# **Temperature controllers**

# Temperature uniformity made easy

# With E5ZN temperature controllers, all temperatures are equal

Omron's E5ZN temperature controllers feature GTC, the innovative new gradient temperature control technology. GTC provides perfectly-controlled 2D temperature profiles over any size sheet and eliminates all irregularities in sheetprocessing temperature to provide faster throughput and high, consistent quality and yield. E5ZN types are available with inputs for thermocouple or PRT signals and with voltage, transistor or analogue outputs.

Up to five E5ZN controllers can be connected together to apply GTC to up to 10 heating elements and a DeviceNet communications unit is available to provide centralised control. E5ZN – the perfect solution for 2D processing temperature control.





### A-0

# The E5\_N series – evolution in temperature control

# Now available in a choice of dimensions!

Omron's best-selling E5CN temperature controller is now joined by the upgraded versions of the E5AN and E5EN, offering the same superb features. The E5\_N series includes a bright LCD display that gives a clear read-out, even under a wide viewing angle and harsh lighting conditions. They feature a colour change display with process values in three colours for easy status recognition, and an 11-segment display that makes text easy to understand.

The unique 2-PID provides optimum control performance. Plus, the E5\_N series is easy to set up and operate. It has customisable menus and parameter protection, as well as PC software tools for parameter cloning, setting and tuning. Trust Omron to set the pace in temperature control evolution!





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### **Table of contents**

Selection table		
Basic temperature controller	K8AB-TH	CD
	E5C2	A-5
	E5CSV	A-11
General purpose controller	E5GN	A-23
	E5□N	A-29
	Common to all E5 N	CD
	E5ZN	A-65
	E5ZN-DRT	A-81
Advanced controller	E5CK	CD
	E5AK/E5EK	CD
	E5□K-T	CD
	E5□R	A-87
	Common to all E5 R	CD
	E5ZE	CD
Auxiliaries	EST2-2C-MV3 (CX-Thermo)	A-118
	PRT1-SCU11	A-120
	ES1B	CD
Technical information	Temperature controllers	CD

# Selection table

	Category Basic temperature controller			General purpose controllers				
on criteria		A Research B			STATE AND			
scti	Model	K8AB-TH	E5C2	E5CSV	E5GN	E5CN	E5EN	E5AN
Sele	Туре	Basic			General purpose			
•	Panel	In-panel type	In- & on-panel typ	e	On-panel type			
	Loops	-	Single loop					
	Size	22.5 mm wide	1/16 DIN	1/16 DIN	1/32DIN	1/16 DIN	1/8 DIN	1/4 DIN
qe	ON / OFF							
ŭ	PID		■ <sup>*1</sup>					
-	2-PID *2							
ntr	Operation *3		Н	H/C	H & C	H&C	H&C	H&C
ပိ	Position proportional *4							
	Accuracy	±2%		±0.5%	±0.5%	±0.5%	±0.5%	±0.5%
	Auto-tuning							
	Self-tuning							
s	Transfer output							
ure	Remote input							
eat	Number of alarms	1		2	1	3	3	3
ш	Heater burnout					□ <sup>*5</sup>		
	IP rating front panel	IP20	IP40	IP65	IP66	IP66	IP66	IP66
	Display	Rotary switch	SV dial	Single 3.5 digit	Dual 4 digit	Dual 4 digit colour change	Dual 4 digit colour change	Dual 4 digit colour change
ply age	110/240 VAC	-	•	•	-	•	•	•
Sup volt	24 VAC / VDC	•						
	RS-232							
°,	RS-485							
E	Event IP							
ē	QLP port							
	DeviceNet							
	Relay							
ēĦ	SSR							
utp	Voltage (pulse)							
٥٥	Linear voltage							
	Linear current							
g 7	mA							
put ty - linea	mV				•	•		
<u> </u>	V							-
	К							
đ	J							
ald -	Т							
õ	E							
Ĕ	L							
her	U							
÷	N							
type	R							
Ŧ	S							
dul	В							
	W							
	PLII							
be	Pt100							
RTD	JPt100							
- Inpu	THE		•					
	Page	CD	A-5	A-11	A-23	A-31	A-45	A-55

\*1

P only 2-PID is Omrons unique high-performance PID control H = heat, H / C = heat or cool, H & C = heat and cool Position proportional = valve control (relay up & down) Heater alarm = heater burnout & SSR failure detection Profibus communication option via gateway for E5\_N, E5\_R, E5ZN, ask your local Omron representative. Fuzzy PID available \*2 \*3 \*4 \*5 \*6 \*7

# **Temperature controllers**

	E52E Multi-point
	E5ZE Multi-point
E5ZN E5CK E5EK E5AK E5CK-T E5EK-T E5AK-T E5ER E5AR	Multi-point
Modular Universal Universal / programmer Advanced	In nonal type
In-panel type On-panel type	m-paner type
Multi-loop         Single loop         Multi-loop           22.5 x 130 mm         1/16 DIN         1/2 DIN	65 x 253 mm
	<b>■</b> *7
H&C         H&C         H&C         H&C         H&C         H&C         H&C         H&C	H&C
$\pm 0.5\%$ $\pm 0.3\%$ $\pm 0.3\%$ $\pm 0.3\%$ $\pm 0.3\%$ $\pm 0.3\%$ $\pm 0.3\%$ $\pm 0.1\%$ $\pm 0.1\%$	±0.3%
	-
2 3 3 3 3 3 3 4 4	2
■ Loop burnout □ □ Loop burnout □ □	
IP66 IP66 IP66 IP66 IP66 IP66 IP66 IP66	
Dual 4 digit Triple 5 digit Triple 5 digit	🗆 Dual 4 digit
	_
	Π
	-
	-
	-
	-
	-
A-65 CD CD CD A-87	CD

Standard

□ Available

No / not available

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- · Readily available
- · Convenience that saves you time



30 View 20 View Download



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# Analogue Temperature Controller E5C2

### DIN-sized (48 x 48 mm) Temperature Controller with Analog Setting

- Compact, low-cost Temperature Controller.
- Incorporates proportional control and reset adjustment function.
- Consecutive mounting possible using mounting adapter.
- Incorporates a plug-in socket, thus allows to DIN-rail and flush mounting.



