

# Ramp/Soak Process Controller E5AK-T/E5EK-T

## Advanced Ramp/Soak Process Controllers Ideal for Worldwide Use

- E5AK-T offers up to eight patterns of simple programming control (4 patterns for E5EK-T), with 16 steps per pattern.
- Temperature and analog inputs in a modular structure, one-stock type.
- High-accuracy: 100 ms sampling (for analog input).
- Conforms to international EMC and safety standards.
- IP66/NEMA 4 (indoor use) front face.
- Serial communications (RS-232C, RS-422 and RS-485) and transfer output (4 to 20 mA).
- Position-proportional control models available for valve control applications.
- Heat/Cool control.
- 3-year warranty.



## Ordering Information

When ordering, order control output boards and option boards separately. Example: for a relay control output, order the E53-R output board in addition to the standard Process Controller (E5AK-T/E5EK-T). Also specify the current transformer.

### ■ Process Controllers

Description	DIN size	Supply voltage	Model
Standard model with terminal cover	1/4 DIN (96 x 96 mm)	100-240 VAC	E5AK-TAA2-500 AC100-240
			E5AK-TAA2 AC100-240
Position-proportional model with terminal cover (See Note 3)	1/4 DIN (96 x 96 mm)	100-240 VAC	E5AK-TPRR2-500 AC100-240
			E5AK-TPRR2 AC100-240
Standard model with terminal cover	1/8 DIN (48 x 96 mm)	100-240 VAC	E5EK-TAA2-500 AC100-240
			E5EK-TAA2 AC100-240
Position-proportional model with terminal cover (See Note 3)	1/8 DIN (48 x 96 mm)	100-240 VAC	E5EK-TPRR2-500 AC100-240
			E5EK-TPRR2 AC100-240

- Note: 1. When using the heater burnout alarm function with a standard model, the linear output board cannot be used for the control outputs (heat).
2. The Process Controller provides transfer outputs at 4 to 20 mA for the PV and SP values and control outputs at 4 to 20 mA for the current outputs.
3. Position-proportional models are intended for motorized valves (not 4 to 20 mA modulating valves). These use two relays ("open" and "close") which will turn a motor clockwise or counter-clockwise, thus opening or closing a valve.
4. Part numbers ending in -500 available at Omron USA, non -500 numbers available in Omron Canada only. Models with -500 have a terminal cover for finger protection.

## ■ Optional Output Boards

Description	Specifications	Compatible controller	Max. quantity	Model
Relay	SPST, 5 A, 250 VAC	E5AK/E5EK	2	<b>E53-R</b>
SSR (solid state relay)	1 A, 75 to 250 VAC	E5AK/E5EK	2	<b>E53-S</b>
Voltage pulse	NPN, 12 VDC	E5AK/E5EK	2	<b>E53-Q</b>
	NPN, 24 VDC	E5AK/E5EK	2	<b>E53-Q3</b>
	PNP, 24 VDC	E5AK/E5EK	2	<b>E53-Q4</b>
Linear current	4 to 20 mA	E5AK/E5EK	2	<b>E53-C3</b>
	0 to 20 mA	E5AK/E5EK	2	<b>E53-C3D</b>
Linear voltage	0 to 10 VDC	E5AK/E5EK	2	<b>E53-V34</b>
	0 to 5 VDC	E5AK/E5EK	2	<b>E53-V35</b>
Computer communications	RS-232C	E5AK/E5EK	3/1	<b>E53-AK01</b>
	RS-422	E5AK/E5EK	3/1	<b>E53-AK02</b>
	RS-485	E5AK/E5EK	3/1	<b>E53-AK03</b>
Event input	For remote set point	E5AK/E5EK	3/1	<b>E53-AKB</b>
Transfer output	4 to 20 mA	E5AK/E5EK	3/1	<b>E53-AKF</b>

Note: If the control period is less than 5 seconds, use an SSR (solid state relay) or pulse voltage output board.

## ■ Accessories (Order Separately)

Description	Specifications	Compatible controller	Max. quantity	Model
Current transformer; order only if using heater burnout alarm function	50 A load, 5.8 mm hole dia.	E5AK/E5EK	1	<b>E54-CT1</b>
	120 A load, 12 mm hole dia.	E5AK/E5EK	1	<b>E54-CT3</b>
Terminal cover (supplied with -500 models)	Provides finger protection from terminals (VDE0106 part 100)	E5AK	1	<b>E53-COV0809</b>
		E5EK	1	<b>E53-COV08</b>
Software	For setup and monitoring; requires optional computer communications board	All	1	<b>Thermo tools</b> (See Note)

Note: Contact Omron for current version information.

# Specifications

## ■ Ratings

<b>Model</b>		E5EK/AK-T (Standard)
<b>Supply voltage</b>		100 to 240 VAC, 50/60 Hz
<b>Power consumption</b>	<b>E5AK-T</b>	16 VA
	<b>E5EK-T</b>	15 VA
<b>Operating voltage range</b>		85% to 110% of rated supply voltage
<b>Input</b>	<b>Thermocouple</b>	K, J, T, E, L, U, N, R, S, B, W, PLII
	<b>Platinum resistance thermometer</b>	JPt100, Pt100
	<b>Current input</b>	4 to 20 mA, 0 to 20 mA (Input impedance: 150 $\Omega$ )
	<b>Voltage input</b>	1 to 5 V, 0 to 5 V, 0 to 10 V (Input impedance: 1 M $\Omega$ )
<b>Control output</b>	<b>Standard model</b>	According to Output Unit (see <i>Output Board Ratings and Characteristics</i> )
	<b>Position-proportional model (See Note)</b>	2 Relay outputs: SPST-NO, 1 A at 250 VAC (including inrush current)
<b>Auxiliary output</b>		SPST-NO, 3 A at 250 VAC (resistive load)
<b>Control method</b>		ON/OFF or advanced PID control (with auto-tuning)
<b>Setting method</b>		Digital setting using front panel keys or communications features
<b>Indication method</b>		7-segment digital display and LEDs
<b>Potentiometer</b>		100 $\Omega$ to 2.5 k $\Omega$
<b>Event input</b>	<b>Contact input</b>	ON: 1 k $\Omega$ max., OFF: 100 k $\Omega$ min.
	<b>No-contact input</b>	ON: residual voltage: 1.5 V max., OFF: leakage current: 0.1 mA max.
<b>Transmission output</b>		4 to 20 mA, permissible load impedance: 600 $\Omega$ max., resolution: approx. 2,600 steps
<b>Current transformer input</b>		Connect only Omron Current Transformers (E54-CT1 or E54-CT3)
<b>Additional functions</b>	<b>Standard</b>	Manual output, heating/cooling control, SP limiter, loop burnout alarm, MV limiter, MV change rate limiter, input digital filter, input shift, run/reset, protect functions, scaling function
<b>Approved standards</b>		UL 1092, CSA22.2 No. 14, CSA22.2 No. 1010-1 Conforms to EN50081-2, EN50082-2, EN61010-1 (IEC1010-1) Conforms to VDE0106/part 100 (Finger Protection), when the separately-ordered terminal cover is mounted.

Note: All control outputs are insulated from the input circuit.

