Programmable Digital Controller
E5ER-T

A new 48 × 96-mm High-speed, High-precision Digital Controller that is Programmable!

• Create up to 32 programs with up to 256 segments total.

• 0.01°C High resolution for Pt input.

• High-speed sampling at 50 ms.

• Settings easily made from a computer using the CX-Thermo.

• RoHS compliance for world-wide application.

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

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

Model Number Structure

■ Model Number Legend

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

E5ER-T□□□□□□□□-□□□
   1 2 3 4 5 6 7 8   9

1. Control method

Blank: Standard or heating/cooling control

P: Position proportional control

2. Output 1

R: NO relay output + NO relay output

Q: Pulse output/current output + pulse output

C: Current output + current output

3. Output 2

R: NO relay output + NO relay output

Q: Pulse output/current output + pulse output

C: Current output + current output

4. Auxiliary Outputs

Blank: None

4: NO relay output + NO relay output

T: 2 transistor outputs

5. Communications

Blank: None

3: RS-485 communications

6. Optional Function

Blank: None

D: 4 event inputs

7. Input 1

B: Universal-input and 2 event inputs

F: Universal-input and FB

W: Universal-input and universal-input

8. Input 2

Blank: None

W: Universal-input and universal-input

9. Other

FLK: CompoWay/F communications

(3 digits): (Modification type)

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.

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/ER Digital Controller User's Manual (Cat. No. Z182)

OMRON

Ordering Information

■ Digital Controllers

When your order, specify the power supply voltage.

Programmable Digital Controllers (100 to 240 VAC)

Size	Control type	Control mode	Outputs (control/transfer)	Optional functions			Model
				Auxiliary outputs (SUB)	Event inputs	Serial communications	
48 × 96 mm	Basic control (1 loop)	Standard control Heating and cooling control	2 (pulse + pulse/current)	4	2	None	E5ER-TQ4B
			2 (current + current)				E5ER-TC4B
			2 (pulse + pulse/current)			RS-485	E5ER-TQC43B-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 (pulse + pulse/current)	2 (See Note 2.)	4	RS-485	E5ER-TQT3DW-FLK
			2 (current + current)				E5ER-TCT3DW-FLK
	Control valve control (1 loop)	Single-loop position-proportional control	Relay outputs (1 open, 1 closed)	2 (See Note 2.)	4	None	E5ER-TPRTDF
			Relay outputs (1 open, 1 closed) and 1 current	4	None	RS-485	E5ER-TPRQ43F-FLK

Note 1: The outputs are transistor output.

Programmable Digital Controllers (24 VAC/DC)

Size	Control type	Control mode	Outputs (control/transfer)	Optional functions			Model
				Auxiliary outputs (SUB)	Event inputs	Serial communications	
48 × 96 mm	Basic control (1 loop)	Standard control Heating and cooling control	2 (pulse + pulse/current)	4	2	None	E5ER-TQ4B
			2 (current + current)				E5ER-TC4B
			2 (pulse + pulse/current)			RS-485	E5ER-TQC43B-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 (pulse + pulse/current)	2 (See Note 2.)	4	RS-485	E5ER-TQT3DW-FLK
			2 (current + current)				E5ER-TCT3DW-FLK
	Control valve control (1 loop)	Single-loop position-proportional control	Relay outputs (1 open, 1 closed)	2 (See Note 2.)	4	None	E5ER-TPRTDF
			Relay outputs (1 open, 1 closed) and 1 current	4	None	RS-485	E5ER-TPRQ43F-FLK

Note 1: The outputs are transistor output.

Inspection Results

If an inspection report is required, it can be ordered at the same time as the Digital Controller using the following model number.