# (€¶%∰

# **Model Number Structure**

# Model Number Legend



### 1. Model name

- 2. Control output
  - R: Relay
  - Q: Voltage
- 3. Control method
  - 20: ON-OFF control
  - 40: P control

#### 4. Input type

- K: K-type thermocouple
- L: J-type thermocouple
- P: Platinum resistance thermometer (PT100)
- G: Thermistor (THE)
- 5. Special type
  - Blank: Standard type D, DIN: Special types

# **Ordering Information**

# ■ Temperature Controllers

Setting	Indication	Control mode	Control mode Output	Model			
method	metnoa			Thermocouple		Platinum resistance	Thermistor
				K (CA) Chromel vs. alumel	L (IC) Iron vs. constantan	thermometer Pt100	IHE
Analog setting	No indication	ON/OFF	Relay	E5C2-R20K	E5C2-R20L-D	E5C2-R20P-D	E5C2-R20G
		Р	Relay	E5C2-R40K	E5C2-R40L-D	E5C2-R40P-D	

Note: When placing an order, specify the standard temperature range and supply voltage in addition to the model number. (e.g., E5C2-R20K 0°C to 200°C 100/110 VAC)

# ■ Accessories (Order Separately)

Name	Model
Front Connecting Socket	P2CF-08
Back Connecting Socket (for flush mounting)	P3G-08
Front Connecting Socket with Finger Protection	P2CF-08-E
Protective Cover (for finger protection)	Y92A-48G

# **Specifications**

# Ratings

Supply voltage	100/110/120 VAC (common), 200/220/240 VAC (common) (See note.) 50/60 Hz (common)	
Operating voltage range	90% to 110% of rated supply voltage	
Power consumption	Approx. 2 VA	
Input	Thermocouple (with sensor burnout detection circuit), platinum resistance thermometer, or thermistor	
Control mode	ON/OFF or P control	
Setting method	Analog setting	
Indication method	No indication	
Control output	Relay output: SPDT, 3 A at 250 VAC, resistive load (switching capacity: 330 VA)	

Note: Specify either 100/110/120 VAC or 200/220/240 VAC when ordering.

### ■ Input Ranges

Input		Thermocouple		Platinum resistance thermometer	Thermistor (see note 2)	
		K (CA) Chromel vs. alumel	L (IC) Iron vs. constantan	Pt100	THE	
Range	°C	0 to 200 (5), 0 to 300 (10), 0 to 400 (10), 0 to 600 (20), 0 to 800 (20), 0 to 1,000 (25), 0 to 1,200 (25)	0 to 200 (5), 0 to 300 (10), 0 to 400 (10)	-50 to 50 (2), -20 to 80 (2), 0 to 50 (1), 0 to 100 (2), 0 to 200 (5), 0 to 300 (10), 0 to 400 (10)	–50 to 50 (2) (6 kΩ at 0°C), 0 to 100 (2) (6 kΩ at 0°C), 50 to 150 (2) (30 kΩ at 0°C)	
	°F	32 to 392 (10), 32 to 572 (20), 32 to 752 (20), 32 to 1,112 (40), 32 to 1,472 (50), 32 to 1,832 (50), 32 to 2,192 (50)	32 to 392 (10), 32 to 572 (20), 32 to 752 (20)	32 to 212 (5), 32 to 392 (10)		

Note: 1. Values in ( ) are the minimum unit.

2. Values in ( ) are the thermistor resistive value.

### ■ Characteristics

Setting accuracy	±2% FS max.		
Hysteresis	Approx. 0.5% FS (fixed)		
Proportional band	3% FS (fixed)		
Control period	Approx. 20 s		
Reset range (see note 1)	5 ±1% FS min.		
Insulation resistance	20 MΩ min. (at 500 VDC)		
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min between charged terminals and uncharged metallic parts		
Vibration resistance	Malfunction: 10 to 55 Hz, 0.15-mm single amplitude for 10 min each in X, Y, and Z directions Destruction: 16.7 Hz, 2-mm double amplitude for 2 hrs each in X, Y, and Z directions		
Shock resistance	Malfunction: 147 m/s <sup>2</sup> , 3 times each in 6 directions Destruction: 294 m/s <sup>2</sup> , 3 times each in 6 directions		
Life expectancy	Electrical: 100,000 operations min. (3 A at 110 VAC, resistive load)		
Ambient temperature	Operating: -10°C to 55°C (with no icing or condensation)		
Ambient humidity	Operating: 45% to 85%		
Degree of protection	Front panel: IEC standard IP40 (see note 2) Terminals: IEC standard IP00		
Weight	Approx. 200 g (with flush-mounting adapter)		

Note: 1. No reset function is incorporated by any E5C2 model with ON/OFF control.

2. The model number of the special watertight cover conforming to IP66, NEMA4 is Y92A-48B.

Temperature controllers

# Nomenclature



RESET adjustment shaft No reset function is incorporated by any E5C2 model with ON/OFF control.

### **Operation Indicator**

	Indicator	Output
Red	Lit	ON
	Not lit	OFF

# **Dimensions**

Note: All units are in millimeters unless otherwise indicated.













Dimensions with Flush-mounting Adapter (Accessory), and Back Connecting Socket (Sold Separately)



(15)

Tightening screw (96) (see note)

Note: 109 mm for US08 Back Connecting Socket

Panel Cutout



Side-by-side Mounting of N Controllers



Note: 1. Recommended panel thickness is 1 to 4 mm.

2. Close side-by-side mounting is possible (in a single direction).

### Accessories (Order Separately)

#### P2CF-08 Front Connecting Socket



P3G-08 Back Connecting Socket (for Flush Mounting)







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Note: A Protective Cover for finger protection (Y92A-48G) is also available.