## ■ Characteristics

Indication accuracy (See Note 1)	Thermocouple	±0.3% of indication value or ±1°C, whichever greater, ±1 digit max.
	Platinum resistance thermometer	±0.2% of indication value or ±0.8°C, whichever greater, ±1 digit max.
	Analog input	±0.2% (of indication value) ±1 digit max.
Hysteresis		0.01% to 99.99% FS (in units of 0.01% FS)
Proportional band (P)		0.1% to 999.9% FS (in units of 0.1% FS)
Integral (reset) time (I)		0 to 3,999 s (in units of 1 s)
Derivative (rate) time (D)		0 to 3,999 s (in units of 1 s)
Control period		1 to 99 s (in units of 1 s)
Manual reset value		0.0% to 100.0% (in units of 0.1%)
Alarm setting range		-1,999 to 9,999 or -199.9 or 999.9 (decimal point position dependent on input type or result of scaling)
Set time		0 to 99 hrs 59 min or 0 to 99 min 59 s
Program capacity		8 patterns (E5AK-T) or 4 patterns (E5EK-T), 16 steps
Programming method		Time or ramp setting method
Time accuracy		±0.2% (±500 ms) of the set value
Sampling period (See Note 2)	Temperature input	250 ms
	Analog input	100 ms
Insulation resistance		20 MΩ min. at 500 VDC
Dielectric strength		2,000 VAC, 50/60 Hz for 1 min between terminals of different polarities
Vibration resistance		Malfunction: 10 to 55 Hz, 10 m/s <sup>2</sup> (approx. 1G) for 10 min each in X, Y, and Z directions
		Destruction: 10 to 55 Hz, 20 m/s <sup>2</sup> (approx. 2G) for 2 hrs each in X, Y, and Z directions
Shock resistance		Malfunction: 200 m/s <sup>2</sup> min. (approx. 20G), 3 times each in 6 directions (100 m/s <sup>2</sup> (approx. 10G) applied to the relay)
		Destruction: 300 m/s <sup>2</sup> min. (approx. 30G), 3 times each in 6 directions
Ambient temperature	Operating	-10°C to 55°C (14°F to 131°F) with no icing and 3-year warranty period: -10°C to 50°C (14°F 122°F)
	Storage	-25°C to 65°C (-13°F to 149°F) with no icing
Ambient humidity	Operating	35% to 85%
Enclosure ratings	Front panel	NEMA 4 for indoor use (equivalent to IP66)
	Rear case	IEC standard IP20
	Terminals	IEC standard IP00
Memory protection		Non-volatile memory (number of writings: 100,000 operations)
Weight	E5AK-T	Approx. 450 g
	E5EK-T	Approx. 320 g
	Mounting bracket	Approx. 65 g

(This table continues on the next page.)

- Note: 1. The indication accuracy of the K1, T, and N thermocouples at a temperature of -100°C max. is ±2°C ±1 digit maximum. The indication accuracy of the U and L thermocouples at any temperature is ±2°C ±1 digit maximum. The indication accuracy of the B thermocouple at a temperature of 400°C max. is unrestricted. The indication accuracy of the R and S thermocouples at a temperature of 200°C max. is ±3°C ±1 digit maximum. The indication accuracy of the W thermocouple at any temperature is (±0.3% of the indicated value or ±3°C, whichever is greater) ±1 digit maximum. The indication accuracy of the PLII thermocouple at any temperature is (±0.3% of the indicated value or ±2°C, whichever is greater) ±1 digit maximum.
2. The sampling period of the standard model with CT and remote SP inputs is 250 ms.

Characteristics Table - continued from previous page

<b>EMC</b>	Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Immunity ESD: EN61000-4-2: 4 kV contact discharge (level 2) 8 kV air discharge (level 3) Immunity RF-interference: ENV50140: 10 V/m (amplitude modulated, 80 MHz to 1 GHz) (level 3) 10 V/m (pulse modulated, 900 MHz) Immunity Conducted Disturbance: ENV50141: 10 V (0.15 to 80 MHz) (level 3) Immunity Burst: EN61000-4-4: 2 kV power-line (level 3) 2 kV I/O signal-line (level 4)
<b>Approved standards</b>	UL1092, CSA22.2 No. 14, CSA22.2 No. 1010-1 Conforms to EN50081-2, EN50082-2, EN61010-1 (IEC1010-1) Conforms to VDE0106/part 100 (Finger Protection), when the separately-ordered terminal cover is mounted.

## ■ Option Board Ratings and Characteristics

Model	Description		Specifications
<b>E53-AKB</b>	Event input		Contact input: ON: 1 k $\Omega$ max., OFF: 100 k $\Omega$ min.  No-contact input: ON: residual voltage 1.5 V max., OFF: leakage current 0.1 mA max.
<b>E53-AK01</b>	Communications	RS-232C	Transmission method: Half-duplex Synchronization method: Start-stop synchronization (asynchronous method) Baud rate: 1.2/2.4/4.8/9.6/19.2 kbps
<b>E53-AK02</b>		RS-422	
<b>E53-AK03</b>		RS-485	
<b>E53-AKF</b>	Transfer output		4 to 20 mA: Permissible load impedance: 600 $\Omega$ max.; Resolution: approx. 2,600 steps

Note: Event input is used for switching the target value, run or stop command, or automatic and manual mode with an external signal input.

## ■ Current Transformer Ratings

Model	E54-CT1	E54-CT3
<b>Max. continuous heater current</b>	50 amps	120 amps (See Note 1)
<b>Dielectric strength</b>	1,000 VAC for 1 min	
<b>Vibration resistance</b>	50 Hz, 98 m/s <sup>2</sup> (10G)	
<b>Weight</b>	Approx. 11.5 g	Approx. 50 g
<b>Accessories</b>	--	Armature: 2; Plug: 2

Note: 1. Use within the max. heater current rating of controller table shown below.

## ■ Heater Burnout Alarm

<b>Max. heater current</b>	Single-phase 50 A AC
<b>Heater current value display accuracy</b>	$\pm 5\%$ FS $\pm 1$ digit max.
<b>Heater burnout alarm setting range</b>	0.1 to 49.9 A (in units of 0.1 A) (See Note 1)
<b>Min. detection ON time</b>	190 ms (See Note 2)

- Note: 1. The heater burnout alarm is always OFF if the alarm is set to 0.0 A and always ON if the alarm is set to 50.0 A.  
2. No heater burnout detection or heater current value measurement is possible if the control output (heat) is ON for less than 190 ms.

## ■ Temperature Ranges

### Platinum Resistance Thermometer

Input (switch selectable)		JPt100	Pt100
Range	°C	-199.9° to 650.0°	-199.9° to 650.0°
	°F	-199.9° to 999.9°	-199.9° to 999.9°
Setting °C/°F for main setting and alarm		0.1	0.1

### Thermocouple

Input (switch selectable)		K1	K2	J1	J2	T	E	L1	L2	U	N	R	S	B	W	PLII
Range	°C	-200 to 1,300	0.0 to 500.0	-100 to 850	0.0 to 400.0	-199.9 to 400.0	0 to 600	-100 to 850	0.0 to 400.0	-199.9 to 400.0	-200 to 1,300	0 to 1,700	0 to 1,700	100 to 1,800	0 to 2,300	0 to 1,300
	°F	-300 to 2,300	0.0 to 900.0	-100 to 1,500	0.0 to 750.0	-199.9 to 700.0	0 to 1,100	-100 to 1,500	0.0 to 750.0	-199.9 to 700.0	-300 to 2,300	0 to 3,000	0 to 3,000	300 to 3,200	0 to 4,100	0 to 2,300
Resolution °C/°F (main setting and alarm)		1	0.1	1	0.1	0.1	1	1	0.1	0.1	1	1	1	1	1	1

Note: 1. The switch is factory-set to 2 (K1).

