Digital Controllers
E5AR

CSM_E5AR_DS_E_3_5

E5AR Digital Controllers offer high speed, high precision, and multiple I/O and use a 5-digit, 3-row LCD display for high visual clarity.

- A short sampling period of 50 ms enables use in applications requiring high-speed response.
- PV, SP, and MV data is displayed simultaneously in a 3-row, negative LCD display with a backlight.
- Multiloop control, cascade control, and proportional control are possible with a single Controller.
- When using models with CompoWay/F communications, initial settings can be downloaded and settings can be masked using Support Software (CX-Thermo version 4.0 or higher).
- Equipped with calculation functions as a standard (e.g., square root calculation and broken-line approximation).
- DeviceNet Communications
  Data setting and monitoring can be performed without special programming.

For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

⚠ Refer to *Safety Precautions for All E5□R Models*.

Refer to *E5AR/E5ER Operation* for operating procedures.

Model Number Structure

■ Model Number Legend

E5AR-□□□□□□□□□-□□□
1 2 3 4 5 6 7 8 9 10

1. Constant Values/Program
None: Constant value

2. Control Method
Blank: Standard or heating/cooling control
P: Position proportional control

3. Output 1
R: DPST-NO relay outputs
Q: Pulse voltage and pulse voltage/current outputs
C: Current and current outputs

4. Output 2
Blank: None
R: Relay outputs
Q: Pulse voltage and pulse voltage/current outputs
C: Current and current outputs

Note: When your order, specify the power supply voltage.

5. Auxiliary Outputs
Blank: None
4: 4PST-NO relay outputs
T: 2 transistor outputs

6. Optional Function 1
Blank: None
3: RS-485 communications

7. Optional Function 2
Blank: None
D: 4 event inputs

8. Input 1
B: Universal-input and 2 event inputs
F: Universal-input and FB
W: Universal-input and universal-input

9. Input 2
Blank: None
W: Universal-input and universal-input

10. Communications Method
Blank: None
FLK: CompoWay/F
DRT: DeviceNet

Note: The above model number legend is intended as a functional description of models. Not all possible combinations of functions are available. Confirm model availability in *Ordering Information* when ordering.

The CX-Thermo Support Software (version 4.0 or higher) can be used to easily set parameters in conversational form.

Note: Be sure to read the precautions for correct use and other precautions in the following user's manual before using the Digital Controller.
E5AR/E5ER Digital Controller User's Manual (Cat. No. Z182)
E5AR/E5ER Digital Controller DeviceNet Communication User's Manual (Cat. No. H124)

Ordering Information

■ Digital Controllers

When your order, specify the power supply voltage.

Standard Controllers (100 to 240 VAC)

Size	Control type	Control mode	Outputs (control/transfer)	Optional functions			Model
				Auxiliary outputs (SUB)	Event inputs	Serial communications	
96 × 96 mm	Basic control (1 loop)	Single-loop standard control Single-loop heating and cooling control	2 points: Pulse voltage and Pulse voltage/current	4	2	No	E5AR-Q4B
			2 points: Current and Current				E5AR-C4B
			2 points: Pulse voltage and Pulse voltage/current			RS-485	E5AR-Q43B-FLK
			2 points: Current and Current				E5AR-C43B-FLK
			2 points: Pulse voltage and Pulse voltage/current		6		E5AR-Q43DB-FLK
			2 points: Current and Current				E5AR-C43DB-FLK
			4 points: Pulse voltage and Pulse voltage/current and Current (2 points)				E5AR-QC43DB-FLK
	2-loop control	2-loop standard control Single-loop heating and cooling control Single-loop cascade control Single-loop control with remote SP Single-loop proportional control	2 points: Pulse voltage and Pulse voltage/current	4	4	RS-485	E5AR-Q43DW-FLK
			2 points: Current and Current				E5AR-C43DW-FLK
		2-loop standard control 2-loop heating and cooling control Single-loop cascade control Single-loop control with remote SP Single-loop proportional control	4 points: Pulse voltage (2 points) and Pulse voltage/current (2 points)				E5AR-QQ43DW-FLK
	4-loop control	4-loop standard control 2-loop heating and cooling control	4 points: Current output (4 points)	4	4	RS-485	E5AR-CC43DWW-FLK
			4 points: Pulse voltage (2 points) and Pulse voltage/current (2 points)				E5AR-QQ43DWW-FLK
	Position-proportional control (1 loop)	Single-loop position-proportional control (See note.)	Relay output (1 open, 1 close)	4	4	No	E5AR-PR4DF
			Relay output (1 open, 1 close) and 1 current (transfer) output			RS-485	E5AR-PRQ43DF-FLK

Note: Can be switched between close control and floating control.

Standard Controllers (24 VAC/DC)

Size	Control type	Control mode	Outputs (control/transfer)	Optional functions			Model
				Auxiliary outputs (SUB)	Event inputs	Serial communications	
96 × 96 mm	Basic control (1 loop)	Single-loop standard control Single-loop heating and cooling control	2 points: Pulse voltage and Pulse voltage/current	4	2	No	E5AR-Q4B
			2 points: Current and Current				E5AR-C4B
			4 points: Pulse voltage and Pulse voltage/current and Current (2 points)		6	RS-485	E5AR-QC43DB-FLK
	2-loop control	2-loop standard control 2-loop heating and cooling control Single-loop cascade control Single-loop control with remote SP Single-loop proportional control	4 points: Pulse voltage (2 points) and Pulse voltage/current (2 points)	4	4	RS-485	E5AR-QQ43DW-FLK
	4-loop control	4-loop standard control 2-loop heating and cooling control	4 points: Current output (4 points)	4	4	RS-485	E5AR-CC43DWW-FLK
	Position-proportional control (1 loop)	Single-loop position-proportional control (See note.)	Relay output (1 open, 1 close)	4	4	No	E5AR-PR4DF
			Relay output (1 open, 1 close) and 1 current (transfer) output			RS-485	E5AR-PRQ43DF-FLK

Note: Can be switched between close control and floating control.

