Ramp/Soak Process Controller
E5CK-T

Advanced, 1/16-DIN Ramp/Soak Process Controllers Ideal for Worldwide Use



- Offers one pattern of simple programming control, up to four patterns with communications (16 steps per pattern).
- Water-resistant front face meets IP66/NEMA 4 (indoor use).
- Modular structure, one-stock type.
- Heat/Cool control.
- Serial communications (RS-232C and RS-485).
- Temperature and analog inputs.
- High-accuracy: 100 ms sampling (for analog input).
- Conforms to international EMC and safety standards.
- 3-year warranty.

Ordering Information

Order control output boards and option boards separately. A single output board and option board can be mounted to each base unit. For example, for a relay control output, order the E53-R4R4 output board in addition to the E5CK-TAA1-500 Process Controller. Model with -500 has a terminal cover for finger protection

■ Process Controllers

Stock Note: Shaded models are normally stocked.

Description	DIN size	Supply voltage	Model
Base unit with terminal cover	1/16 DIN (48 x 48 mm)	100-240 VAC	**E5CK-TAA1-500 AC100-240**
			E5CK-TAA1 AC100-240

Note: Part numbers ending in -500 available at Omron USA, non -500 numbers available in Omron Canada only. Model with -500 has a terminal cover for finger protection.

■ Optional Output Boards

Stock Note: Shaded models are normally stocked.

Description	Specifications	Max. quantity	Model
Relay/Relay	SPST/SPST, 5 A, 250 VAC	1	**E53-R4R4**
Relay/Pulse	SPST, 5 A/NPN, 24 VDC	1	**E53-Q4R4**
	SPST, 5 A/PNP, 24 VDC	1	**E53-Q4HR4**
Relay/Linear current	SPST, 5 A/4–20 mA	1	**E53-C4R4**
	SPST, 5 A/0-20 mA	1	**E53-C4DR4**
Relay/Linear voltage	SPST, 5 A/0-10 VDC	1	**E53-V44R4**
Pulse/Pulse	NPN/NPN, 24 VDC	1	**E53-Q4Q4**
	PNP/PNP, 24 VDC	1	**E53-Q4HQ4H**
Computer communications	RS-232C	1	**E53-CK01**
	RS-485	1	**E53-CK03**
Event input	For remote set point	1	**E53-CKB**
Transfer output	4 to 20 mA	1	**E53-CKF**

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

■ Accessories (Order Separately)

Stock Note: Shaded models are normally stocked.

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.	E5CK-T	1	**E54-CT1**
	120 A load, 12 mm hole dia.	E5CK-T	1	**E54-CT3**
Terminal cover (supplied with -500 models)	Provides finger protection from terminals (VDE0106 part 100)	E5CK-T	1	**E53-COV07**
Software	For setup and monitoring; requires optional computer communications board	All	1	**Thermo Tools (see Note)**

Note: Contact Omron for current version information.

Specifications

■ Ratings

Model		E5CK-T
Supply voltage		100 to 240 VAC, 50/60 Hz
Power consumption		15 VA
Operating voltage range		85% to 110% of rated supply voltage
Input	**Thermocouple**	K, J, T, E, L, U, N, R, S, B, W, PLII
	Platinum resistance thermometer	JPt100, Pt100
	Current input	4 to 20 mA, 0 to 20 mA
	Voltage input	1 to 5 V, 0 to 5 V, 1 to 10 V
Input impedance	**Current input**	150 Ω
	Voltage input	1 MΩ min.
Control output		According to Output Board (see *Output Board Ratings and Characteristics*)
Auxiliary output		SPST-NO, 1 A at 250 VAC (resistive load)
Control method		ON/OFF or advanced PID control
Setting method		Digital setting using front panel keys or communications features
Indication method		7-segment digital display and LEDs
Additional functions	**Standard**	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