2. Thermocouple W is W/Re5-26 (tungsten rhenium 5, tungsten rhenium 26).

### Current/Voltage

Input (switch selectable)	Current input		Voltage input		
	4 to 20 mA	0 to 20 mA	1 to 5 V	0 to 5 V	0 to 10 V
Range	One of following ranges depending on results of scaling -1999 to 9999 -199.9 to 999.9 -19.99 to 99.99 -1.999 to 9.999				
Resolution (main setting and alarm)	Depends on the scale range selected				

# Nomenclature

## E5AK-T

### Pattern Number

Indicates the pattern number.

### Program Status Indicators

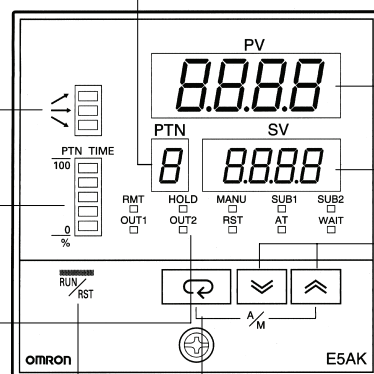
The top indicator indicates the rising step, the middle indicator indicates the constant step, and the bottom indicator indicates the falling step.

### Bar Graph

Indicates the rate of pattern elapsing time at the rate of 20% (5 levels) per one segment.

### Operation Indicators

- **OUT1**  
Lit when the pulse output function assigned to control output 1 turns ON.
- **OUT2**  
Lit when the pulse output function assigned to control output 2 turns ON.
- **SUB1**  
Lit when the output function assigned to auxiliary output 1 turns ON.
- **SUB2**  
Lit when the output function assigned to auxiliary output 2 turns ON.
- **MANU**  
Lit when the manual operation mode.
- **RST**  
Lit when the operation is reset.
- **RMT**  
Lit during remote operation.
- **AT**  
Flashes during auto-tuning.
- **HOLD**  
Lit when the program is on hold.
- **WAIT**  
Lit when the program is waiting.



### Display 1

Displays the process value or parameter code.

### Display 2

Displays the present SP, manipulated variable, or parameter settings.

### Up Key/Down Key

Press to increase or decrease the value on the No.2 display.

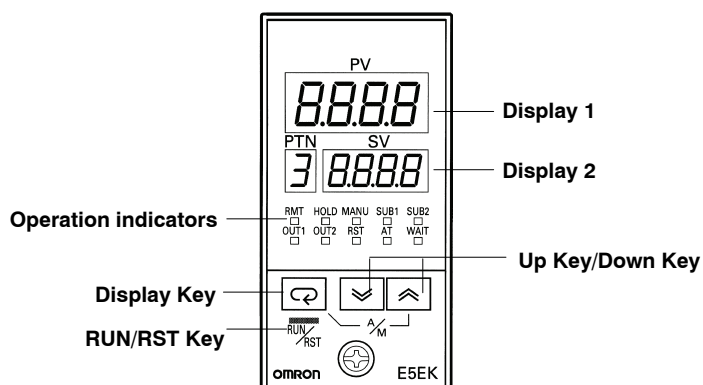
### Display Key

Press to shift the display to the next parameter.

### RUN/RST Key

Switches between RUN and RESET mode.

## E5EK-T



### Display 1

### Display 2

### Operation indicators

### Up Key/Down Key

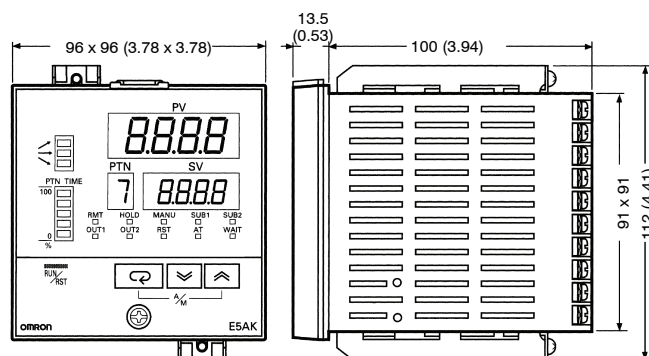
### Display Key

### RUN/RST Key

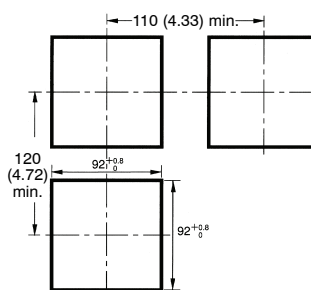
# Dimensions

Unit: mm (inch)

## E5AK-T

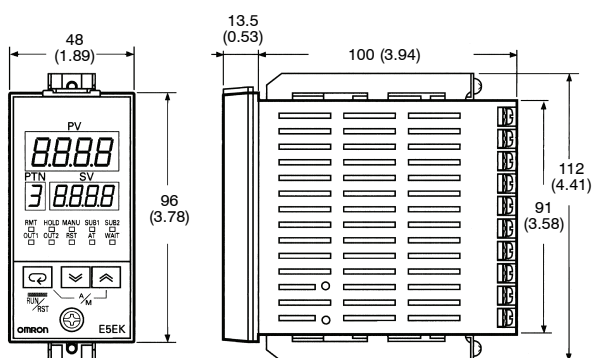


### Panel Cutouts

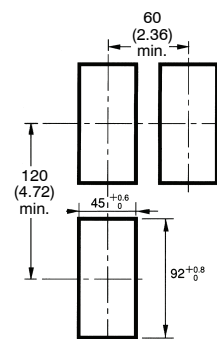


- Note: 1. Recommended panel thickness is 1 to 8 mm.  
2. Maintain the specified vertical and horizontal mounting space between each Unit. Units must not be closely mounted (vertically or horizontally).

## E5EK-T



### Panel Cutouts

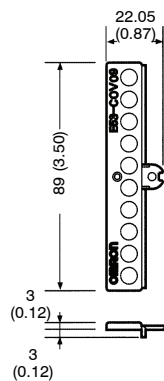
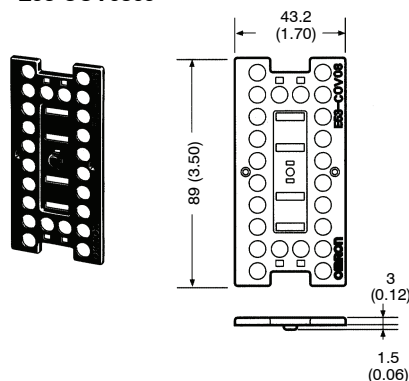


- Note: 1. Recommended panel thickness is 1 to 8 mm.  
2. Maintain the specified vertical and horizontal mounting space between each Unit. Units must not be closely mounted vertically or horizontally.