#### **Protective Cover Y92A-48**

The protective cover protects the front panel, particularly the setting section, against dust, dirt, and water drip. It also prevents the set values from being altered due to accidental contact with the setting keys.

Appearance	
Model	Y92A-48B

# Installation

### ■ Connections

#### **Input**

Connect a thermocouple, the E52-THE  $\square$  Thermistor or platinum resistance thermometer to the E5C2 as shown in the following illustration.



### <u>Output</u>

If the load circuit is a heating control system, be sure to connect the load to terminals 4 and 5. If the load circuit is a cooling control system, be sure to connect the load to terminals 4 and 6. If the heating control system is connected to terminals 4 and 6 or the cooling control system is connected to terminals 4 and 5, the temperature of the heating control system or cooling control system will be abnormal and a serious accident may result.

If the E5C2 is in frequent operation, such as proportional operation, add an appropriate external relay to the E5C2 by considering the capacity of the load and the life of the relay.

### Power Supply

If a single power supply is used for the E5C2 and the load, the supply voltage of the power supply may vary greatly when the load is open or closed if the capacity of the power supply is not large enough. Make sure that the capacity of the power supply is large enough so that the supply voltage range will be always from 90% to 110% of the rated supply voltage.

The E5C2 operates at either 50 or 60 Hz.

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### Mounting

### DIN-rail mounting (E5C2 with P2CF-08)

When mounting two or more E5C2 models with DIN-rail mounting sockets, leave a space of approximately 20 mm on both sides of the sockets where hooks are located.



### **Flush Mounting**

Insert E5C2 into the square hole of the panel and insert an adapter from the back so that there will be no space between E5C2 and the panel. Then, secure the E5C2 with a screw.



Tightening screw

The P3G-08 can be wired in the same way as the P2CF-08.



### **Dismounting**

If flush mounted, loosen the screw of the adapter and disengage the hooks for dismounting.



### **Temperature Setting**

Do not turn the temperature setting knob of the E5C2 with excessive force, otherwise the stopper of the knob may break.

### **Others**

Do not remove the housing of the E5C2, otherwise the housing may break.

To clean the surface of the E5C2, use a soft cloth wet with neutral detergent or alcohol. Do not use any organic solvent, such as paint thinner or benzine, strong acid or strong alkali to clean the surface of the E5C2, otherwise the surface of the E5C2 will become 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.

Cat. No. H081-E2-02

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



# Temperature Controllers

### Easy Setting Using DIP Switch and Simple Functions in DIN 48 × 48 mm-size Temperature Controllers

- Easy setting using DIP and rotary switches.
- Multi-input (thermocouple/platinum resistance thermometer).
- Clearly visible digital display with character height of 13.5 mm.
- RoHS compliant.





# **Model Number Structure**

# ■ Model Number Legend

### **Models with Terminal Blocks**

- Output type
   R: Relay
   Q: Voltage for driving SSR

   Number of alarms
- 1: 1 alarm

#### 3. Input type

T: Thermocouple/platinum resistance thermometer (multi-input)

#### 4. Power supply voltage Blank: 100 to 240 VAC D: 24 VAC/VDC

5. Terminal cover

500: Finger protection cover

# **Ordering Information**

# ■ List of Models

Size	Power supply voltage	Number of alarm points	Control output	TC/Pt multi-input Incl. terminal cover
1/16 DIN	100 to 240 VAC	1	Relay	E5CSV-R1T-500
48 x 48 x 78 mm (W x H x D)			Voltage (for driving SSR)	E5CSV-Q1T-500
· · · ·	24 VAC/VDC	1	Relay	E5CSV-R1TD-500
			Voltage (for driving SSR)	E5CSV-Q1TD-500

# ■ Accessories (Order Separately)

### **Protective Front Cover**

Туре	Model
Hard Protective Cover	Y92A-48B

# **Specifications**

# Ratings

Supply voltage		100 to 240 VAC, 50/60 Hz	24 VAC/VDC, 50/60 Hz			
Operating voltage range		85% to 110% of rated supply voltage				
Power cor	nsumption	5 VA	3 VA/2 W			
Sensor in	put	Multi-input (thermocouple/platinum resistance thermom	eter) type: K, J, L, T, U, N, R, Pt100, JPt100			
Control	Relay output	SPST-NO, 250 VAC, 3A (resistive load)				
output	Voltage output (for driving the SSR)	VDC, 21 mA (with short-circuit protection circuit)				
Control m	ethod	ON/OFF or 2-PID (with auto-tuning)				
Alarm output		SPST-NO, 250 VAC, 1A (resistive load)				
Setting method		Digital setting using front panel keys (functionality set-up with DIP switch)				
Indication	method	3.5 digit, 7-segment digital display (character height: 13.5 mm) and deviation indicators				
Other functions		<ul> <li>Setting change prohibit (key protection)</li> <li>Input shift</li> <li>Temperature unit change (°C/°F)</li> <li>Direct/reverse operation</li> <li>Control period switching</li> <li>8-mode alarm output</li> <li>Sensor error detection</li> </ul>				
Ambient temperature		-10 to 55°C (with no condensation or icing)				
Ambient humidity		25% to 85%				
Storage te	emperature	-25 to 65°C (with no condensation or icing)				