■ 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)
Set time		0 to 99 hrs 59 min or 0 to 99 min 59 s
Program capacity		1 pattern, 16 steps (possible to use up to 4 patterns with the communications function.)
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^2 (approx. 1G) for 10 min each in X, Y, and Z directions
	Destruction	10 to 55 Hz, 20 m/s^2 (approx. 2G) for 2 hrs each in X, Y, and Z directions
Shock resistance	**Malfunction**	200 m/s^2 min. (approx. 20G), 3 times each in 6 directions (100 m/s^2 (approx. 10G) applied to the relay)
	Destruction	300 m/s^2 min. (30G), 3 times each in 6 directions
Ambient temperature	**Operating**	−10°C to 55°C (with no icing)/3-year warranty period: −10°C to 50°C
	Storage	−25°C to 65°C (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		Approx. 170 g; Adapter: approx. 10 g
EMC		Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Immunity ESD: EN61000-4-2: 4kV contact discharge (level 2) 8kV air discharge (level 3) Immunity RF-interference: ENV50140: 10V/m (amplitude modulated, 80 MHz to 1 GHz) (level 3) 10 V/m (pulse modulated, 900 MHz) Immunity Conducted Disturbance: ENV50141: 10V (0.15 to 80 MHz) (level 3) Immunity Burst: EN61000-4-4: 2kV power-line (level 3) 2kV I/O signal-line (level 4)
Approved standards		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.

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% 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.

■ Option Board Ratings and Characteristics

Model	Description		Specifications
E53-CKB	Event input		Contact input: ON: 1 kΩ max., OFF: 100 kΩ min. No-contact input: ON: residual voltage 1.5 V max., OFF: leakage current 0.1 mA max.
E53-CK01	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
E53-CK03		RS-485	
E53-CKF	Transfer output		4 to 20 mA: Permissible load impedance: 500 Ω max. Resolution: approx. 2,600 steps

Note: Event input is used for switching the pattern number, run or reset command, or automatic and manual mode with an external signal input.

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°
Resolution °C/°F (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, alarm)		1	0.1	1	0.1	0.1	1	1	0.1	0.1	1	1	1	1	1	1

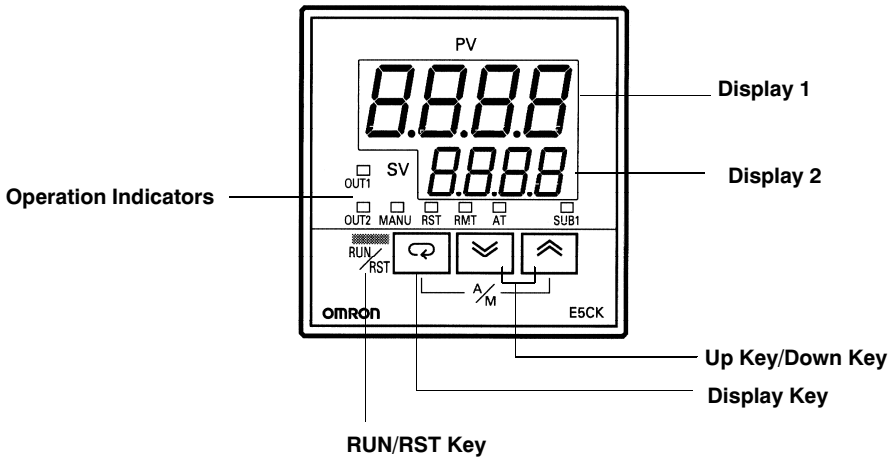
Note: 1. Setting number is factory-set to 2 (K1).
2. Thermocouple W is W/Re 5-26 (tungsten rhenium 5, tungsten rhenium 26).