Inspection Report (Order Separately)

Model
E5ER-K

■ Accessories (Order Separately)

Terminal Cover

Descriptions	Model
Terminal Cover for E5ER	E53-COV15

Rubber Packing

Model
Y92S-P5

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

Specifications

■ Ratings

Supply voltage (See note 2.)	CE Marking	100 to 240 VAC, 50/60 Hz	24 VAC, 50/60 Hz; 24 VDC
	UL certification	100 to 120 VAC, 50/60 Hz	
Operating voltage range		85% to 110% of rated supply voltage	
Power consumption		17 VA max. (with maximum load)	11 VA/7 W max. (with maximum load)
Sensor input (See note 3.)		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	
	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		<u>Relay Output</u> N.O., 250 VAC, 1 A (resistive load) <u>Transistor Output</u> Maximum load voltage: 30 VDC; Maximum load current: 50 mA; Residual voltage: 1.5 V max.; Leakage current: 0.4 mA max.	
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: 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 display: 9.5 mm; SV display: 7.2 mm; MV display: 7.2 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: Do not use an inverter output as the power supply. (Refer to *Safety Precautions for All E5□R Models*.)
2: 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.
3: 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.

■ 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 / −200.0	1300.0 / −150.00 (150.00)	850.0 / −20.0	400.0 / −100.0	600.0 / −20.0	850.0 / 0.0	400.0 / −100.0	1300.0 / −200.0	1700.0 / 0.0	1700.0 / 0.0	1800.0 / 100.0 / 0.0	2300.0 / 0.0	20 to 4	20 to 0	5 to 1	5 to 0	10 to 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.														Set to ANALOG		

Note: 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 (malfunction)	10 to 55 Hz, 20 m/s^2 for 10 min each in X, Y, and Z directions
Shock resistance (malfunction)	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. 330 g; Mounting bracket: Approx. 60 g; Terminal cover: Approx. 16 g
Degree of protection	Front panel: NEMA4X for indoor use; Rear case: IP20; Terminals: IP00
Memory protection	Non-volatile memory (number of writes: 100,000)
Applicable standards	UL 61010C-1, CSA C22.2 No. 1010-1 (Power supply voltage: 100 to 120 VAC): Pollution degree 2/Overvoltage category 2 EN 61010-1 (IEC 61010-1) (Power supply voltage: 100 to 240 VAC): Pollution degree 2/Overvoltage category 2

EMC	EMI: EN61326-1 (See note 4.)
	  Radiated Interference Electromagnetic Field Strength: EN55011 Group 1 Class A
	  Noise Terminal Voltage: EN55011 Group 1 Class A
	
	EMS: EN61326-1 (See note 4.)
	  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: 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 38,400 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

■ Program Control Functions

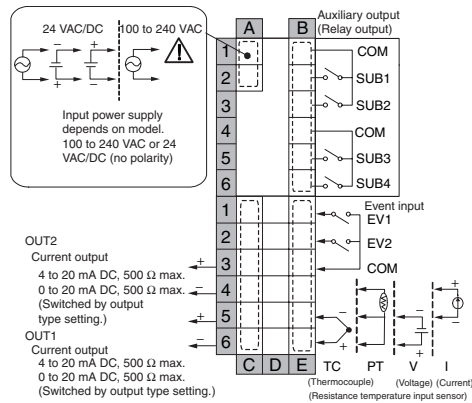|		
Number of programs (patterns)		32 (with 8 segments/program)
Number of segments (steps)		32 (with 8 programs)
Maximum number of segments		256
Segment setting method		Time setting (Segment set with set point and time.) Gradient setting (Segment set with set point, gradient, and time.)
Segment times		0 h 0 min to 99 h 59 min 0 min 0 s to 99 min 59 s 0 min 00.0 s to 99 min 59.9 s
Alarm group number specifications	**Number of sets**	4
	Setting method	Set separately for each program.
Reset operation		Select either stopping control or fixed SP operation.
Startup operation		Select continuing, resetting, manual operation, run mode, or ramp back operation.
PID sets	**Number of sets**	8
	Setting method	Set separately for each program (automatic PID group selection also supported).
Alarm SP function		Select from ramp SP and target SP.
Program status control	**Segment operation**	Advance, hold, and back
	Program operation	Program repetitions and program links
Wait operation	**Wait method**	Select from waiting at segment ends and always waiting.
	Wait width setting	Wait width upper limit and lower limit set separately for each program.
	Setting method	ON/OFF setting for each segment
Time signals	**Number of outputs**	6
	Number of ON/OFF operations	3 each per output
	Setting method	Set separately for each program.
Segment outputs	**Number of outputs**	10
	Setting method	ON/OFF set for each segment.
Program status output		Program end output (pulse width can be set) Segment number output
Program startup operation	**PV start**	Select from segment 1 set point, gradient-priority PV start, and time-priority PV start.
	Standby	Standby
Operation end operation		Select from resetting, continuing control at final set point, and fixed SP control.
Number of event inputs		10 max.