# ■ Characteristics

Setting accuracy		Thermocouple (See note 1.):	( $\pm 0.5\%$ of indication value or $\pm 1^{\circ}$ C, whichever is greater) $\pm 1$ digit max.		
Indication accuracy (ambient temperature)	re of 23°C)	Platinum resistance thermometer (See note 2.)	): ( $\pm 0.5\%$ of indication value or $\pm 1^{\circ}$ C, whichever is greater) $\pm 1$ digit max.		
Influence of tempera	ature	R thermocouple inputs: (±1%	of PV or $\pm 10^{\circ}$ C, whichever is greater) $\pm 1$ digit max.		
Influence of voltage		Platinum resistance thermometer inputs: (±1%)	, of PV or ±4°C, whichever is greater) ±1 digit max. , of PV or ±2°C, whichever is greater) ±1 digit max.		
Hysteresis (for ON/C	OFF control)	0.1% FS			
Proportional band (F	P)	1 to 999°C (automatic adjustment using auto-to	uning/self-tuning)		
Integral time (I)		1 to 1,999 s (automatic adjustment using auto-	-tuning/self-tuning		
Derivative time (D)		1 to 1,999 s (automatic adjustment using auto-	-tuning/self-tuning)		
Alarm output range		Absolute-value alarm:       Same as the control range         Other:       0% to 100% FS         Alarm hysteresis:       0.2°C or °F (fixed)			
Control period		2/20 s			
Sampling period		500 ms			
Insulation resistance	e	20 MΩ min. (at 500 VDC)			
Dielectric strength		2,000 VAC, 50/60 Hz for 1 min between current-carrying terminals of different polarity			
Vibration	Malfunction	10 to 55 Hz, 20 m/s <sup>2</sup> for 10 min each in X, Y, and Z directions			
resistance	Destruction	10 to 55 Hz, 0.75-mm single amplitude for 2 hr each in X, Y, and Z directions			
Shock resistance	Malfunction	100 m/s <sup>2</sup> min., 3 times each in 6 directions			
	Destruction	300 m/s <sup>2</sup> min., 3 times each in 6 directions			
Life expectancy Electrical 100,000 operations min. (relay output models)					
Weight		Approx. 120 g (Controller only)			
Degree of protection	ı	Front panel: Equivalent to IP66; Rear case: IP20; Terminals: IP00			
Memory protection		EEPROM (non-volatile memory) (number of w	rites: 1,000,000)		
EMC		EMI Radiated: EMI Conducted: ESD Immunity: Radiated Electromagnetic Field Immunity: Conducted Disturbance Immunity: Noise Immunity (First Transient Burst Noise):	EN 55011 Group 1 Class A EN 55011 Group 1 Class A EN 61000-4-2: 4 kV contact discharge (level 2) 8 kV air discharge (level 3) EN 61000-4-3: 10 V/m (80-1000 MHz, 1.4-2.0 GHz amplitude modulated) (level 3) 10 V/m (900 MHz pulse modulated) EN 61000-4-6: 3 V (0.15 to 80 MHz) (level 2) EN 61000-4-4		
		Burst Immunity:         2           Surge Immunity:         2           Voltage Dip/Interrupting Immunity:         8	2 kV power-line (level 3), 1 kV I/O signal-line (level 3) EN 61000-4-5: Power line: Normal mode 1 kV; Common mode 2 kV Output line (relay output): Normal mode 1 kV; Common mode 2 kV EN 61000-4-11 0.5 cycle, 100% (rated voltage)		
Approved standards		UL 61010C-1 (listing), CSA C22.2 No.1010-1			
Conformed standard	ls	EN 61326, EN 61010-1, IEC 61010-1, VDE 01	06 Part 100 (finger protection), when the terminal cover is mounted.		
Note: 1. The follow • U, L: ±2	ving exception °C ±1 digit m	ns apply to thermocouples.	2. The following exceptions apply to platinum resistance thermometers.		

• R: ±3°C ±1 digit max. at 200°C or less

Input set values 0, 1, 2, 3 for E5CSV: 0.5% FS  $\pm$ 1 digit max. Input set value 1 for E5CSV: 0.5% FS  $\pm$ 1 digit max.

Temperature controllers

# Installation

- All models in the E5CSV Series conform to DIN 43700 standards.
- The recommended panel thickness is 1 to 4 mm.
- Be sure to mount the E5CSV horizontally.

### Mounting the E5CSV

- 1. For waterproof mounting, waterproof packing must be installed on the Controller. Waterproofing is not possible when group mounting several Controllers.
- 2. Insert the E5CSV into the mounting hole in the panel.
- 3. Push the adapter from the terminals up to the panel, and temporarily fasten the E5CSV.
- 4. Tighten the two fastening screws on the adapter. Alternately tighten the two screws little by little to maintain a balance. Tighten the screws to a torque of 0.29 to 0.39 N·m.

# Dimensions

Note: All units are in millimeters unless otherwise indicated.



- Note: 1. The voltage output (12 VDC, 21 mA) is not electrically isolated from the internal circuits. When using a grounding thermocouple, do not connect output terminals 1 or 2 to ground. Otherwise, unwanted current paths will cause measurement errors.
  - 2. Models with 100 to 240 VAC and 24 VAC/VDC are separate. Models using 24 VDC have no polarity.

# Operation

### E5CSV

#### Deviation indicators

The  $\triangle$  indicator lights when the PV is greater than the SP and the  $\bigtriangledown$  indicator lights when the PV is less than the SP. The  $\square$  indicator (green) lights when the deviation is less than 1% FS (0.25% FS for multi-input models). These indicators flash during ST (self-tuning)/AT (auto-tuning).

#### Mode indicators

The SP indicator lights when the setting temperature is being displayed. The ALM indicator lights when the alarm value 1 is being displayed.

#### Mode Key

When the power is turned ON, normally the display will use the display items in the following order each time the Mode Key is pressed.





When the protect switch is ON, the set value can be changed by pressing the Up and Down Keys while holding down the Lock Release Key.

PV, SP, Alarm Value, Input Shift Display

The display switches each time the Rey is pressed.

#### Output indicator

Lights when the control output is ON.

#### Alarm indicators

ALM1 (Alarm 1): Lights when the alarm 1 output is ON. ALM2 (Alarm 2): For future use.

Up Key

Pressing the Up Key increases the SP/alarm value display. Keeping the Up Key pressed continues to increase the display value. When the internal protect switch is ON, press the Up Key while holding down the Lock Release Key.

#### Down Key

Pressing the Down Key decreases the SP/alarm value display. Keeping the Down Key pressed continues to decrease the display value. When the internal protect switch is ON, press the Down Key while holding down the Lock Release Key.