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 range selected				

Nomenclature

■ E5CK-T

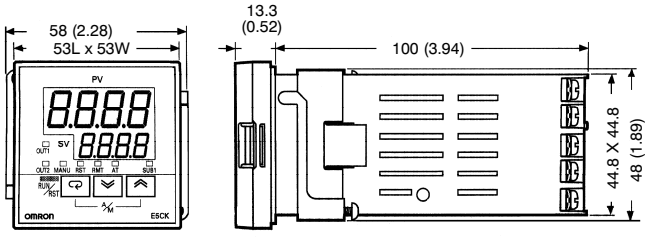


Dimensions

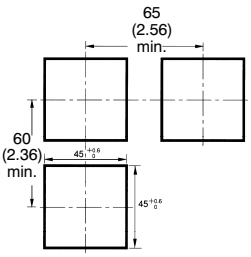
Unit: mm (inch)

■ E5CK-T





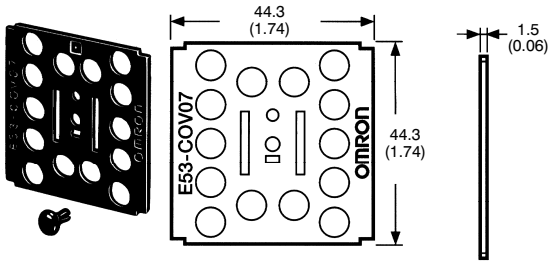
Panel Cutouts



■ Accessories

Terminal Cover

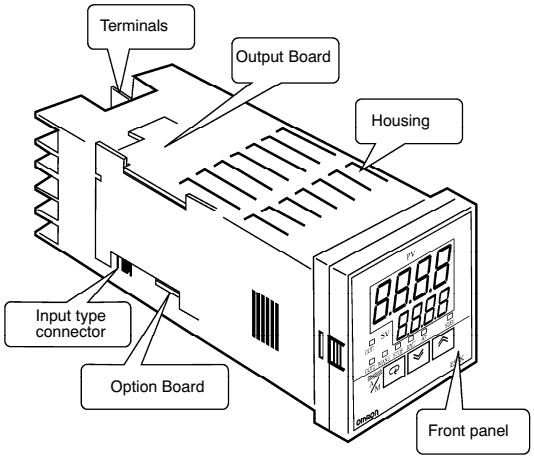
E53-COV07



Note: Terminal cover is supplied for controller with -500 in the part number; for non-500 model, order separately.

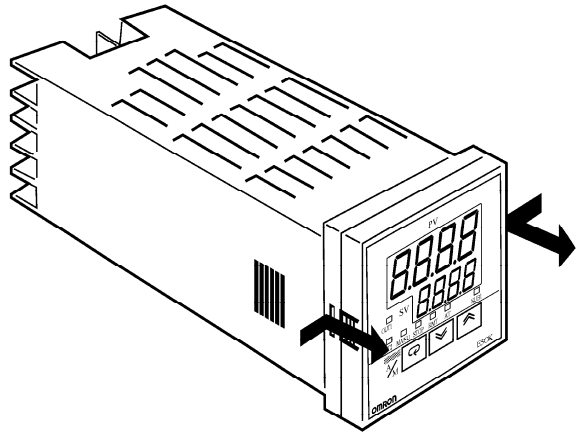
Installation

■ Main Parts



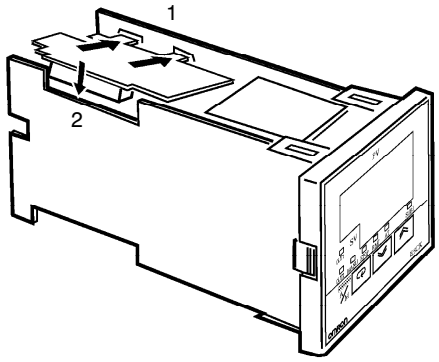
■ Removing Internal Mechanism

While pressing the hooks on the left and right sides of the front panel, carefully pull the internal mechanism from the housing. (Refer to the drawing below.)



