJ/EJ: 8 pcs. E5CJ: 4 pcs.	E5AJ/BJ/EJ: 6 pcs. E5CJ: 3 pcs.	E5AJ/BJ/EJ: 2 pcs. E5CJ: 1 piece	E5AJ/BJ/EJ: 5 pcs. E5CJ: 2 pcs.
Rated input voltage	5 to 24 VDC	5 to 24 VDC	5 to 24 VDC	12 VDC	5 to 24 VDC
Features	Thin, monoblock construction with heat sink	For high-power heater control	Standard model with screw terminals	Compact, low-cost model with tab terminals	Socket, model with 5-A switching capacity

Note: The number of Units in parentheses is for the 400-V type.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

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

Cat. No. H062-E1-5A In the interest of product improvement, specifications are subject to change without notice.

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