DeviceNet-compatible Controllers (100 to 240 VAC)

Size	Control type	Control mode	Outputs (control/transfer)	Optional functions			Model
				Auxiliary outputs (SUB)	Event inputs	DeviceNet communications	
96 × 96 mm	Basic control (1 loop)	1 loop for standard control Single-loop heating and cooling control	2 points: Pulse voltage and Pulse voltage/current	4	2	Yes	E5AR-Q4B-DRT
			2 points: Current and Current				E5AR-C4B-DRT
			4 points: Pulse voltage and Pulse voltage/current and Current (2 points)				E5AR-QC4B-DRT
	2-loop control	2-loop standard control 2-loop heating and cooling control Single-loop cascade control Single-loop control with remote SP Single-loop proportional control	4 points: Pulse voltage (2 points) and Pulse voltage/current (2 points)	4	None	Yes	E5AR-QQ4W-DRT
	4-loop control	4-loop standard control 2-loop heating and cooling control	4 points: Current (4 points)	4	None	Yes	E5AR-CC4WW-DRT
	Position-proportional control (1 loop)	Single-loop position-proportional control (See note.)	Relay output (1 open, 1 close)	4	None	Yes	E5AR-PR4F-DRT
			Relay output (1 open, 1 close) and 1 current (transfer) output				E5AR-PRQ4F-DRT

Note: Can be switched between close control and floating control.

DeviceNet-compatible Controllers (24 VAC/DC)

Size	Control type	Control mode	Outputs (control/transfer)	Optional functions			Model
				Auxiliary outputs (SUB)	Event inputs	DeviceNet communications	
96 × 96 mm	Basic control (1 loop)	1 loop for standard control Single-loop heating and cooling control	2 points: Pulse voltage and Pulse voltage/current	4	2	Yes	E5AR-Q4B-DRT
			2 points: Current and Current				E5AR-C4B-DRT
			4 points: Pulse voltage and Pulse voltage/current and Current (2 points)				E5AR-QC4B-DRT
	2-loop control	2-loop standard control 2-loop heating and cooling control Single-loop cascade control Single-loop control with remote SP Single-loop proportional control	4 points: Pulse voltage (2 points) and Pulse voltage/current (2 points)	4	None	Yes	E5AR-QQ4W-DRT
	4-loop control	4-loop standard control 2-loop heating and cooling control	4 points: Current (4 points)	4	None	Yes	E5AR-CC4WW-DRT
	Position-proportional control (1 loop)	Single-loop position-proportional control (See note.)	Relay output (1 open, 1 close)	4	None	Yes	E5AR-PR4F-DRT
			Relay output (1 open, 1 close) and 1 current (transfer) output				E5AR-PRQ4F-DRT

Note: Can be switched between close control and floating control.

Inspection Results

The Inspection Report can be ordered at the same time as the Digital Controller using the following model number.

Inspection Report (Sold Separately)

Descriptions	Model
Inspection Report for E5AR	E5AR-K

■ Accessories (Order Separately)

Terminal Cover (Sold Separately)

Descriptions	Model
Terminal Cover for E5AR	E53-COV14

Unit Label Sheet

Model
Y92S-L1

Rubber Packing

Model
Y92S-P4

Note: The Rubber Packing is provided with the Digital Controller.

Mounting Adapters

Model
Y92H-9

Note: These Mounting Adapters are provided with the Digital Controller.

Specifications

■ Ratings

Item		Supply voltage (See note 1.)	100 to 240 VAC, 50/60 Hz	24 VAC, 50/60 Hz; 24 VDC
Operating voltage range			85% to 110% of rated supply voltage	
Power consumption			22 VA max. (with maximum load)	15 VA/10 W max. (with maximum load)
Sensor input (See note 2.)			Thermocouple: K, J, T, E, L, U, N, R, S, B, W Platinum resistance thermometer: Pt100 Current input: 4 to 20 mA DC, 0 to 20 mA DC (including remote SP input) Voltage input: 1 to 5 VDC, 0 to 5 VDC, 0 to 10 VDC (including remote SP input) (Input impedance: 150 Ω for current input, approx. 1 MΩ for voltage input)	
Control output	Voltage (pulse) output		12 VDC, 40 mA max. with short-circuit protection circuit (E5AR-QQ□WW-□: 21 mA max.)	
	Current output		0 to 20 mA DC, 4 to 20 mA DC; load: 500 Ω max. (including transfer output) (Resolution: Approx. 54,000 for 0 to 20 mA DC; Approx. 43,000 for 4 to 20 mA DC)	
	Relay output		Position-proportional control type (open, closed) N.O., 250 VAC, 1 A (including inrush current)	
Auxiliary output			Relay Output N.O., 250 VAC, 1 A (resistive load)	
Potentiometer input			100 Ω to 2.5 kΩ	
Event input	Contact		Input ON: 1 kΩ max.; OFF: 100 kΩ min.	
	No-contact		Input ON: Residual voltage of 1.5 V max.; OFF: Leakage current of 0.1 mA max.	
			Short circuit current: Approx. 4 mA	
Remote SP input			Refer to the information on sensor input.	
Transfer output			Refer to the information on control output.	
Control method			2-PID or ON/OFF control	
Setting method			Digital setting using front panel keys or setting using serial communications	
Indication method			7-segment digital display and single-lighting indicator Character Height PV: 12.8 mm; SV: 7.7 mm; MV: 7.7 mm	
Other functions			Depends on model.	
Ambient operating temperature			–10 to 55°C (with no icing or condensation) For 3 years of assured use: –10 to 50°C (with no icing or condensation)	
Ambient operating humidity			25% to 85%	
Storage temperature			–25 to 65°C (with no icing or condensation)	

Note 1: The supply voltage (i.e., 100 to 240 VAC or 24 VAC/VDC) depends on the model. Be sure to specify the required type when ordering.
2: The Controller is equipped with multiple sensor input. Temperature input or analog input can be selected with the input type setting switch. There is basic insulation between power supply and input terminals, power supply and output terminals, and input and output terminals.
3: Do not use an inverter output as the power supply. (Refer to *Safety Precautions for All E5□R Models*.)

■ Input Ranges

Platinum Resistance Thermometer, Thermocouple, Current, or Voltage Input

Input type	Platinum Resistance Thermometer		Thermocouple													Current		Voltage		
Name	Pt100		K		J		T	E	L	U	N	R	S	B	W (W/Re 5-26)	[mA]		[V]		
Temperature Range (°C)	850.0	150.00	1300.0	500.0	850.0	400.0	400.0	600.0	850.0	400.0	1300.0	1700.0	1700.0	1800.0	2300.0	20 to 4	20 to 0	5 to 1	5 to 0	10 to 0
	–200.0	–150.00	–200.0	–20.0	–100.0	–20.0	–200.0	0.0	–100.0	–200.0	–200.0	0.0	0.0	100.0	0.0					
Setting	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Minimum setting unit (SP and alarm)	0.1°C	0.01°C	0.1°C													(Depends on scaling and number of decimal places.)				
Input type setting switch	Set to TC.PT. (TC.PT / INT TYPE / ANALOG)															Set to ANALOG. (TC.PT / INT TYPE / ANALOG)				

The shaded area indicates the setting status at the time of purchase.