# Settings before Turning ON the Power

### E5CSV

Remove the E5CSV from the case to make the settings.

1. Insert the tool into the two tool insertion holes (one on the top and one on the bottom) and release the hooks.



2. Insert the tool in the gap between the front panel and rear case, and pull out the front panel slightly. Grip the front panel and pull out fully. Be sure not to impose excessive force on the panel.

3. When inserting the E5CSV, check to make sure that the sealing rubber is in place and push the E5CSV toward the rear case until it snaps into position. While pushing the E5CSV into place, push down on the hooks on the top and bottom surfaces of the rear case so that the hooks are securely locked in place. Make sure that electronic components do not come into contact with the case.



Note: 1. The INIT switch is always OFF during normal operation.

### 1. Sensor Type Specification

#### Multi-input (Thermocouple/Platinum **Resistance Thermometer) Models**

Input L U Ν R 700 1,70C 1,60C 1,50C 1,40C 1,30C 1,20C 1,100 1,000 900 800 700 600 500 400 300 200 100 1.300 1.300 850 850 SP range 400 400 199.9 199.9 199.9 0.0 -100 Setting number 0 1 2 3 4 5 6 7 8 9

#### • Using Thermocouple Sensors, Control Mode Switch 5: OFF

The control range is -20°C to +20°C of the input temperature range.

- The input indication range is the range that can be displayed for the control range (-99 to 1999). If the input is within the control Note: 1. range but exceeds the display range (-99 to 1999), values below -99 will be displayed as "ccc" and values above 1,999 will be displayed as "ccc" and values above 1,999 will be
  - 2. If unit is changed to 1 degree when the SP and alarm value for the temperature range are displayed in 0.1-units from 0.0 to 199.9 or 0.0 to 99.9, the values will be multiplied by 10 (e.g., 0.5 becomes 5). If the unit is changed in the reverse direction, the values will be divided by 10. After changing the range, set the SP and alarm value again.
- Using Platinum Resistance Thermometers,

#### **Control Mode Switch 5: ON**

	Input			Pt100	)				JPt100	)	
SP range	1,000 900 800 700 600 500 400 300 200 100 0 -100	850	199.9	99	200	400	500	199.9	99	200	400
Setting n	umber	0	1	2	3	4	5	6	7	8	9

The control range is -20°C to +20°C of the input temperature range.

- Note: 1. The input indication range is the range that can be displayed for the control range (-99 to 1999). If the input is within the control range but exceeds the display range (-99 to 1999), values below -99 will be displayed as "ccc" and values above 1,999 will be displayed as ".....
  - If unit is changed to 1 degree when the SP and alarm value for the temperature range are displayed in 0.1-units from 0.0 to 199.9 or 0.0 to 99.9, the values will be multiplied by 10 (e.g., 0.5 2. becomes 5). If the unit is changed in the reverse direction, the values will be divided by 10. After changing the range, set the SP and alarm value again.

### Mode Key Display Order



- If the SP falls outside the temperature range when the temperature range is changed, the SP will be displayed first. The SP will be changed automatically either to the minimum value or the maximum value, whichever is nearest.
- If the alarm value falls outside the temperature range when the temperature range is changed, the alarm value will be displayed first. The alarm value will be changed automatically to the maximum value in the new temperature range.

### ST (Self-tuning) Features

ST (self-tuning) is a function that finds PID constants by using step response tuning (SRT) when Controller operation begins or when the set point is changed. Once the PID constants have been calculated, ST is not executed when the next control operation is started as long as the set point remains unchanged. When the ST function is in operation, be sure to turn ON the power supply of the load connected to the control output simultaneously with or before starting Controller operation.

### Executing AT (Auto-tuning)

AT (auto-tuning) is executed by pressing the  $\textcircled{\sc black}$  Up and  $\textcircled{\sc black}$  Down Keys for at least 2 s while the PV is displayed. The deviation indicators flash during auto-tuning (AT) execution. AT will be cancelled by performing the same operation that AT is executing during AT operation. Flashing stops when AT is completed.



Note: One of the deviation indicators (▲■▼) will flash.

# Electrical Life Expectancy **Curve for Relays (Reference** Values)



Switching current (A)

**Cemperatur** controllers



### 2. Operation Settings

Use the control mode switches (	ON 1 2 3 4 5 6	) to change the
control mode. (All switches are O	FF for the defa	ult settings.)



Fu	nction selection	1	2	3	4	5	6
ON/OFF	PID control	ON					
PID	ON/OFF control	OFF					
Control	2 s		ON				
period	20 s		OFF				
Direct/ reverse	Direct operation (cooling)			ON			
opera- tion	Reverse operation (heating)			OFF			
Input	Enabled				ON		
shift display	Disabled				OFF		
Tempera- ture Sensor	Platinum resistance thermometer input				•	ON	
selection	Thermocouple input					OFF	
Temper-	°F						ON
ature unit	°C						OFF

Note: The previous name Pt100 has been changed to JPt100 in accordance with revisions to JIS. The previous name J-DIN has been changed to L in accordance with revisions to DIN standards.

### 3. Alarm Modes

Select the number of the alarm mode switch when changing

the alarm mode. (The default is 2).

Set value	Alarm type	Alarm output operation		
0, 9	Alarm function OFF	OFF		
1	Upper- and lower- limit			
2	Upper-limit	ON I I I I I I I I I I I I I I I I I I I		
3	Lower-limit			
4	Upper- and lower- limit range			
5	Upper- and lower- limit with standby sequence (See note 2.)			
6	Upper-limit with standby sequence (See note 2.)	ON I I I I I I I I I I I I I I I I I I I		
7	Lower-limit with standby sequence (See note 2.)	ON OFF SP		
8	Absolute-value upper-limit			

Note: 1. No alarm. The alarm value (alarm operation display) will not be displayed when the setting is 0 or 9 even if the selection key is pressed.