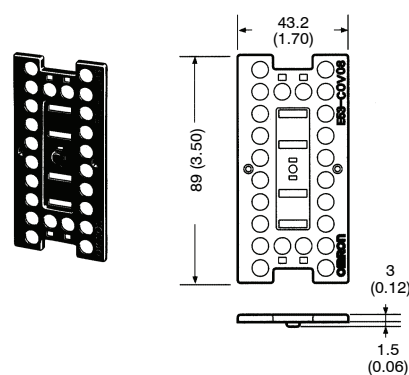
## Accessories (Order Separately)

### Terminal Cover

#### E53-COV0809



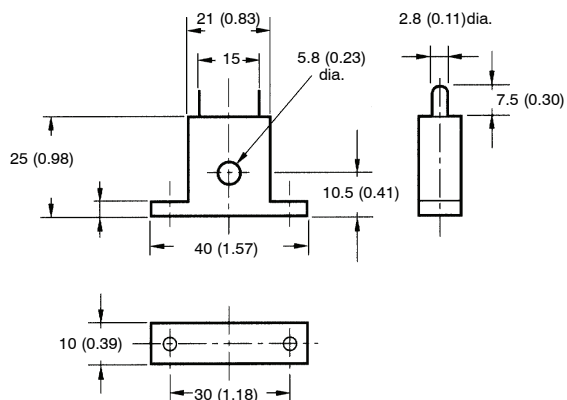
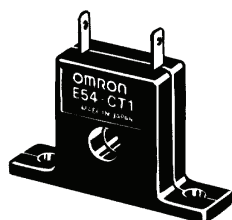
#### E53-COV08





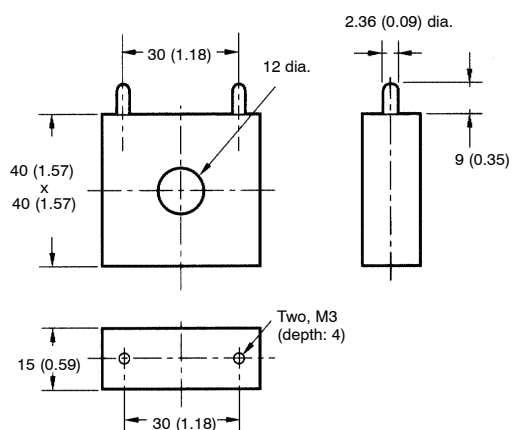
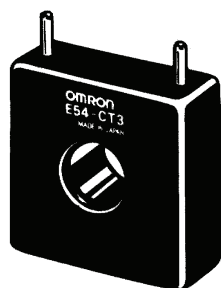
# Current Transformers

E54-CT1



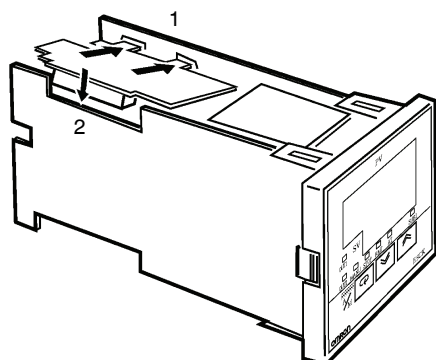
Unit: mm (inch)

E54-CT3



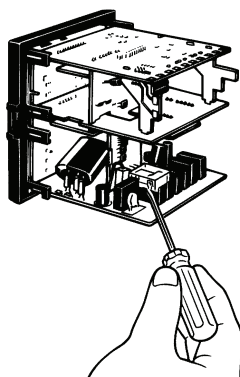
## ■ Setting Up the Output Board

- Two rectangular holes are provided on the power board (right side of Controller). Fit the two protrusions of the output board into these two holes.
- With the output board fitted into the power board, fit the output board into the connector on the control board (left side of Controller).

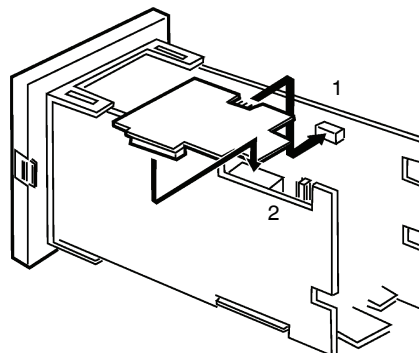


## Removing the Output Board

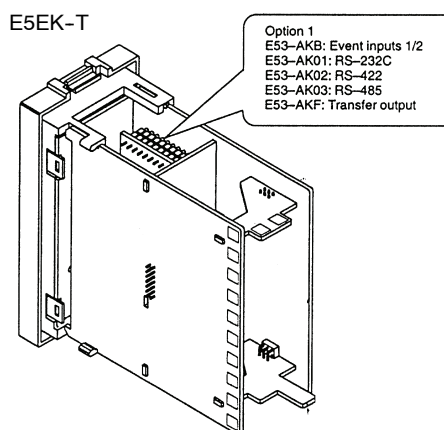
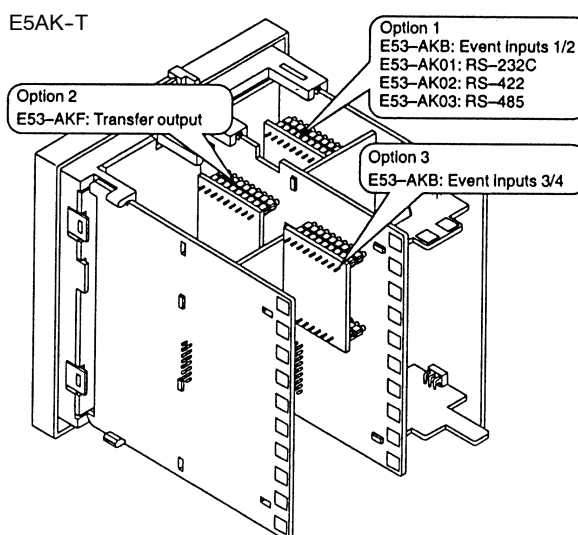
To replace the output board, use a flat-blade screwdriver to push up the output board.



## ■ Setting Up the Option Board



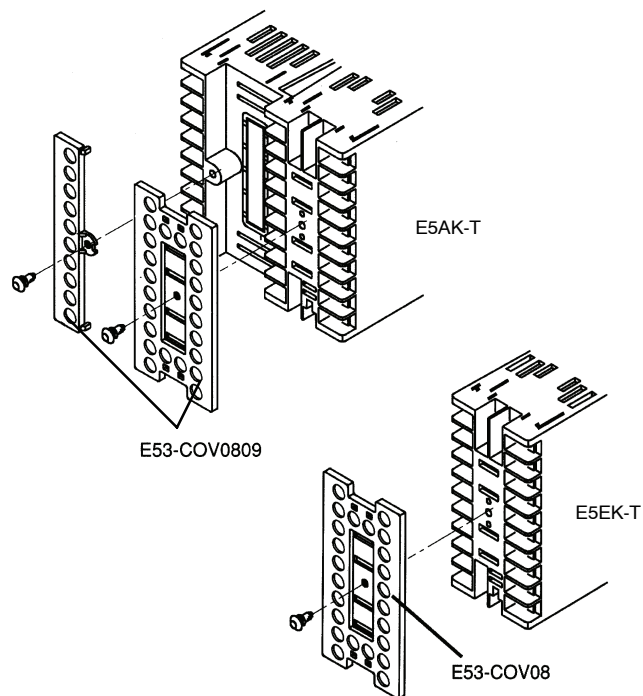
- Insert the option boards into the sockets for options 1 to 3. The following diagram shows the relationship between the option boards and mounting positions.



**E53-COV0809, E53-COV08 Terminal Cover**

Terminal covers are supplied for controllers with -500 in the part number; for non -500 models, order covers separately. Fasten the terminals covers as follows by using the snap pins.

Note: Snap pins are provided with the terminal covers.