■ Characteristics

Indication accuracy	Thermocouple input with cold junction compensation: (±0.1% of PV or ±1°C, whichever is greater) ±1 digit max. (See note 1.) Thermocouple input without cold junction compensation: (±0.1% FS or ±1°C, whichever is smaller) ±1 digit (See note 2.) Analog input: ±0.1% FS ±1 digit max. Platinum resistance thermometer input: (±0.1% of PV or ±0.5°C, whichever is greater) ±1 digit max. Position-proportional potentiometer input: ±5% FS ±1 digit max.
Control mode	Standard control (heating or cooling control), heating/cooling control, standard control with remote SP (2-input models only), heating/cooling control with remote SP (2-input models only), cascade standard control (2-input models only), cascade heating/cooling control (2-input models only), proportional control (2-input models only), position-proportional control (control-valve control models only)
Influence of temperature **Influence of voltage** **Influence of EMS. (at EN61326-1)**	Thermocouple input (R, S, B, W): (±1% of PV or ±10°C, whichever is greater) ±1 digit max. Other thermocouple input: (±1% of PV or ±4°C, whichever is greater) ±1 digit max. ∗K-type thermocouple at −100°C max.: ±10°C max. Platinum resistance thermometer: (±1% of PV or ±2°C, whichever is greater) ±1 digit max. Analog input: (±1%FS) ±1 digit max.
Control period	0.2 to 99.0 s (in units of 0.1 s) for time-proportioning control output
Proportional band (P)	0.00% to 999.99% FS (in units of 0.01% FS)
Integral time (I)	0.0 to 3,999.9 s (in units of 0.1 s)
Derivative time (D)	0.0 to 3,999.9 s (in units of 0.1 s)
Hysteresis	0.01% to 99.99% FS (in units of 0.01% FS)
Manual reset value	0.0% to 100.0% (in units of 0.1% FS)
Alarm setting range	−19,999 to 99,999 EU (See note 3.) (The decimal point position depends on the input type and the decimal point position setting.)
Input sampling period	50 ms
Insulation resistance	20 MΩ min. (at 500 VDC)
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min (between charged terminals of different polarities)
Vibration resistance	10 to 55 Hz, 20 m/s^2 for 10 min each in X, Y, and Z directions
Shock resistance	100 m/s^2, 3 times each in X, Y, and Z directions
Inrush current	100 to 240-VAC models: 50 A max. 24 VAC/VDC models: 30 A max.
Weight	Controller only: Approx. 450 g; Mounting bracket: Approx. 60 g; Terminal cover: Approx. 30 g
Degree of protection	Front panel: NEMA4X for indoor use (equivalent to IP66); Rear case: IP20; Terminals: IP00
Memory protection	Non-volatile memory (number of writes: 100,000)
Applicable standards	UL61010C-1, CSA C22.2 No. 1010-1 EN61010-1 (IEC61010-1): Pollution degree 2/overvoltage category 2
EMC	EMI: EN61326-1 (See note 5.) Radiated Interference Electromagnetic Field Strength: EN55011 Group 1 Class A Noise Terminal Voltage: EN55011 Group 1 Class A EMS: EN61326-1 (See note 5.) ESD Immunity: EN61000-4-2: 4 kV contact discharge (level 2) 8 kV air discharge (level 3) Electromagnetic Immunity: EN61000-4-3: 10 V/m (amplitude-modulated, 80 MHz to 1 GHz, 1.4 GHz to 2 GHz) (level 3) Burst Noise Immunity: EN61000-4-4: 2 kV power line (level 3) 2 kV output line (relay output) (level 4) 1 kV measurement line, I/O signal line (level 4) 1 kV communications line (level 3) Conducted Disturbance Immunity: EN61000-4-6: 3 V (0.15 to 80 MHz) (level 3) Surge Immunity: EN61000-4-5: 1 kV line to line (power line, output line (relay output)) (level 2) 2 kV line to ground (power line, output line (relay output)) (level 3) Power Frequency Magnetic Field Immunity: EN61000-4-8: 30 A/m (50 Hz) continuous field Voltage Dip/Interrupting Immunity: EN61000-4-11: 0.5 cycle, 100% (rated voltage)

Note 1: K-, T-, or N-type thermocouple at −100°C max.: ±2°C ±1 digit max.
U- or L-type thermocouple: ±2°C ±1 digit max.
B-type thermocouple at 400°C max.: No accuracy specification.
R- or S-type thermocouple at 200°C max.: ±3°C ±1 digit max.
W-type thermocouple: (±0.3% of PV or ±3°C, whichever is greater) ±1 digit max.

2: U- or L-type thermocouple: ±1°C ±1 digit
R- or S-type thermocouple at 200°C max.: ±1.5°C ±1 digit

3: "EU" (Engineering Unit) represents the unit after scaling. If a temperature sensor is used it is either °C or °F.

4: Conditions: Ambient temperature from −10 to 23 to 55°C and voltage of −15% to 10% of rated voltage.

5: Industrial electromagnetic environment (EN/IEC 61326-1 Table 2)

■ Communications Specifications

Transmission path connection	Multiple points
Communications method	RS-485 (two-wire, half duplex)
Synchronization method	Start-stop synchronization
Baud rate	9,600, 19,200, or 384,000 bps
Transmission code	ASCII
Data bit length	7 or 8 bits
Stop bit length	1 or 2 bits
Error detection	Vertical parity (none, even, odd) Block check character (BCC): CompoWay/F CRC-16: Modbus
Flow control	None
Interface	RS-485
Retry function	None
Communications buffer	217 bytes
Communications response send wait time	0 to 99 ms, Default: 20 ms