Alarm Setting Range

X: 0 to FS (full scale); Y: Within temperature range

- The value of X is the deviation setting for the SP (set point).
- 2. Standby Sequence Function (The standby sequence operates when the power is turned ON.)

#### **Rising Temperature**

**Dropping Temperature** 



Note: Turn OFF the power before changing the DIP switch settings on the E5CSV. Each of the switch settings will be enabled after the power is turned ON.

For details on the position of the temperature range switch, control mode switches, and alarm mode switch, refer to page A-14.

Temperature controllers

### 4. Using the Control Mode Switches

#### (1) Using ON/OFF Control and PID Control

### (1.1) ON/OFF Control

The control mode is set to ON/OFF control as the default setting.



### (1.2) PID Control

Turn ON switch 1 to use PID control.



Switch 1 ON: PID control

1. Set the control period.

Performing Control via Relay Output, External Relay, or Conductor

Switch 2: OFF (control period: 20 s)



Control output ON OFF 20 sQuick Control Response Using an SSR Switch 2: ON (control period: 2 s) ON 1 2 3 4 5 6Control output ON

2 s

OFF

To perform cooling control of freezers, etc., turn ON switch 3.



2. Set direct/reverse operation for the output. <u>Performing Heating Control for Heaters</u> Switch 3: OFF





Performing Cooling Control for Freezers Switch 3: ON



#### (2) Using the E5CSV in Devices for Fahrenheit-scale Users

#### (Displaying in °F)

Turn ON switch 6 to display temperatures in °F.



#### Temperature Range for °F

The temperature is set to °F using the same temperature range switch as °C.

7

8

9

Multi-input (Thermocouple/				
Platinum Resistance				
Thermometer)				
Control mode switch 5: OFF				

Setting 0 K

> 1 2 J

3

4

5 T

6

7 U

8 N

9 R

L

°F

-99 to 1999 0.0 to 199.9

-99 to 1500

0.0 to 199.9

-99 to 1500

-99 to 700

-99 to 700

-99 to 1999

0 to 1999

0.0 to 199.9

Multi-input (Thermocouple/ Platinum Resistance Thermometer) Control mode switch 5: ON						
Set- ting	Set- °F ting					
0	Pt100	-99 to 1500				
1		0.0 to 199.9				
2		-99 to 99				
3		0 to 200				
4		0 to 400				
5	JPt100	-99 to 900				
6		0.0 to 199.9				

-99 to 99

0 to 200

0 to 400

**Note:** The control range for multi-input (thermocouple/platinum resistance thermometer) models is -40 to +40°F of each temperature range. The previous name J-DIN has been changed to L in accordance with revisions to DIN standards.

#### (3) Setting Input Shift

Turn ON switch 4, and after turning ON the power, press the Mode Key until  $\mathcal{H}_{\mathbf{I}}^{\mathbf{I}}$  (indicates input shift of 0) is displayed. Press the Up and Down Keys to set the shift value.



#### Shift Example

Input shift display	Measured temperature	Temperature display
ਸਹੀ (no shift)	100°C	100°C
<i>H</i> 9 (+9°C shift)	100°C	109°C
<b>ሬ                                    </b>	100°C	91°C

Note: When control mode switch 4 is turned OFF (no input shift display), the input shift is not displayed but <u>the shift value is enabled</u>. To disable input shift, set the input shift value to H<sup>[]</sup>. The shift range depends on the setting unit.

Setting unit	1°C	0.1°C
Compensation range	-99 to +99°C	-9.9 to +9.9°C
Input shift display	L99 to H99	L9.9 to H9.9

### 5. Protect Switch



When the protect switch is ON, Up Key and Down Key operations are prohibited to prevent setting mistakes.

Temperature controllers

# **Error Displays and Causes**

In addition to the alarm indicator, errors notification is provided on the display. Be sure to remove the cause of the error promptly.

Display status	Cause	Control output
PV displayed as	The process value is higher than the control temperature range (overflow).	Heating control (reverse operation): OFF
FFF		Cooling control (direct operation): ON
PV displayed as	The process value is lower than the control temperature range (underflow).	Heating control (reverse operation): ON
		Cooling control (direct operation): OFF
FFF flashing	(1)Thermocouple models and platinum resistance thermometer models: The process value is higher than the overflow temperature, or a Sensor error has occurred.	OFF
	(2) Multi-input (Thermocouple/platinum resistance thermometer) models: The process value is higher than the control temperature range or a Sensor error has occurred.	
flashing	(1) Thermocouple and platinum resistance thermometer input: The process value is lower than the underflow temperature, or a Sensor error has occurred.	OFF
	(2) Thermocouples: The polarity is reversed.	
	(3) Multi-input (Thermocouple/platinum resistance thermometer) models: The process value is lower than the control temperature range or a Sensor error has occurred.	
Ellis	A memory error (E11) has occurred. Turn the power ON again. If the display remains	The control outputs and alarm outputs
displayed	the same, the Controller must be repaired.	turn OFF.

Note: In models with an alarm, *FFF* appears or flashes on the display to indicate that the temperature has exceeded the maximum display temperature and the output is set according to the alarm mode. In the same way, --- appears or flashes on the display to indicate that the temperature has exceeded the minimum display temperature and the output is set according to the alarm mode.

# **Sensor Error Displays and Causes**

# ■ Thermocouple

	Status	Display	Control output
Burnout		FFF flashing	OFF

Note: The room temperature is displayed if an input short-circuit occurs.

### Platinum Resistance Thermometer



Note: The resistance value for platinum resistance thermometers is 100  $\Omega$  at 0°C and 140  $\Omega$  at 100°C.

# Precautions

### 

Do not touch the terminals while power is being supplied. Doing so may occasionally result in minor injury due to electric shock.

Do not allow pieces of metal, wire clippings, or fine metallic shavings or filings from installation to enter the product. Doing so may occasionally result in electric shock, fire, or malfunction.