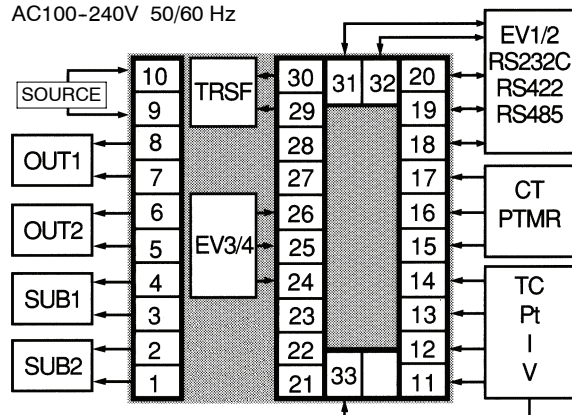


# Wiring Terminals

## Terminal Arrangement

### E5AK-T

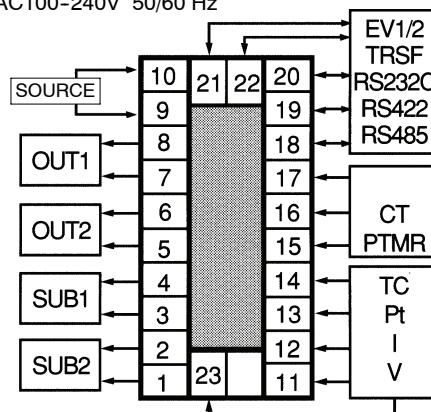
AC100-240V 50/60 Hz



TRSF: Transfer output  
EV1 to 4: Event input  
PTMR: Potentiometer

### E5EK-T

AC100-240V 50/60 Hz



TRSF: Transfer output  
EV1/2: Event input  
PTMR: Potentiometer

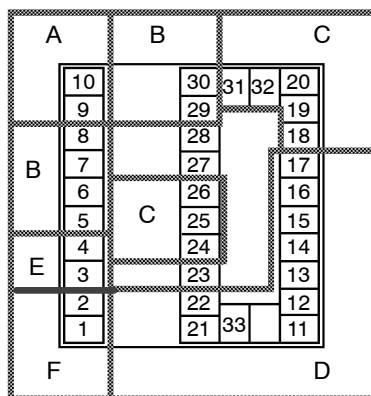
# Wiring Precautions

- Use ducts to separate input leads and power lines in order to protect the Controller and its lines from external noise.
- Solderless terminals are recommended when wiring the Controller.
- Tighten the terminal screws using a torque no greater than 0.78 N • m, or 8 kgf • cm max. Be careful not to tighten the terminal screws too tightly.

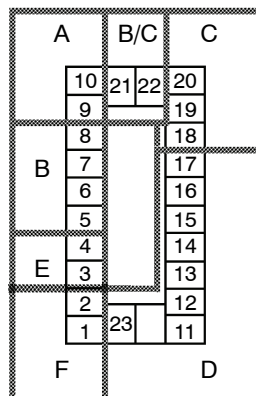
## Power Blocks for E5AK-T/EK-T

The E5AK/E5EK has independent power supplies for each of the terminal blocks shown below.

### E5AK-T



### E5EK-T

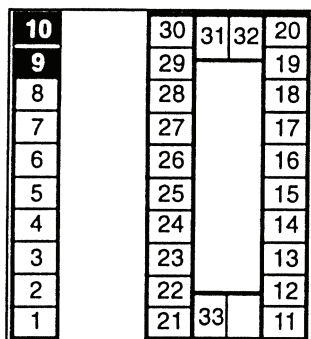


# E5AK-T Wiring

In the following wiring diagrams, the left side of the terminal numbers indicate the inside of the Controller.

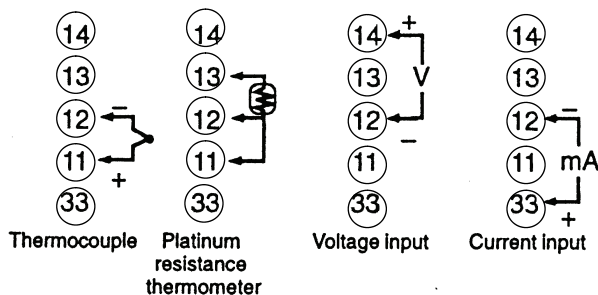
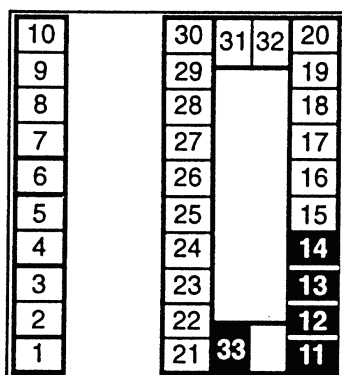
## Power Supply

Input 100 to 240 VAC to terminal numbers 9 and 10 according to the specifications.



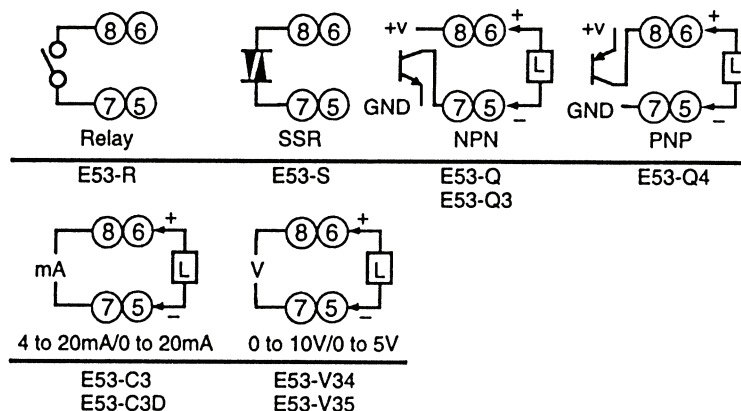
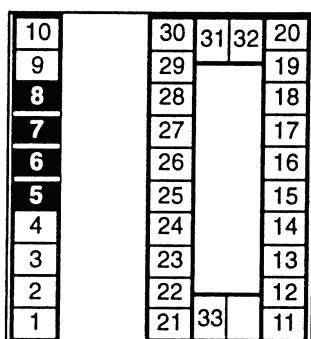
## Sensor Input

Connect the sensor input to terminal numbers 11 to 14 and 33 as follows according to the input type.



## Control Output

Terminal numbers 7 and 8 are for control output 1 (OUT1), and terminal numbers 5 and 6 are for control output 2 (OUT2). The following diagrams show the available output boards and their internal equalizing circuits.



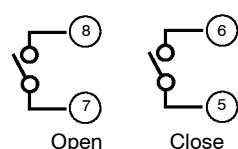
With E53-V□□ output boards, approx. 2 V is output for one second after the power is interrupted.

## Specifications for Each Output Board

Model	Output type	Specifications
E53-R	Relay	5 A at 250 VAC
E53-S	SSR	1 A at 75 to 250 VAC
E53-Q E53-Q3 E53-Q4	Voltage (NPN) Voltage (NPN) Voltage (PNP)	NPN: 40 mA at 12 VDC (with short-circuit protection) NPN: 20 mA at 24 VDC (with short-circuit protection) PNP: 20 mA at 24 VDC (with short-circuit protection)
E53-C3 E53-C3D	4 to 20 mA 0 to 20 mA	4 to 20 mA; permissible load impedance: 600 $\Omega$ max.; resolution: approx. 2600 0 to 20 mA; permissible load impedance: 600 $\Omega$ max.; resolution: approx. 2600
E53-V34 E53-V35	0 to 10 V 0 to 5 V	0 to 10 VDC; permissible load impedance: 1 k $\Omega$ min.; resolution: approx. 2600 0 to 5 VDC; permissible load impedance: 1 k $\Omega$ min.; resolution: approx. 2600

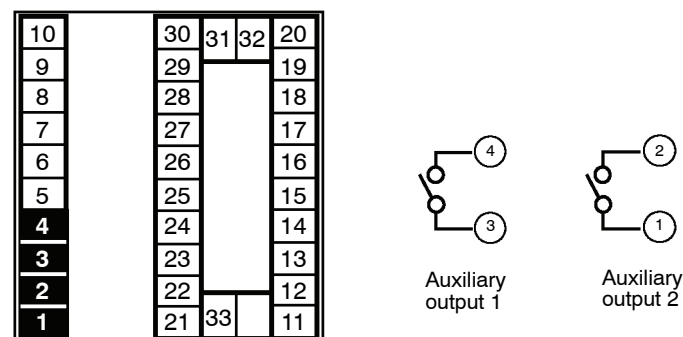
With E5AK-PRR2 Controllers, the relay output (1 A at 250 VAC) is fixed.