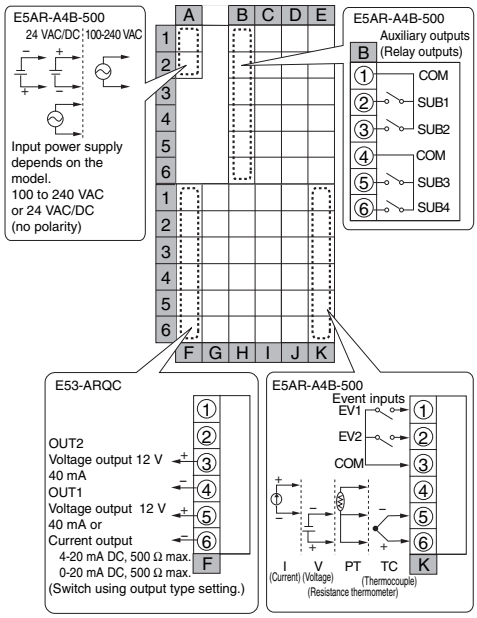
DeviceNet

Item		Specifications			
Communications protocol		Conforms to DeviceNet			
Communications functions	**Remote I/O communications**	• Master-slave connections (polling, bit-strobe, COS, or cyclic) • Conform to DeviceNet specifications.			
	I/O allocations	• Can allocate any I/O data from the Configurator. • Can allocate any data, such as parameters specific to the DeviceNet and the Digital Controller variable area. • Up to 2 blocks for the IN Area, up to a total of 100 words. • One block for the OUT Area, up to 100 words (first word is always allocated to Output Enable Bits).			
	Message communications	• Explicit message communications • CompoWay/F communications commands can be sent (commands are sent in explicit message format).			
Connection format		Combination of multidrop and T-branch connections (for trunk and drop lines)			
Baud rate		DeviceNet: 500, 250, or 125 kbps, or automatic detection of master baud rate			
Communications media		Special 5-wire cable (2 signal lines, 2 power lines, and 1 shield line)			
Communications distance		Baud rate	Network length	Drop line length	Total drop line length
		500 kbps	100 m max. (100 m max.)	6 m max.	39 m max.
		250 kbps	250 m max. (100 m max.)	6 m max.	78 m max.
		125 kbps	500 m max. (100 m max.)	6 m max.	156 m max.
		The values in parentheses apply when Thin Cables are used.			
Supply voltage		DeviceNet power supply: 24 VDC			
Allowable voltage range		DeviceNet power supply: 11 to 25 VDC			
Current consumption		50 mA max. (24 VDC)			
Maximum number of nodes that can be connected		64 (includes Configurator when used)			
Maximum number of slaves that can be connected		63			
Error control		CRC error detection			
Power supply		Power supplied from DeviceNet communications connector.			