Do not use the product where subject to flammable or explosive gas. Otherwise, minor injury from explosion may occasionally occur.

Never disassemble, modify, or repair the product or touch any of the internal parts. Minor electric shock, fire, or malfunction may occasionally occur.

CAUTION - Risk of Fire and Electric Shock

- a) This product is UL listed as Open Type Process Control Equipment. It must be mounted in an enclosure that does not allow fire to escape externally.
- b) More than one disconnect switch may be required to de-energize the equipment before servicing the product.
- c) Signal inputs are SELV, limited energy. (See note 1.)
- d) Caution: To reduce the risk of fire or electric shock, do not interconnect the outputs of different Class 2 circuits. (See note 2.)

If the output relays are used past their life expectancy, contact fusing or burning may occasionally occur. Always consider the application conditions and use the output relays within their rated load and electrical life expectancy. The life expectancy of output relays varies considerably with the output load and switching conditions.



Loose screws may occasionally result in fire. Tighten terminal screws to the specified torque of 0.74 to 0.90  $N{\cdot}m.$ 

Unexpected operation may result in equipment damage or accidents if the settings are not appropriate for the controlled system. Set the Temperature Controller as follows:

- Set the parameters of the Temperature Controller so that they are appropriate for the controlled system.
- Turn the power supply to the Temperature Controller OFF before changing any switch setting. Switch settings are read only when the power supply is turned ON.
- Make sure that the INIT switch in the control mode switches is turned OFF before operating the Temperature Controller.

A malfunction in the Temperature Controller may occasionally make control operations impossible or prevent alarm outputs, resulting in property damage. To maintain safety in the event of malfunction of the Temperature Controller, take appropriate safety measures, such as installing a monitoring device on a separate line.



Faulty terminal contact or decreased waterproofing capability may result in a fire or equipment malfunction. When inserting the Temperature Controller into the rear case after setting the switches, check the watertight packing and make sure that the top and bottom hooks are locked securely in place.



- **Note: 1.** A SELV circuit is one separated from the power supply with double insulation or reinforced insulation, that does not exceed 30 V r.m.s. and 42.4 V peak or 60 VDC.
  - 2. A class 2 power supply is one tested and certified by UL as having the current and voltage of the secondary output restricted to specific levels.

# Precautions for Safe Use

Be sure to observe the following precautions to prevent operation failure, malfunction, or adverse affects on the performance and functions of the product. Not doing so may occasionally result in unexpected events.

- 1. The product is designed for indoor use only. Do not use the product outdoors or in any of the following locations.
  - Places directly subject to heat radiated from heating equipment.
  - Places subject to splashing liquid or oil atmosphere.
  - Places subject to direct sunlight.
  - Places subject to dust or corrosive gas (in particular, sulfide gas and ammonia gas).
  - Places subject to intense temperature change.
  - · Places subject to icing and condensation.
  - Places subject to vibration and large shocks.
- 2. Use and store the product within the rated temperature and humidity ranges.

Group-mounting two or more Temperature Controllers, or mounting Temperature Controllers above each other may cause heat to build up inside the Temperature Controllers, which will shorten their service life. In such a case, use forced cooling by fans or other means of air ventilation to cool down the Temperature Controllers.

- **3.** To allow heat to escape, do not block the area around the product. Do not block the ventilation holes on the product.
- 4. Use the specified size (M3.5, width of 7.2 mm or less) crimped terminals for wiring. To connect bare wires to the terminal block, use copper braided or solid wires with a gage of AWG24 to AWG18 (equal to a cross-sectional area of 0.205 to 0.832 mm<sup>2</sup>). (The stripping length is 5 to 6 mm.) Up to two wires of the same size and type, or two crimp terminals can be inserted into a single terminal.
- 5. Be sure to wire properly with correct polarity of terminals. Do not wire any of the I/O terminals incorrectly.
- 6. Do not wire the terminals that are not used.
- 7. The voltage output (control output) is not electrically isolated from the internal circuits. When using a grounded temperature sensor, do not connect any of the control output terminals to ground. Otherwise unwanted current paths will cause measurement errors.
- 8. To avoid inductive noise, keep the wiring for the Temperature Controller's terminal block away from power cables carrying high voltages or large currents. Also, do not wire power lines together with or parallel to Temperature Controller wiring. Using shielded cables and using separate conduits or ducts is recommended. Attach a surge suppressor or noise filter to peripheral devices that generate noise (in particular, motors, transformers, solenoids, magnetic coils or other equipment that have an inductance component).

When a noise filter is used at the power supply, first check the voltage or current, and attach the noise filter as close as possible to the temperature controller.

Allow as much space as possible between the Temperature Controller and devices that generate powerful high frequencies (high-frequency welders, high-frequency sewing machines, etc.) or surge.