When replacing the output board, use the E53-R. The following diagrams show the relationship between terminals and open/close relay settings.



## Auxiliary Output

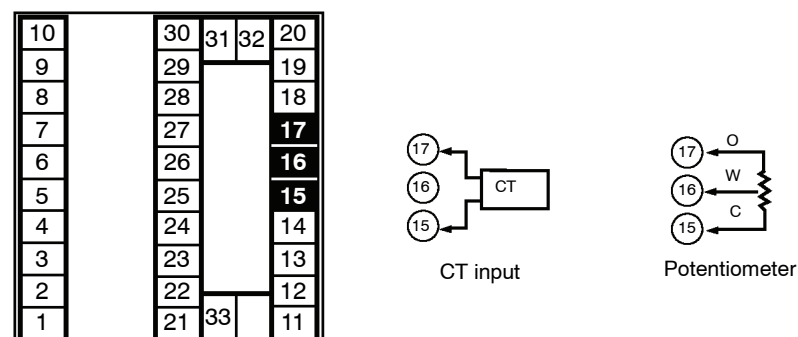
Terminal numbers 3 and 4 are for auxiliary output 1 (SUB1) and terminal numbers 1 and 2 are for auxiliary output 2 (SUB2). The following diagrams show the internal equalizing circuits for the auxiliary outputs:



Output specifications are as follows: SPST-NO, 3 A at 250 VAC

## CT Input/Potentiometer

When using the HBA function on the E5AK-TAA2 Controller, connect CT input (CT) to terminal numbers 15 to 17. When monitoring the valve opening on the E5AK-TPRR2 Controller, connect the potentiometer (PTMR) to terminal numbers 15 to 17. Connect each of these inputs as follows:

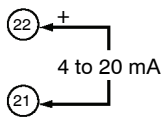
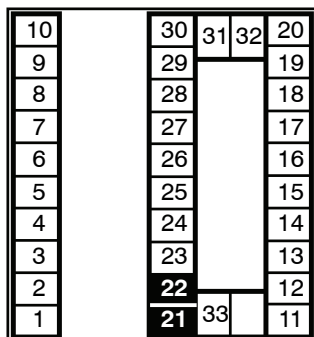


For details on CT inputs, refer to *Appendix, About Current Transformer* in the *E5AK-T/E5EK-T User's Manual (H83/H85)*.

For details on the potentiometer, refer to the *Instruction Manual* for the valve connected to the Controller. The variable resistance range is 100  $\Omega$  to 2.5 k $\Omega$ .

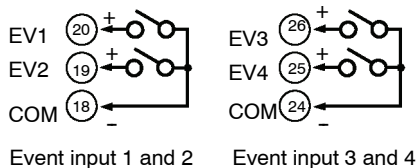
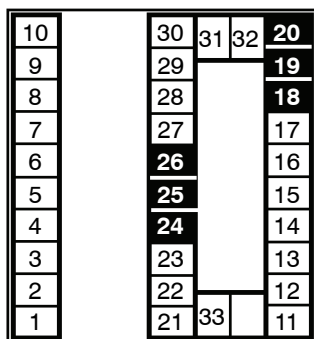
## Remote SP Input

Connect the input (RSP) to be used as the remote SP to terminal numbers 21 and 22. Only 4 to 20 mA inputs can be connected. Connect the input as follows:



## Event Input

Connect event inputs 1 and 2 (EV1/2) to terminal numbers 18 to 20, and events 3 and 4 (EV3/4) to terminal numbers 24 to 26. However, note that terminal numbers 18 to 20 cannot be used on Controllers with a communications function. Connect the event inputs as follows:

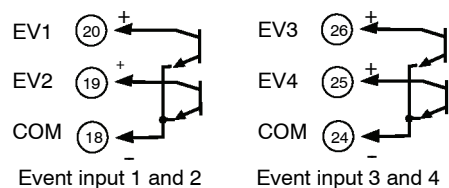


Terminals 18 and 24 (COM) are connected internally.

Use event inputs under the following conditions:

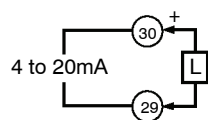
Contact input	ON: 1 k $\Omega$ max. OFF: 100 k $\Omega$ min.
No-contact input	ON: Residual voltage 1.5 V max., OFF: Leakage current 0.1 mA max.

Polarities during no-contact input are as follows:



## Transfer Output

Connect transfer output (TRSF) to terminal numbers 29 and 30. The internal equalizing circuit for transfer output is as follows:



Transfer output specifications are as follows: 4 to 20 mA

Permissible load impedance: 600  $\Omega$  max.

Resolution: approx. 2600

## Communications

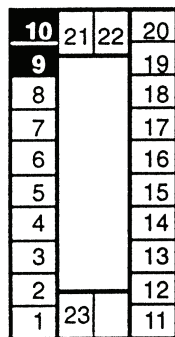
Terminal numbers 18 to 20, 31 and 32 can be used only on Controllers with communications boards (E53-AK01/02/03). For details on wiring, refer to *Chapter 6, Using the Communications Function* in the *E5AK-T/E5EK-T User Manuals (H83 and H85)*.

## ■ E5EK-T WIRING

In the following wiring diagrams, the left side of the terminal numbers indicate the inside of the Controller.

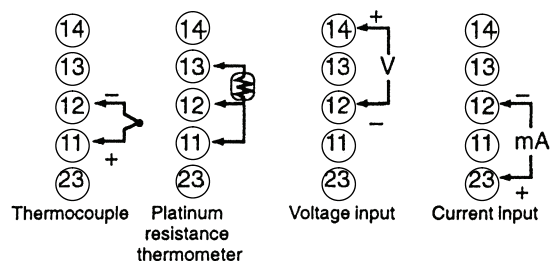
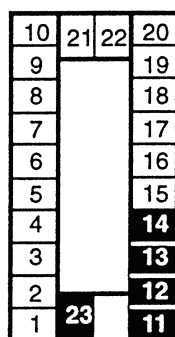
### Power Supply

Input 100 to 240 VAC to terminal numbers 9 and 10 according to the specifications.



### Sensor Input

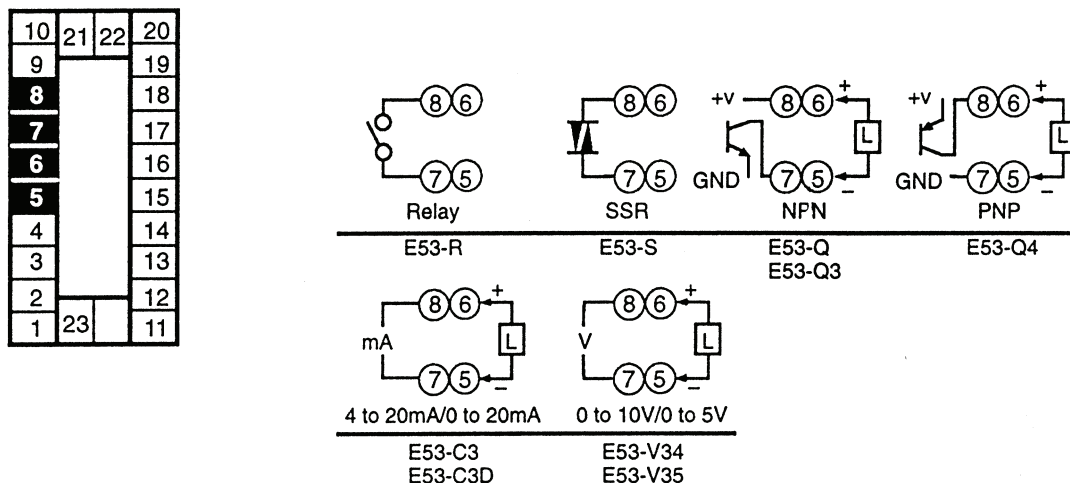
Connect the sensor input to terminal numbers 11 to 14 and 23 as follows according to the input type.