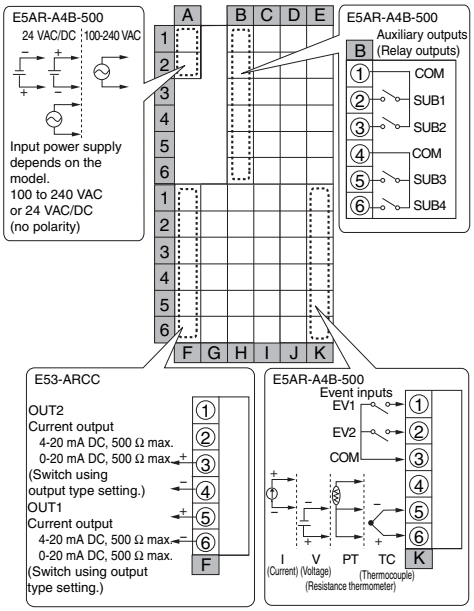
Wiring Terminals

■ E5AR Standard Controller Connections

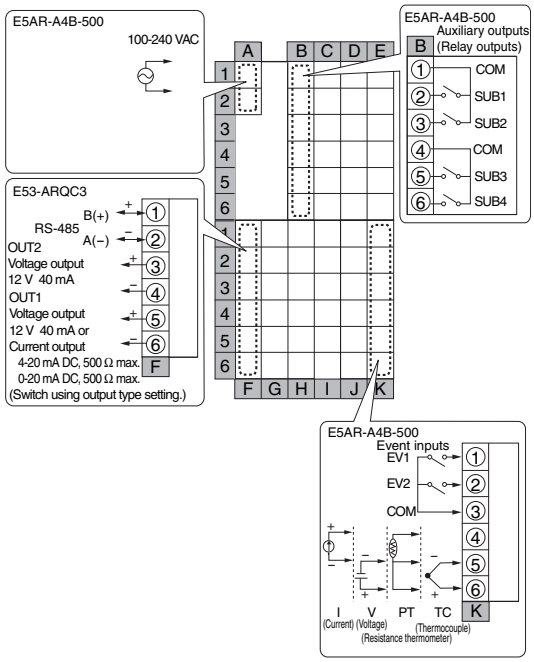
E5AR-Q4B



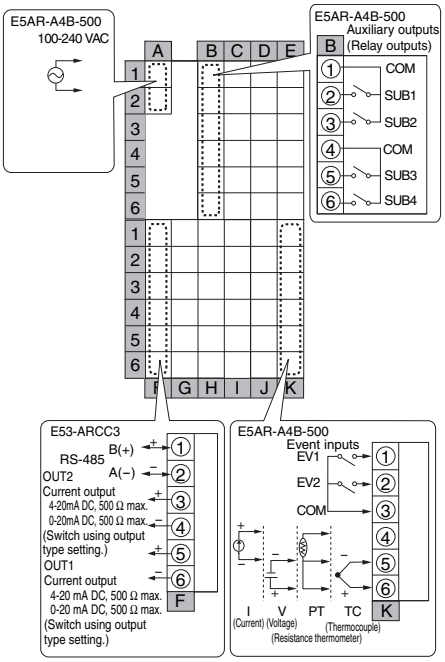
E5AR-C4B



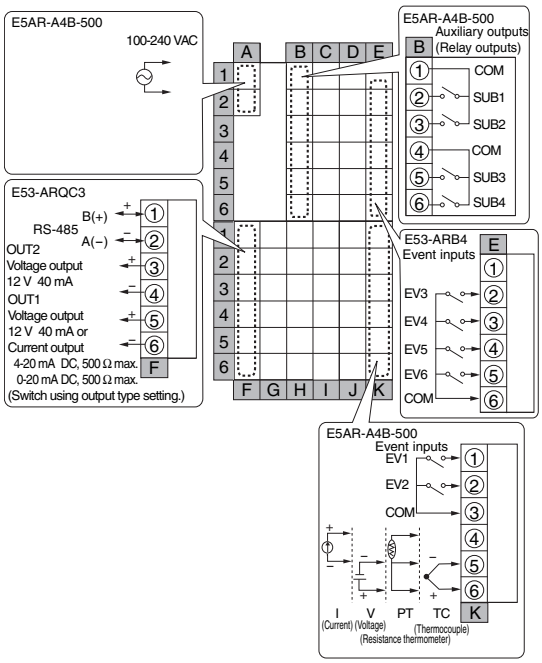
E5AR-Q43B-FLK



E5AR-C43B-FLK



E5AR-Q43DB-FLK



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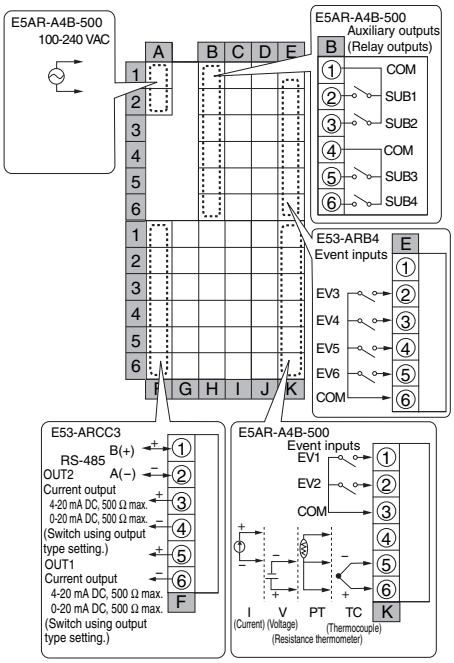

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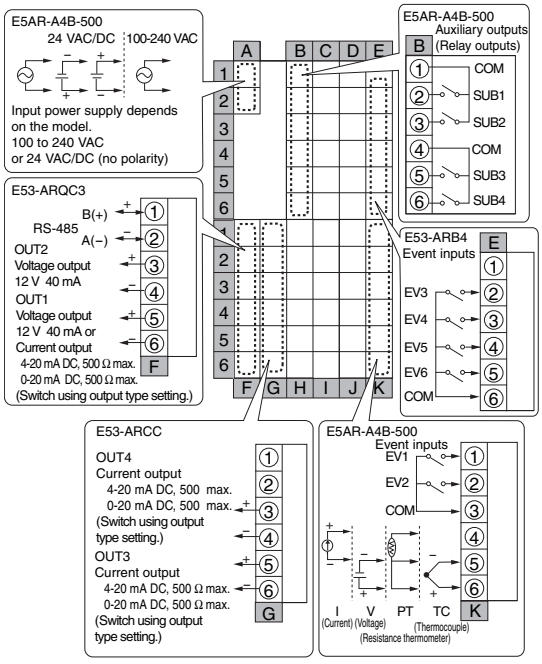
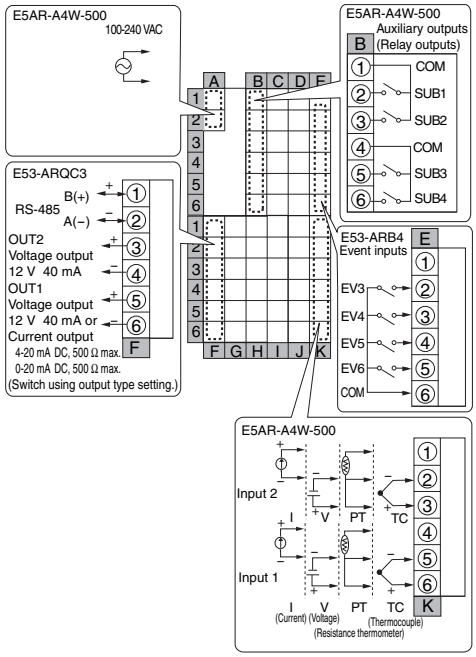
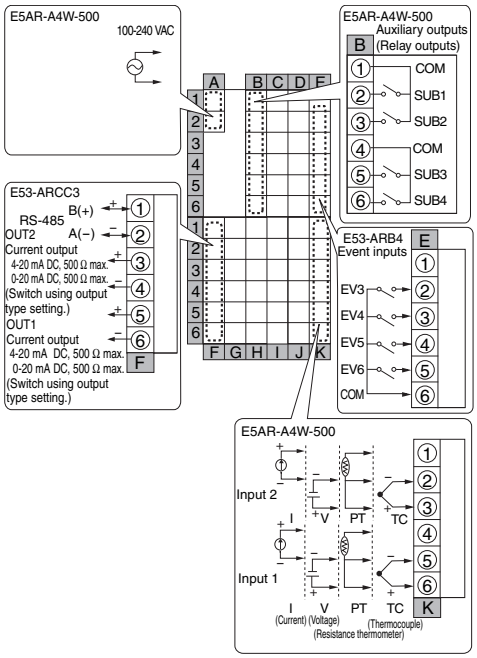


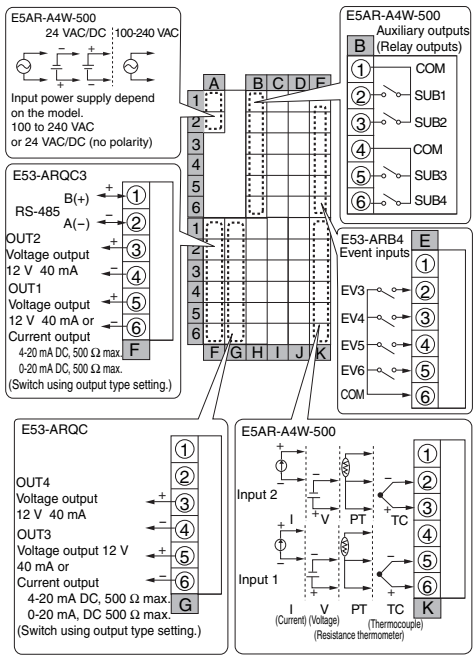
E5AR-Q43DW-FLK (2-loop Control)



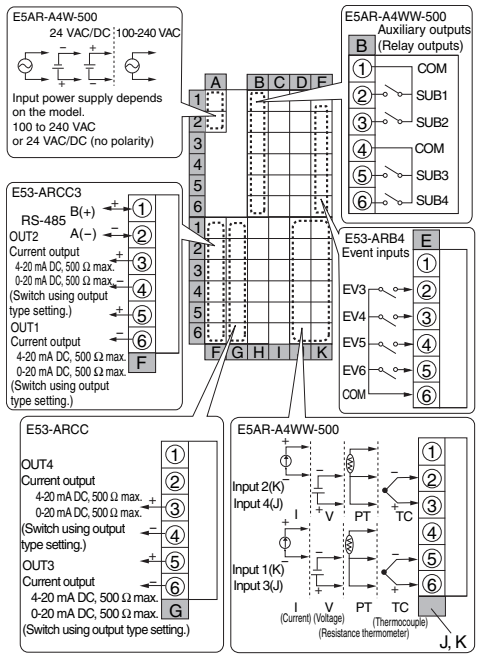
E5AR-C43DW-FLK (2-loop Control)