■ Setting Up the Output Board

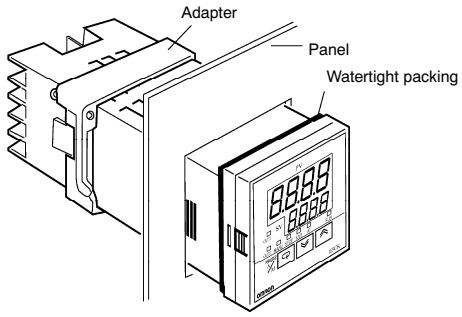
1. Two rectangular holes are provided on the power board (right side of Controller). Fit the two protrusions of the output board into these two holes.
2. With the output board fitted into the power board, fit the output board into the connector on the control board (left side of Controller).



■ Mounting the Controller

Note: On a standard model, set up the output boards for control outputs 1 and 2 before mounting the controller.

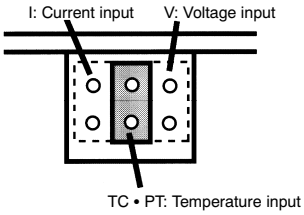
1. Insert the Controller into the panel's mounting hole at the position shown in the figure below.
2. Push the adapter along the Controller body from the terminals up to the panel, and fasten temporarily.
3. Tighten the two fixing screws on the adapter. When tightening screws, tighten the two screws alternately keeping the torque to approximately 0.29 to 0.39 N • m, or 3 to 4 kgf • cm.



Input Jumper Setting

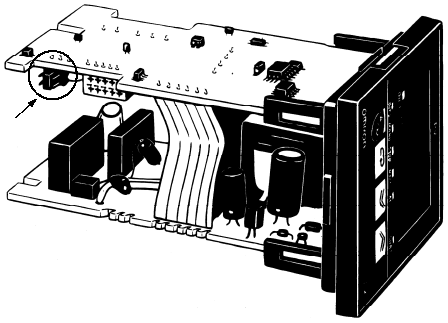
Note: The jumper is factory-set to TC • PT (temperature input).

Set the jumper to temperature, voltage, or current input according to the sensor connected to the input terminal.



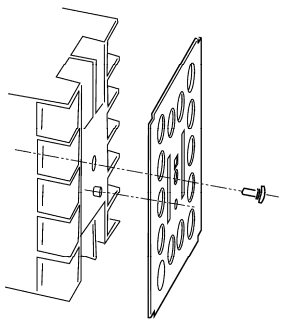
Note: Do not touch the pins of the jumper connector when setting the input type.

After setting the jumper, put on the housing, pressing the housing until the hooks of the front panel snap on.



Terminal Cover

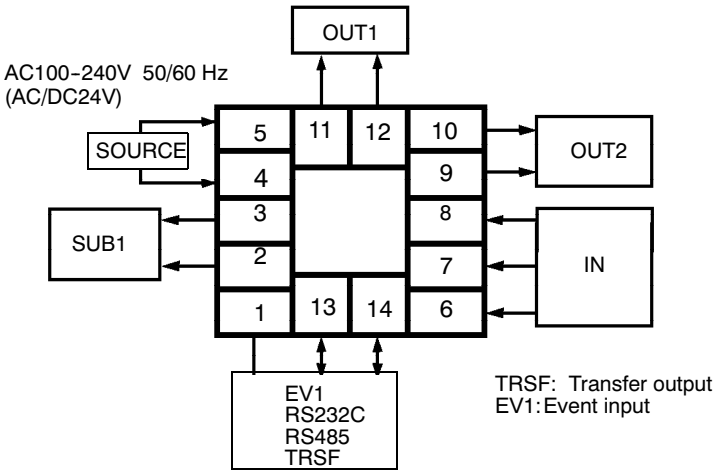
The E5CK-AA1-500 Controller is provided with a terminal cover E53-COV07. Fasten the terminal cover as follows by using the snap pin.



■ Wiring Terminals

Terminal Arrangement

E5CK-T



■ Wiring Precautions

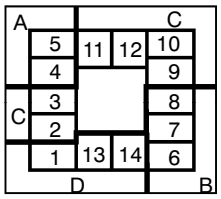
- Use ducts to separate input leads and power lines in order to protect the Controller and its lines from external noise.
- Solderless terminals are recommended when wiring the Controller.
- Tighten the terminal screws using a torque no greater than 0.78 N • m, or 8 kgf • cm max. Be careful not to tighten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

Power Blocks for E5CK-T

The E5CK-T has independent power supplies for each of the terminal blocks shown below.