## Control Output

Terminal numbers 7 and 8 are for control output 1 (OUT1), and terminal numbers 5 and 6 are for control output 2 (OUT2). The following diagrams show the available output boards and their internal equalizing circuits.



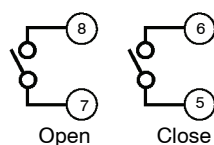
With E53-V□□ output boards, approx. 2 V is output for one second after the power is interrupted.

## Specifications for Each Output Board

Model	Output type	Specifications
E53-R	Relay	5 A at 250 VAC
E53-S	SSR	1 A at 75 to 250 VAC
E53-Q E53-Q3 E53-Q4	Voltage (NPN) Voltage (NPN) Voltage (PNP)	NPN: 40 mA at 12 VDC (with short-circuit protection) NPN: 20 mA at 24 VDC (with short-circuit protection) PNP: 20 mA at 24 VDC (with short-circuit protection)
E53-C3 E53-C3D	4 to 20 mA 0 to 20 mA	4 to 20 mA, permissible load impedance: 600 Ω max., resolution: approx. 2600 0 to 20 mA, permissible load impedance: 600 Ω max., resolution: approx. 2600
E53-V34 E53-V35	0 to 10 V 0 to 5 V	0 to 10 VDC, permissible load impedance: 1 kΩ min., resolution: approx. 2600 0 to 5 VDC, permissible load impedance: 1 kΩ min., resolution: approx. 2600

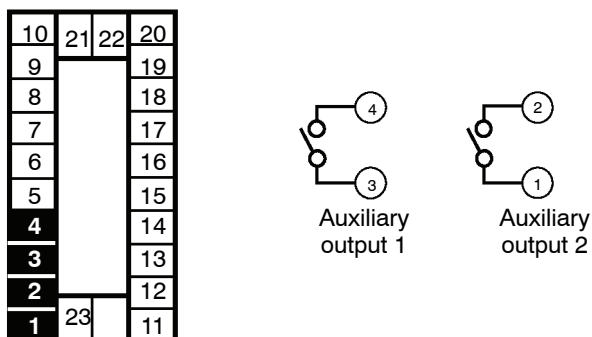
With E5EK-TPRR2 Controllers, the relay output (1 A at 250 VAC) is fixed.

When replacing the output board, use the E53-R. The following diagrams show the relationship between terminals and open/close relay settings.



## Auxiliary Output

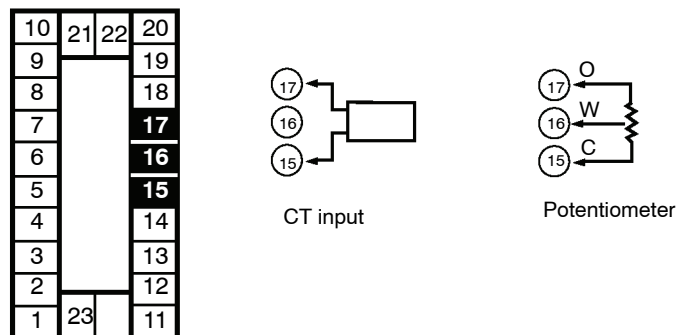
Terminal numbers 3 and 4 are for auxiliary output 1 (SUB1) and terminal numbers 1 and 2 are for auxiliary output 2 (SUB2). The following diagrams show the internal equalizing circuits for the auxiliary outputs:



Output specifications are as follows: SPST-NO, 3 A at 250 VAC

## CT Input/Potentiometer

When using the HBA function on the E5EK-TAA2 Controller, connect CT input (CT) to terminal numbers 15 to 17. When monitoring the valve opening on the E5EK-TPRR2 Controller, connect the potentiometer (PTMR) to terminal numbers 15 to 17. Connect each of these inputs as follows:

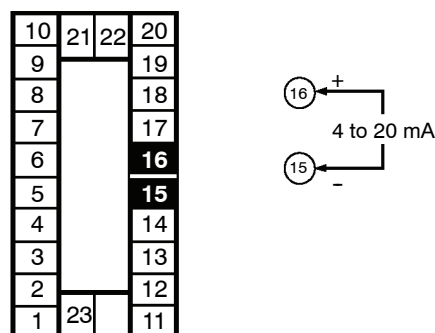


For details on CT inputs, refer to *Appendix, About Current Transformer* in the *E5AK-T/E5EK-T User's Manual (H83/H85)*.

For details on the potentiometer, refer to the *Instruction Manual* for the valve connected to the Controller. The variable resistance range is 100  $\Omega$  to 2.5 k $\Omega$ .

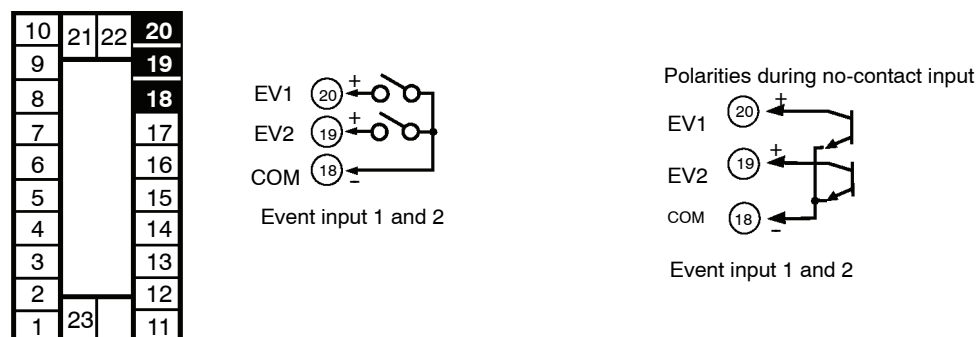
## Remote SP Input

Connect the input (RSP) to be used as the remote SP to terminal numbers 15 and 16. However, note that the remote SP cannot be used on the E5EK-TPRR2 Controller. Only 4 to 20 mA inputs can be connected. Connect the input as follows:



## Event Input

Connect event inputs 1 and 2 (EV1/2) to terminal numbers 18 to 20. However, note that terminal numbers 18 to 20 cannot be used on Controllers with a communications function. Connect the event inputs as follows:

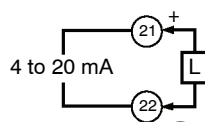


Use event inputs under the following conditions:

Contact input	ON: 1 k $\Omega$ max., OFF: 100 k $\Omega$ min.
No-contact input	ON: Residual voltage 1.5 V max., OFF: Leakage current 0.1 mA max.

### Transfer Output

Connect transfer output (TRSF) to terminal numbers 21 and 22. The internal equalizing circuit for transfer output is at right.



Transfer output specifications are as follows:  
4 to 20 mA,  
Permissible load impedance: 600  $\Omega$  max.,  
Resolution: Approx. 2600

### Communications

Terminal numbers 18 to 22 can be used only on controllers with communications boards (E53-AK01/02/03). For details on wiring, refer to *Chapter 6, Using the Communications Function* in the *E5AK-T/E5EK-T User Manuals (H088-E3-1 and H089-E3-1)*.