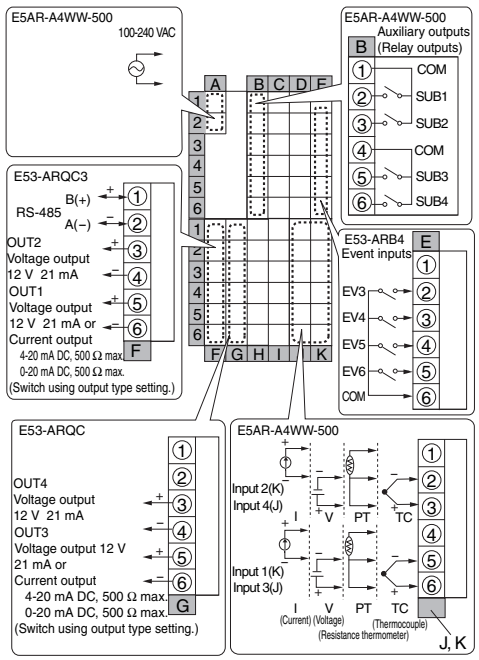
E5AR-QQ43DW-FLK (2-loop Control)



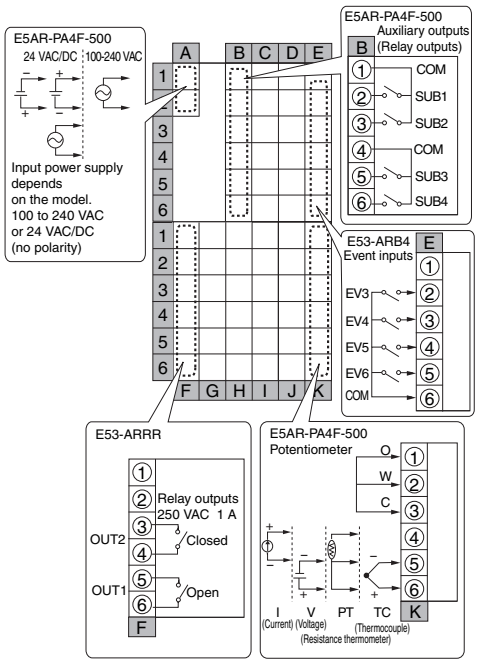
E5AR-CC43DWW-FLK (4-loop Control)



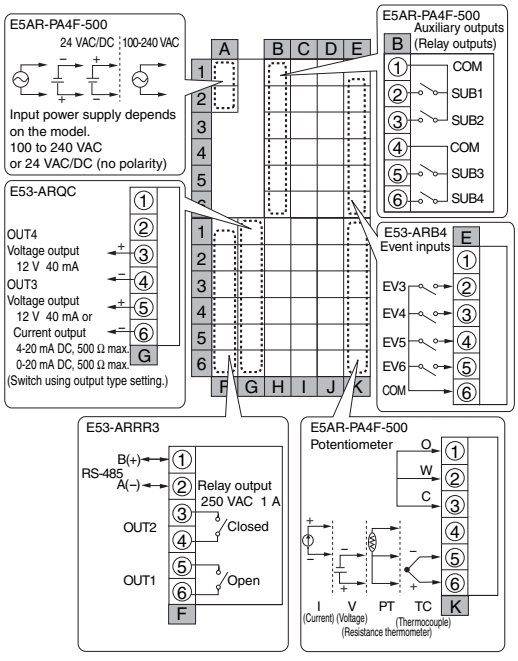
E5AR-QQ43DWW-FLK (4-loop Control)