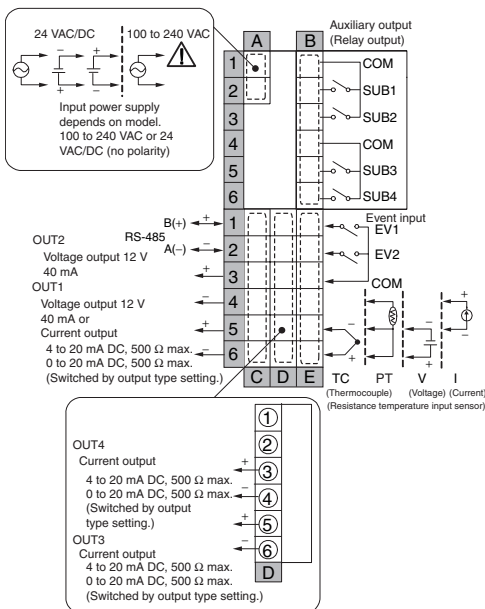# Wiring Terminals

■ E5ER-T (Programmable Type)

E5ER-TQ4B
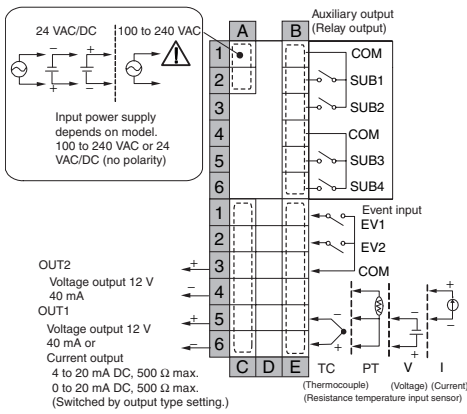
E5ER-TC4B

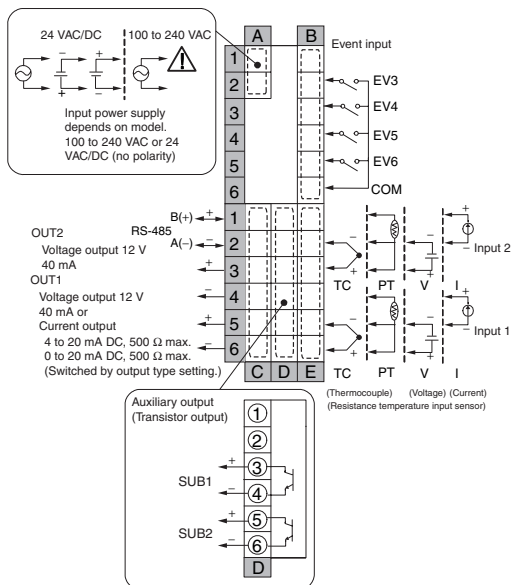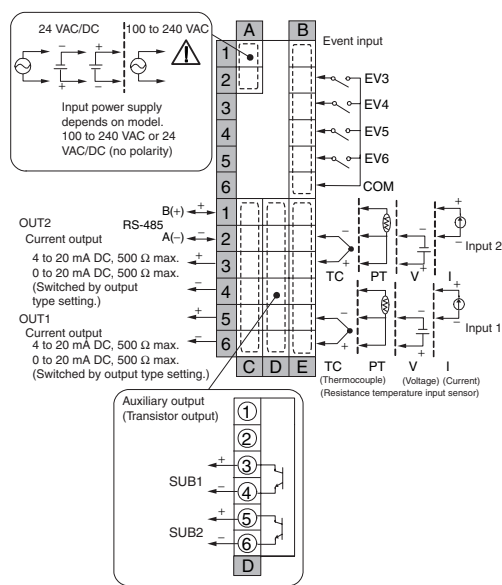### E5ER-TQC43B-FLK