Note: The power supplies for blocks C (exclude relay output) and D are shared for the following option board:
E53-CKB or E53-CKF Option Board

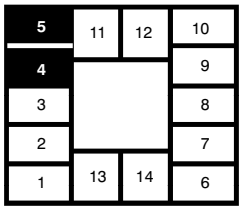
E5CK-T



■ E5CK-T Wiring

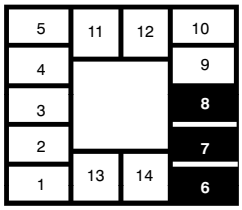
Power Supply

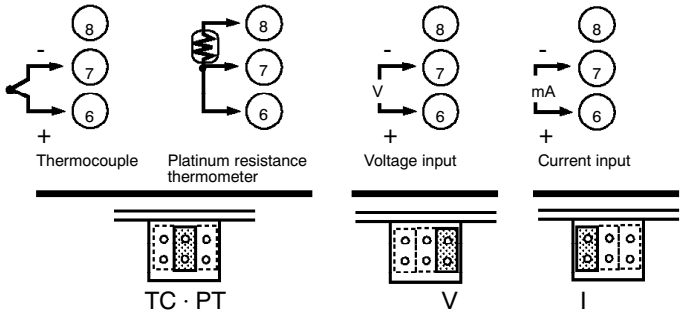
Input 100 to 240 VAC to terminal numbers 4 and 5 according to the specification.



Input

Connect the input to terminal numbers 6 to 8 as follows according to the input type.

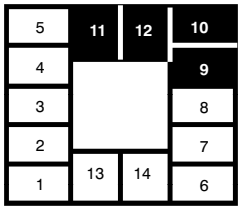


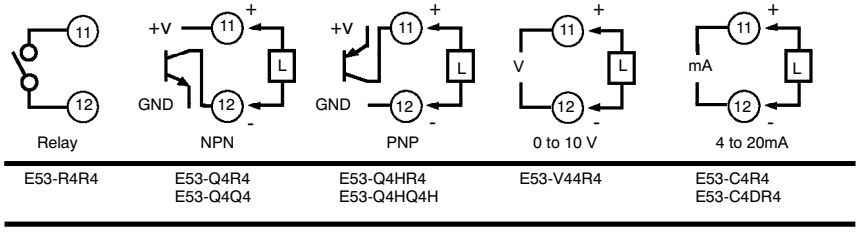


Match the inputs with the internal jumper settings for each input type. For thermocouple or platinum resistance thermometer inputs, set the inputs to a common position (TC/PT) as the temperature input.

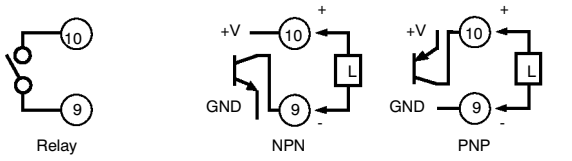
Control Output

Terminal numbers 11 and 12 are for control output 1 (OUT1). The five output types and internal equalizing circuits are available according to the output board.





Terminal numbers 9 and 10 are for control output 2 (OUT2). The three output types and internal equalizing circuits are available according to the output board.