E5AR-PR4DF

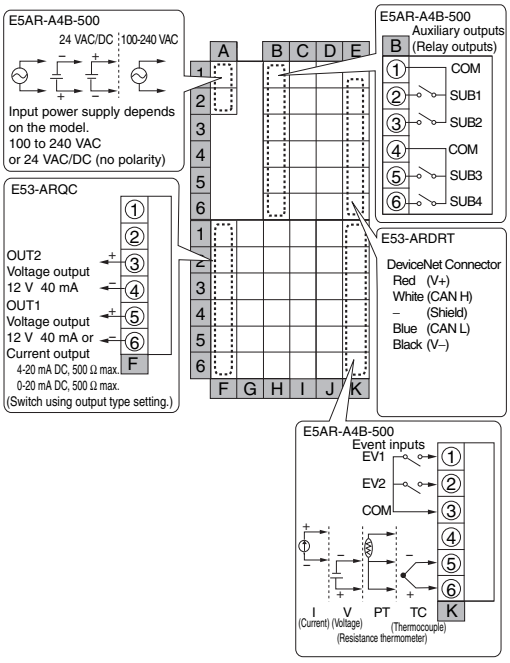


E5AR-PRQ43DF-FLK

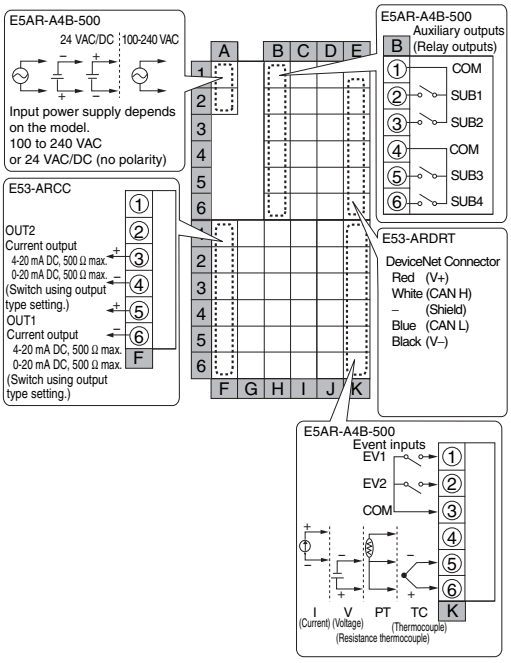


■ E5AR DeviceNet-compatible Controller Connections

E5AR-Q4B-DRT



E5AR-C4B-DRT



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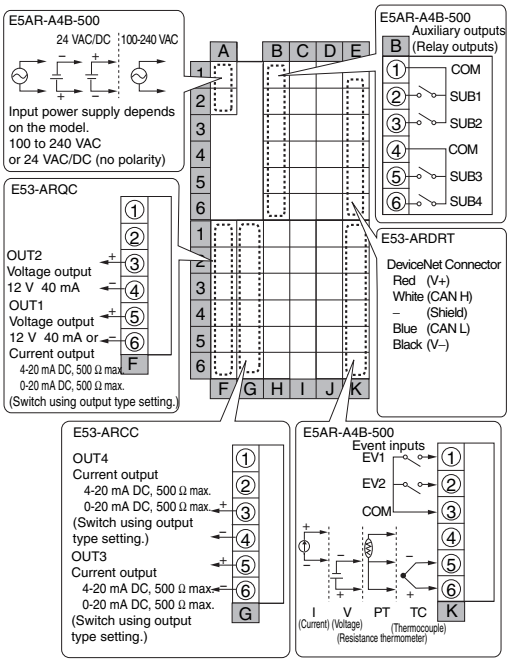
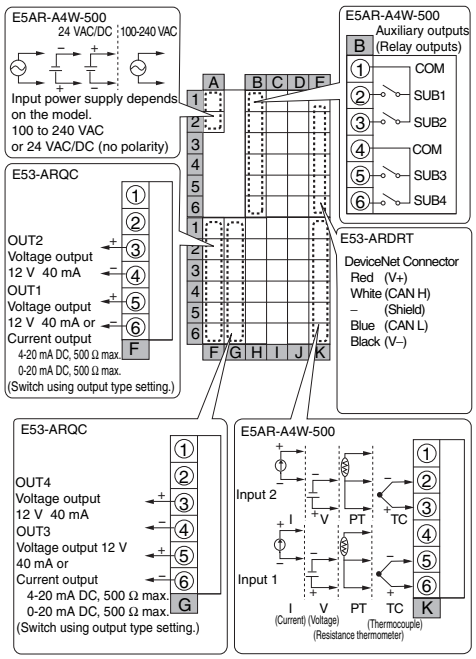
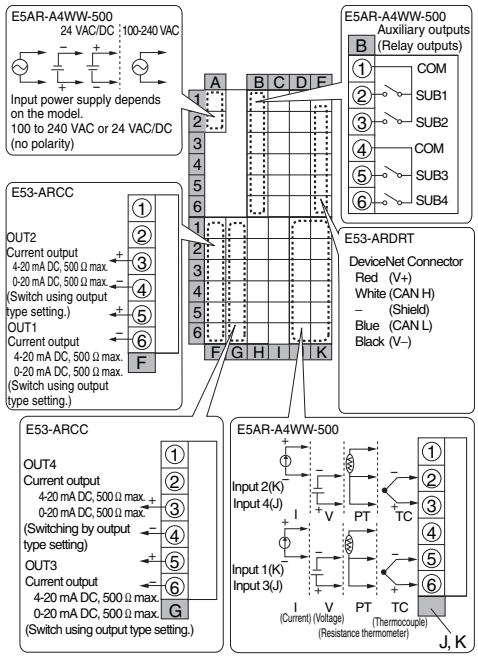


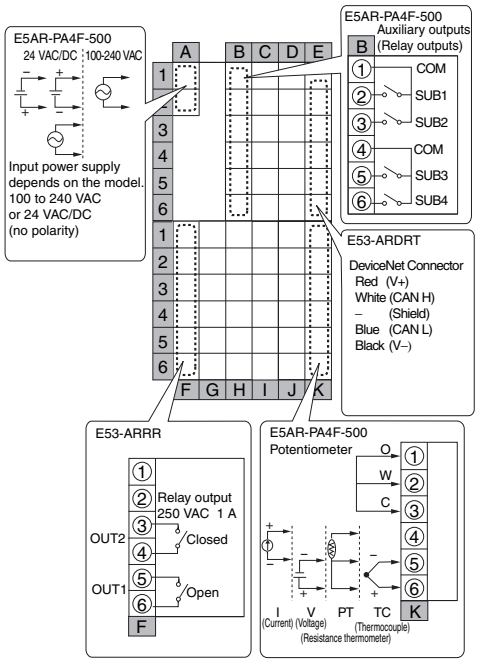
E5AR-QQ4W-DRT (2-loop Control)



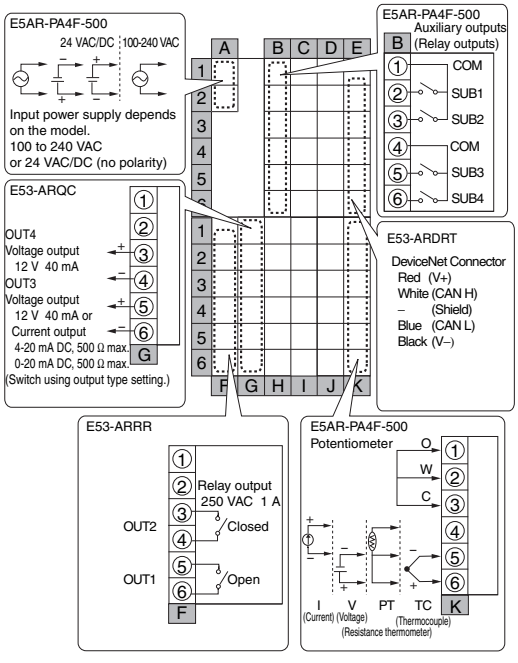
E5AR-CC4WW-DRT (4-loop Control)