## Precautions

### ■ Operating Environment

- Operate the Controller within the rated ambient operating temperature, ambient operating humidity, and storage temperature ranges.
- Use the Controller according to the vibration resistance, shock resistance, and enclosure ratings.
- Do not install the Controller in places with corrosive gas or excessive dust.
- Do not install the Controller near machines generating high-frequency noise.

### ■ Mounting

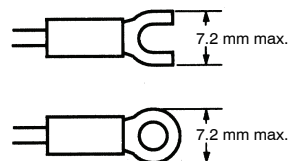
- The dimensions of the Controller conform to DIN 43700.
- Recommended panel thickness is 1 to 8 mm.
- Mount the Unit horizontally.

### ■ Connection

- To reduce inductive noise influence, the lead wires connecting the input type to the 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.

### ■ Connection Example

- Wire the terminals of the Unit using solderless terminals.
- The tightening torque applied to the terminal screws of the Unit must be approximately 0.78 N • m or 8 kgf • cm.
- Use the following type of solderless terminals for M3.5 screws.

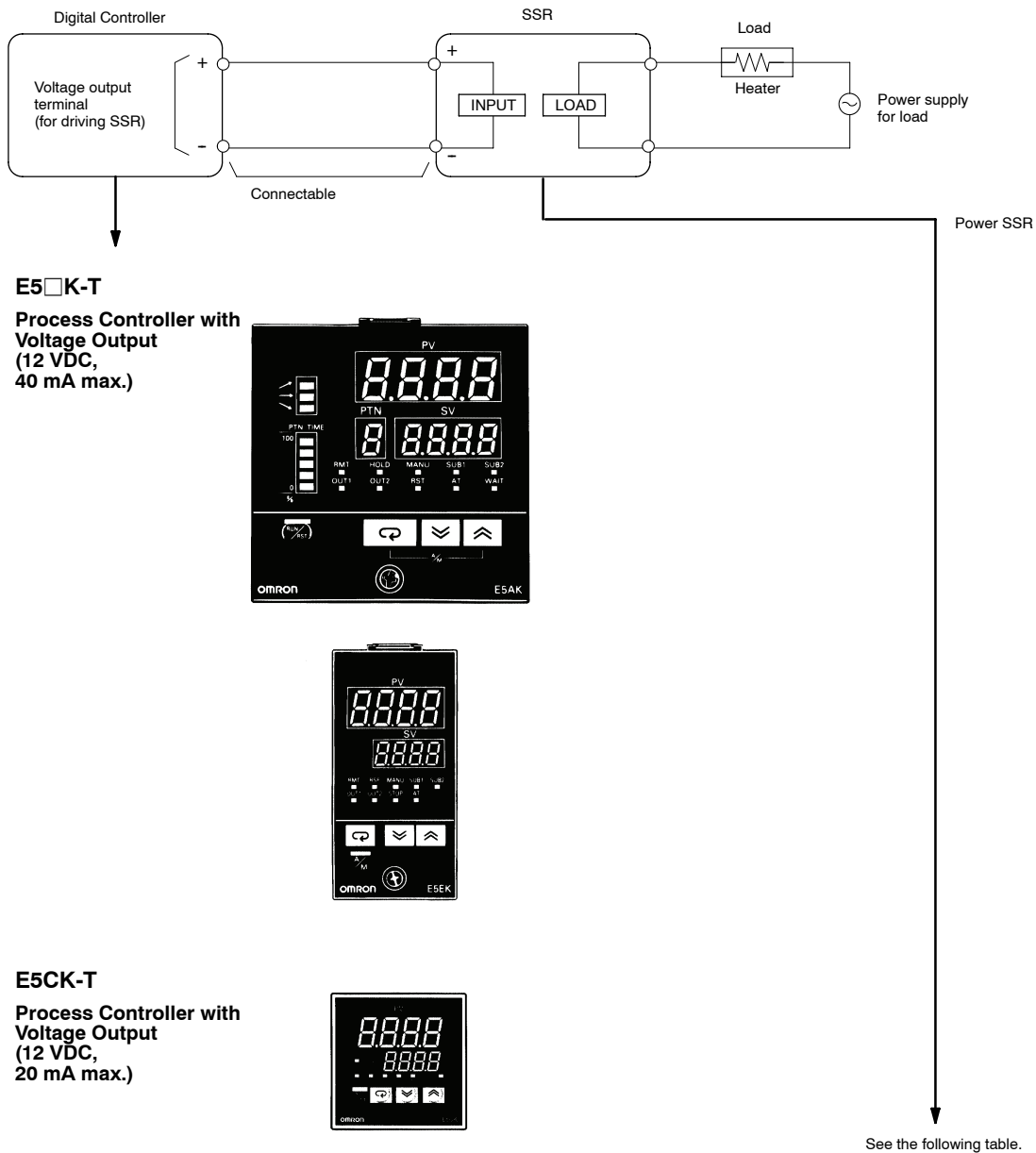


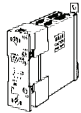
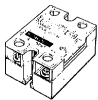

### ■ Operation

- The alarm outputs of a model with an alarm function may not turn ON correctly when the model malfunctions. The use of alarm equipment with the Controller is recommended.
- The parameters and internal switch are set before shipping so that the Unit will function normally. Change the settings of the parameters and internal switch according to the application if necessary.
- After power has been supplied to the Controller, several seconds are required until the relay is turned ON. Consider this time delay when designing sequenced circuits which incorporate a Controller.
- Do not use excessive force when removing the internal mechanism from the housing. Protect the internal connector or electronic parts of the Unit from shock.
- Protect against static discharge when changing the settings of the internal switch. Changing the settings on a grounded conductive mat is recommended.
- When connecting the control output board to the Temperature Controller or Process Controller, make sure that the control output board is the appropriate type, or the system may malfunction.
- The heater burnout alarm will not be available if the linear output board is used.

# SSR

## Connection Example of Process Controller and SSR



Model	G3PA/G3PB	G3NA	G3NE
Appearance			
SSRs connected in parallel	E5AK-/E5EK-T: 8 pcs. E5CK-T: 4 pcs.	E5AK-/E5EK-T: 5 pcs. E5CK-T: 2 pcs.	E5AK-/E5EK-T: 2 pcs. E5CK-T: 1 piece
Rated input voltage	5 to 24 VDC	5 to 24 VDC	12 VDC
Features	Thin, SSR with built-in heat sink; 1-phase and 3-phase models	Standard model with screw terminals	Compact, low-cost model with tab terminals

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Предоставляем спец цены на элементы для создания инженерных сэмплов.

**Упорный труд, качественный результат дают нам право быть уверенными в себе и надежными для наших клиентов.**

### **Наша компания это:**

- Гарантия качества поставляемой продукции
- Широкий ассортимент
- Минимальные сроки поставок
- Техническая поддержка
- Подбор комплектации
- Индивидуальный подход
- Гибкое ценообразование

Наша организация особенно сильна в поставках модулей, микросхем, пассивных компонентов, ксайленсах (XC), EPF, EPM и силовой электроники.

Большой выбор предлагаемой продукции, различные виды оплаты и доставки, позволят Вам сэкономить время и получить максимум выгоды от сотрудничества с нами!

## Перечень производителей, продукцию которых мы поставляем на российский рынок







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гарантия бесперебойности производства и  
качества выпускаемой продукции

С удовольствием будем прорабатывать для Вас поставки всех необходимых компонентов по текущим запросам для скорейшего выявления групп элементов, по которым сотрудничество именно с нашей компанией будет для Вас максимально выгодным!

С уважением,

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