E53-R4R4 /E53-V44R4 E53-Q4R4 /E53-C4R4 E53-Q4HR4/E53-C4DR4	E53-Q4Q4	E53-Q4HQ4H

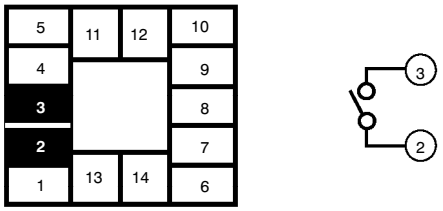
Specifications for Each Type of Output

Output type	Specifications
Relay Voltage (NPN) Voltage (PNP)	3 A at 250 VAC 20 mA at 12 VDC (with short-circuit protection) 20 mA at 12 VDC (with short-circuit protection)
0 to 10 V 4 to 20 mA	0 to 10 VDC, permissible load impedance: 1 kΩ min., resolution: approx. 2,600 4 to 20 mA, permissible load impedance: 500 Ω max., resolution: approx. 2,600

Auxiliary Output 1

Terminal numbers 2 and 3 are for auxiliary output 1 (SUB1).

The internal equalizing circuit for auxiliary output 1 is as follows:

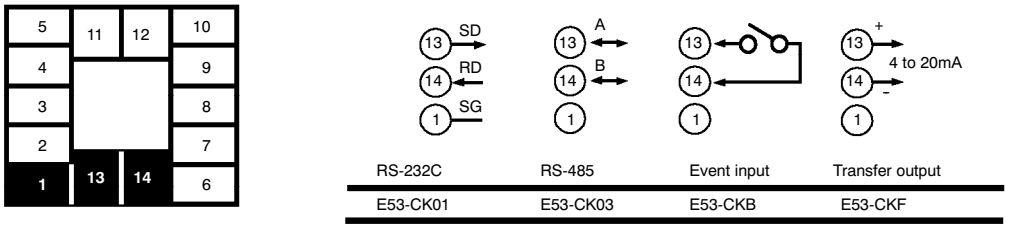


Relay specifications are as follows: SPST-NO, 250 VAC, 1 A

Option

Terminal numbers 1, 13, and 14 are valid only when the option board is set in the Controller.

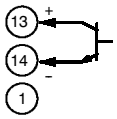
The following four connections are possible depending on the model of the option board.



Use event inputs under the following conditions:

Contact input	ON: 1 kΩ max., OFF: 100 kΩ min.
No-contact input	ON: residual voltage 1.5 V max., OFF: leakage current 0.1 mA max.

The polarity for no-contact input is as follows:



Transfer output specifications are as follows: 4 to 20 mA, load: 500 Ω max., resolution approx. 2600

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.



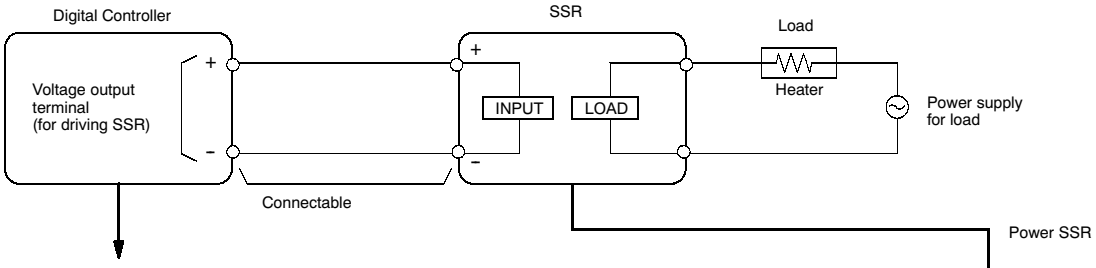


■ Operation

- 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.

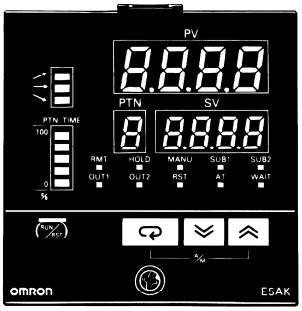
■ SSR

Connection Example of Process Controller and SSR



E5□K-T

Process Controller with Voltage Output (12 VDC, 40 mA max.)



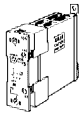
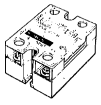


E5CK-T

Controller with Voltage Output (12 VDC, 20 mA max.)



See the following table.

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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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
416-286-6465

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