E5AR-PR4F-DRT

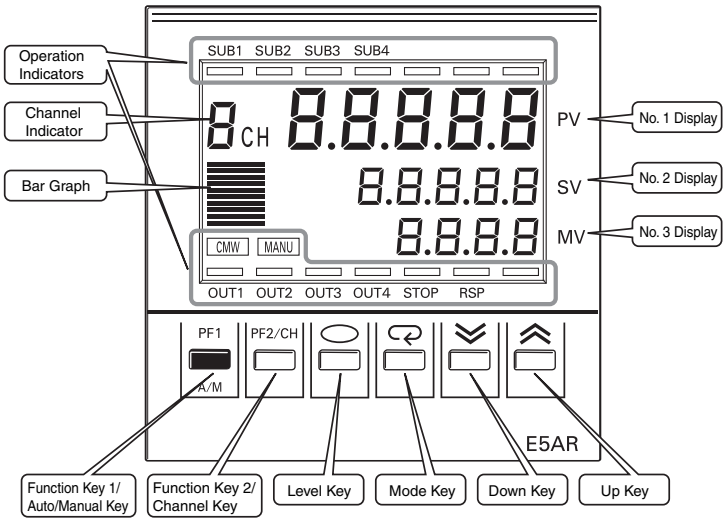


E5AR-PRQ4F-DRT

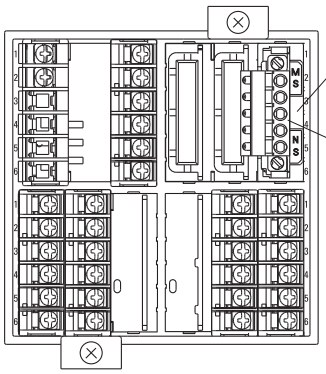


Nomenclature

E5AR



DeviceNet-compatible Controllers, Rear Panel



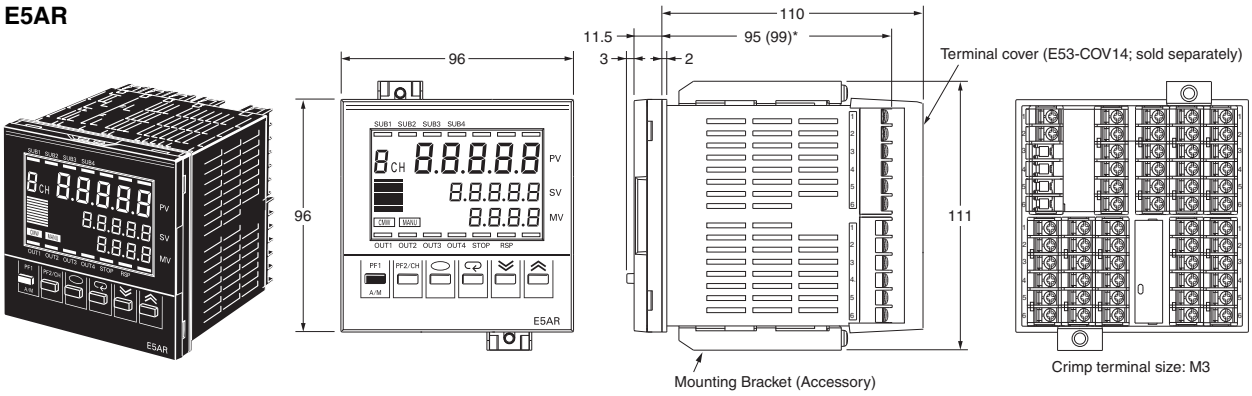
MS/NS indicators
Top: MS
Bottom: NS

DeviceNet communications connector
Used to connect the DeviceNet communications cables.
The DeviceNet communications power is also supplied through this connector.
The connector included with the DeviceNet-compatible Controllers is the FKC 2.5/5-STF-5.08 AU M (PHOENIX CONTACT).

Dimensions

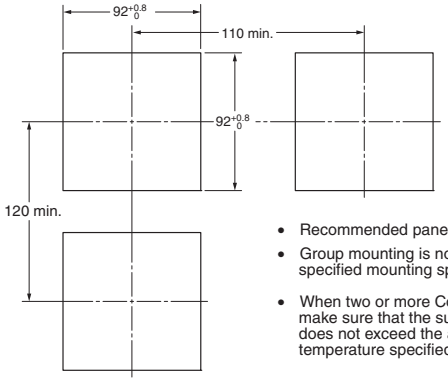
Note: All units are in millimeters unless otherwise indicated.

E5AR



* The value in parentheses is for DeviceNet-compatible Controllers.

Panel Cutouts

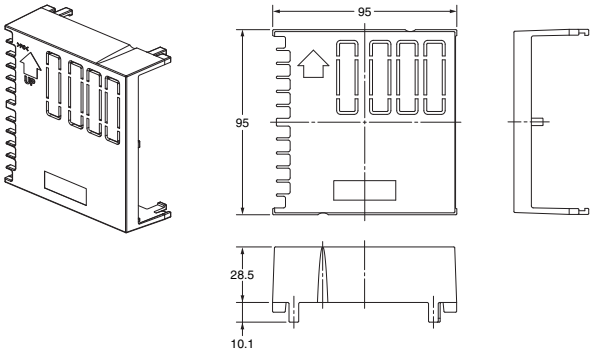


- Recommended panel thickness is 1 to 8 mm.
- Group mounting is not possible. (Maintain the specified mounting space between Controllers.)
- When two or more Controllers are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature specified in the specifications.

■ Accessories (Order Separately)

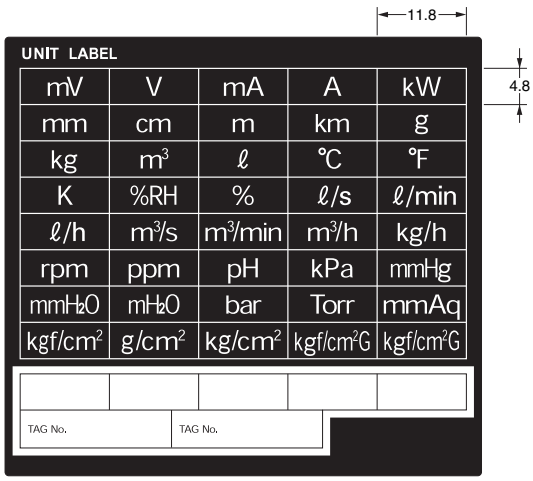
Terminal Cover

E53-COV14 (for E5AR)



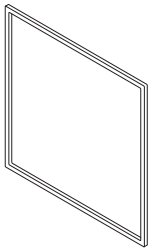
Unit Label Sheet

Y92S-L1



Rubber Packing

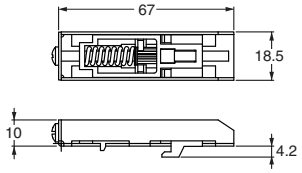
Y92S-P4 (for DIN96 × 96)



Order the Rubber Packing separately if it becomes lost or damaged. (Refer to page 4.)
The Rubber Packing can be used to achieve an IP66 degree of protection.
(Deterioration, shrinking, or hardening of the rubber packing may occur depending on the operating environment. Therefore, periodic replacement is recommended to ensure the level of waterproofing specified in NEMA4. The time for periodic replacement depends on the operating environment. Be sure to confirm this point at your site. Consider one year a rough standard. OMRON shall not be liable for the level of water resistance if the customer does not perform periodic replacement.)
The Rubber Packing does not need to be attached if a waterproof structure is not required.

Mounting Adapters

Y92H-9 (2pcs)



One set is packaged with the product.
Order Mounting Adapters separately if yours are lost or damaged.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

In the interest of product improvement, specifications are subject to change without notice.

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2017.8

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