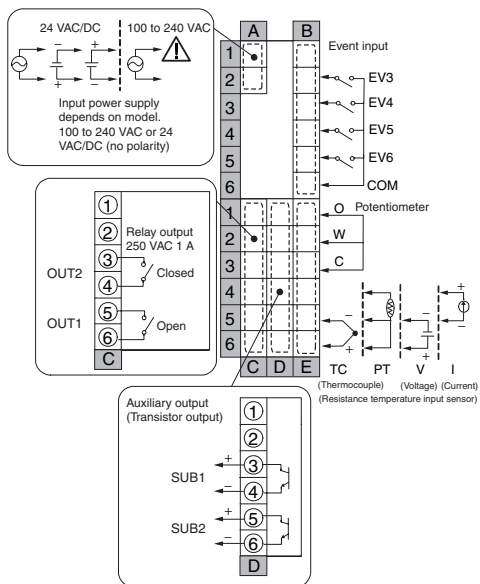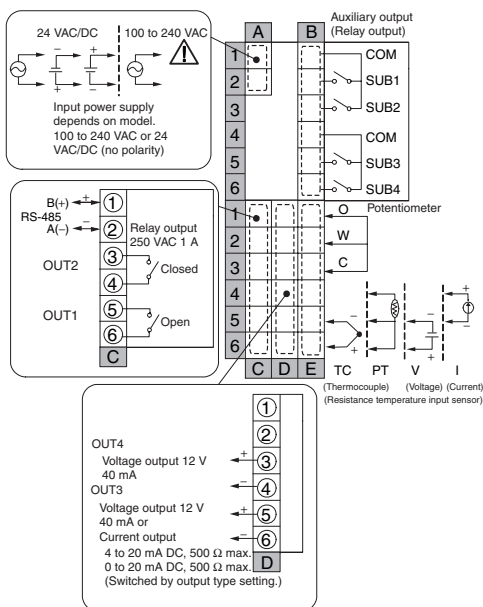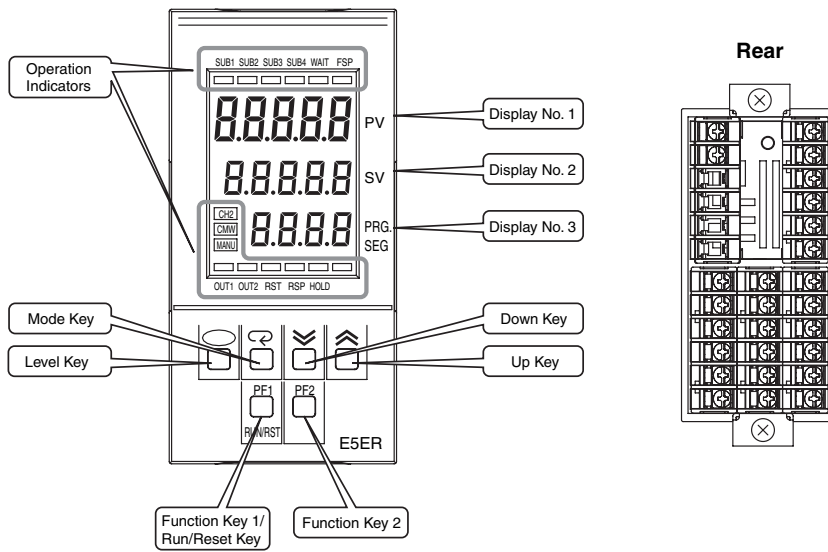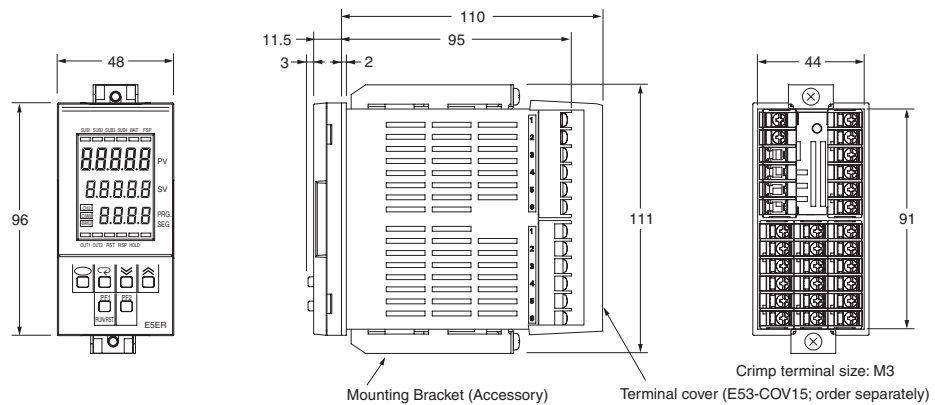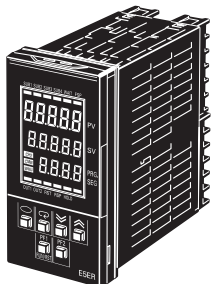| ⚠ Note	The power supply voltage must be 100 to 240 VAC or 24 VAC/DC for the E5ER-T to comply with CE marking requirements. The power supply voltage must be 100 to 120 VAC or 24 VAC/DC for the E5ER-T to comply with UL requirements.

6

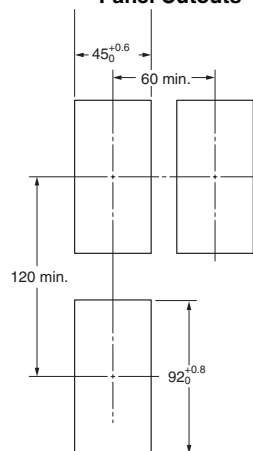## E5ER-TQT3DW-FLK (2-loop Control)

24 VAC/DC | 100 to 240 VAC

Input power supply depends on model. 100 to 240 VAC or 24 VAC/DC (no polarity)

A | B

1 — Event input
2
3 — EV3
4 — EV4
5 — EV5
6 — EV6 / COM

OUT2 — RS-485 — B(+) — 1
Voltage output 12 V 40 mA — A(−) — 2
OUT1 — 3
Voltage output 12 V 40 mA or Current output — 4
4 to 20 mA DC, 500 Ω max. — 5
0 to 20 mA DC, 500 Ω max. — 6
(Switched by output type setting.)

C | D | E

TC — PT — V — I
(Thermocouple) (Voltage) (Current)
(Resistance temperature input sensor)

Input 2
Input 1

Auxiliary output (Transistor output)

① ② ③ ④ ⑤ ⑥
SUB1
SUB2

D

E5ER-TCT3DW-FLK (2-loop Control)

24 VAC/DC | 100 to 240 VAC

Input power supply depends on model. 100 to 240 VAC or 24 VAC/DC (no polarity)

A | B

1 — Event input
2
3 — EV3
4 — EV4
5 — EV5
6 — EV6 / COM

OUT2 — RS-485 — B(+) — 1
Current output — A(−) — 2
4 to 20 mA DC, 500 Ω max. — 3
0 to 20 mA DC, 500 Ω max. — 4
(Switched by output type setting.) — 5
OUT1 — 6
Current output
4 to 20 mA DC, 500 Ω max.
0 to 20 mA DC, 500 Ω max.
(Switched by output type setting.)

C | D | E

TC — PT — V — I
(Thermocouple) (Voltage) (Current)
(Resistance temperature input sensor)

Input 2
Input 1

Auxiliary output (Transistor output)

① ② ③ ④ ⑤ ⑥
SUB1
SUB2

D

E5ER-TPRTDF

24 VAC/DC | 100 to 240 VAC

Input power supply depends on model. 100 to 240 VAC or 24 VAC/DC (no polarity)

A | B

1 — Event input
2
3 — EV3
4 — EV4
5 — EV5
6 — EV6 / COM

① O — Potentiometer
② Relay output 250 VAC 1 A
③ W
④ Closed
OUT2 — ⑤ C
OUT1 — ⑥ Open

C | D | E

TC — PT — V — I
(Thermocouple) (Voltage) (Current)
(Resistance temperature input sensor)

Auxiliary output (Transistor output)

① ② ③ ④ ⑤ ⑥
SUB1
SUB2

D

E5ER-TPRQ43F-FLK

24 VAC/DC | 100 to 240 VAC

Input power supply depends on model. 100 to 240 VAC or 24 VAC/DC (no polarity)

A | B

Auxiliary output (Relay output)

1 — COM
2 — SUB1
3 — SUB2
4 — COM
5 — SUB3
6 — SUB4

RS-485 — B(+) — ① O — Potentiometer
A(−) — ② Relay output 250 VAC 1 A — W
③ C
OUT2 — ④ Closed
⑤
OUT1 — ⑥ Open

C | D | E

TC — PT — V — I
(Thermocouple) (Voltage) (Current)
(Resistance temperature input sensor)

OUT4
Voltage output 12 V 40 mA
OUT3
Voltage output 12 V 40 mA or Current output
4 to 20 mA DC, 500 Ω max.
0 to 20 mA DC, 500 Ω max.
(Switched by output type setting.)

① ② ③ ④ ⑤ ⑥
D

⚠ Note	The power supply voltage must be 100 to 240 VAC or 24 VAC/DC for the E5ER-T to comply with CE marking requirements. The power supply voltage must be 100 to 120 VAC or 24 VAC/DC for the E5ER-T to comply with UL requirements.

Nomenclature

E5ER-T

Operation Indicators

SUB1 SUB2 SUB3 SUB4 WAIT FSP

PV — Display No. 1

SV — Display No. 2

CH2 / CMW / MANU

PRG. SEG — Display No. 3

OUT1 OUT2 RST RSP HOLD

Mode Key

Level Key

Down Key

Up Key

PF1 PF2

RUN/RST

E5ER

Function Key 1/ Run/Reset Key

Function Key 2

Rear

Crimp terminal size: M3

Dimensions

Note: All units are in millimeters unless otherwise indicated.

E5ER-T

48

96

110

11.5

3

2

95

111

44

91

Mounting Bracket (Accessory)

Terminal cover (E53-COV15; order separately)

Crimp terminal size: M3

Panel Cutouts

$45^{+0.6}_{0}$

60 min.

120 min.

$92^{+0.8}_{0}$

• 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-COV15 (for E5ER)

Unit Label Sheet

Y92S-L1

UNIT LABEL				
mV	V	mA	A	kW
mm	cm	m	km	g
kg	m^3	ℓ	℃	℉
K	%RH	%	ℓ/s	ℓ/min
ℓ/h	m^3/s	m^3/min	m^3/h	kg/h
rpm	ppm	pH	kPa	mmHg
mmH₂0	mH₂0	bar	Torr	mmAq
kgf/cm^2	g/cm^2	kg/cm^2	kgf/cm^2G	kgf/cm^2G

TAG No.   TAG No.
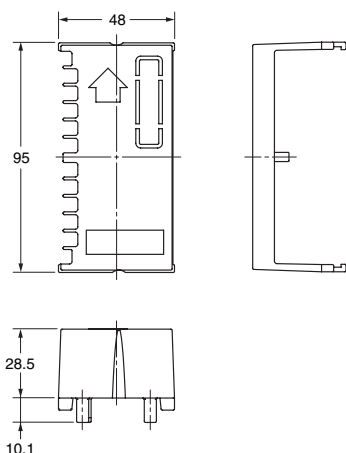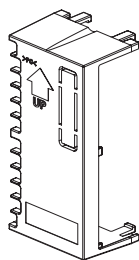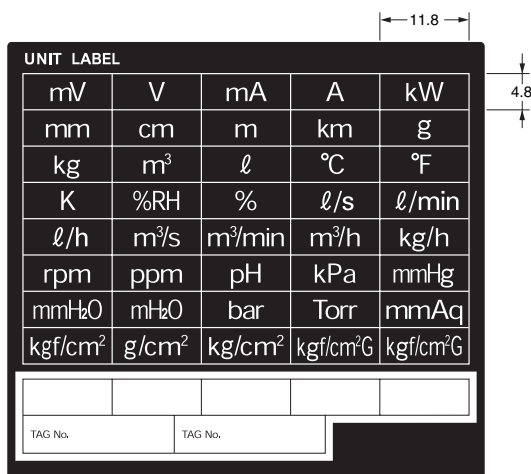
Rubber Packing

Y92S-P5 (for DIN48 × 96)

Order the Rubber Packing separately if it becomes lost or damaged. (Refer to page 2.)
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.

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.