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- 9. Use the product within the rated load and power supply.
- 10.Use a switch, relay, or other contact so that the power supply voltage reaches the rated voltage within 2 seconds. If the applied voltage is increased gradually, the power supply may not be reset or malfunctions may occur.
- 11. When using PID operation (self-tuning), turn ON the power supply to the load (e.g., heater) at the same time or before turning the power supply to the Temperature Controller ON. If power is turned ON for the Temperature Controller before turning ON power supply to the load, self-tuning will not be performed properly and optimum control will not be achieved.
- 12.Design the system (e.g., control panel) to allow for the 2 seconds of delay required for the Temperature Controller's output to stabilize after the power is turned ON.
- 13.A switch or circuit breaker should be provided close to this unit. The switch or circuit breaker should be within easy reach of the operator, and must be marked as a disconnecting means for this unit.
- 14.Approximately 30 minutes is required for the correct temperature to be displayed after turning the power supply to the Temperature Controller ON. Turn the power supply ON at least 30 minutes prior to starting control operations.
- **15.**Be sure that the platinum resistance thermometer type and the input type set on the Temperature Controller are the same.
- **16.**When extending the thermocouple lead wires, always use compensating conductors suitable for the type of thermocouple. Do not extend the lead wires on a platinum resistance thermometer. Use only low-resistance wire (5  $\Omega$  max. per line) for lead wires and make sure that the resistance is the same for all three wires.
- 17. When drawing out the Temperature Controller from the case, do not apply force that would deform or alter the Temperature Controller.
- 18. When drawing out the Temperature Controller from the case to replace the Temperature Controller, check the status of the terminals. If corroded terminals are used, contact faults with the terminals may cause the temperature inside the Temperature Controller to increase, possibly resulting in fire. If the terminals are corroded, replace the rear case as well.
- 19. When drawing out the Temperature Controller from the case, turn the power supply OFF first, and absolutely do not touch the terminals or electronic components or apply shock to them. When inserting the Temperature Controller, do not allow the electronic components to come into contact with the case.
- **20.**Static electricity may damage internal components. Always touch grounded metal to discharge any static electricity before handling the Temperature Controller. When drawing out the Temperature Controller from the case, do not touch the electronic components or patterns on the board with your hand. Hold the Temperature Controller by the edge of the front panel when handling it.
- **21.**Do not use paint thinner or similar chemical to clean with. Use standard grade alcohol.
- 22.Use tools when separating parts for disposal. Contact with the sharp internal parts may cause injury.

### Precautions for Correct Use

### Service Life

Use the Temperature Controller within the following temperature and humidity ranges:

Temperature: -10 to  $55^{\circ}$ C (with no icing or condensation) Humidity: 25% to 85%

If the Controller is installed inside a control board, the ambient temperature must be kept to under 55°C, including the temperature around the Controller.

The service life of electronic devices like Temperature Controllers is determined not only by the number of times the relay is switched but also by the service life of internal electronic components. Component service life is affected by the ambient temperature: the higher the temperature, the shorter the service life and, the lower the temperature, the longer the service life. Therefore, the service life can be extended by lowering the temperature of the Temperature Controller.

When two or more Temperature Controllers are mounted horizontally close to each other or vertically next to one another, the internal temperature will increase due to heat radiated by the Temperature Controllers and the service life will decrease. In such a case, use forced cooling by fans or other means of air ventilation to cool down the Temperature Controllers. When providing forced cooling, however, be careful not to cool down the terminals sections alone to avoid measurement errors.

### Measurement Accuracy

When extending or connecting the thermocouple lead wire, be sure to use compensating wires that match the thermocouple type. Do not extend the lead wire of the platinum resistance thermometer. If the lead wire of the platinum resistance thermometer must be extended, be sure to use wires that have low resistance and keep the resistance of the three lead wires the same.

Mount the Temperature Controller so that it is horizontally level.

If the measurement accuracy is low, check whether the input shift has been set correctly.

### Waterproofing

The degree of protection is as shown below. Sections without any specification on their degree of protection or those with IP $\Box$ 0 are not waterproof.

Front panel: IP66, rear case: IP20, terminals: IP00

# Warranty and Application Considerations

#### Read and Understand this Catalog

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

#### Warranty and Limitations of Liability

#### WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

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#### LIMITATIONS OF LIABILITY

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#### Application Considerations

#### SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used.

Know and observe all prohibitions of use applicable to this product.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

#### Disclaimers

#### **PERFORMANCE DATA**

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON *Warranty and Limitations of Liability.* 

#### **CHANGE IN SPECIFICATIONS**

Product specifications and accessories may be changed at any time based on improvements and other reasons. Consult with your OMRON representative at any time to confirm actual specifications of purchased product.

#### DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

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

Cat. No. H138-E2-01-X

2-01-X In the interest of product improvement, specifications are subject to change without notice.

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# Digital Temperature Controllers

### Compact and Intelligent Temperature Controllers

### 1/32 DIN with Communications Function

- Various temperature inputs: Thermocouple, platinum resistance thermometer, infrared temperature sensor, and analog inputs.
- Auto-tuning and self-tuning available. Auto-tuning is possible even while self-tuning is being executed.
- Heating or heating/cooling control is available.
- Water-resistant construction (NEMA4X: equivalent to IP66).
- Conforms to UL, CSA, and IEC safety standards as well as CE marking.

# **Model Number Structure**

# Model Number Legend



- 1. Output type R: Relay Q: Voltage (for driving SSR)
- 2. Number of alarms
- Blank:No alarm
- 1: One alarm
- 3. Communications

Blank:No communications function 03: RS-485

# **Ordering Information**

# Standard Models

Size	Power supply voltage	No. of alarm points	Control output	Thermocouple model	Platinum resistance thermometer model		
1/32 DIN 48(W) x 24(H) x 100(D) mm	100 to 240 VAC		Relay	E5GN-RTC	E5GN-RP		
			Voltage (for driving SSR)	E5GN-QTC	E5GN-QP		
		1	Relay	E5GN-R1TC	E5GN-R1P		
		(see note 1)	Voltage (for driving SSR)	E5GN-Q1TC	E5GN-Q1P		
	24 VAC/VDC		Relay	E5GN-RTC	E5GN-RP		
			Voltage (for driving SSR)	E5GN-QTC	E5GN-QP		
		1	Relay	E5GN-R1TC	E5GN-R1P		
		(see note 1)	Voltage (for driving SSR)	E5GN-Q1TC	E5GN-Q1P		

Note 1. If the heating/cooling function is used, ALM1 will be used for control output and so alarm output will not be available.

2. Control output 2 for heating/cooling control is relay output.

3. Specify the power supply specifications when ordering.



4. Input type

- TC: Thermocouple
- P: Platinum resistance thermometer
- 5. CompoWay/F serial communications -FLK: CompoWay/F serial communications

# Communication Models

Size	Power supply voltage	Communication function	Control output	Thermocouple model	Platinum resistance thermometer model
1/32 DIN	100 to 240 VAC	RS-485	Relay	E5GN-R03TC-FLK	E5GN-R03P-FLK
48(W) x 24(H) x 100(D) mm		1	Voltage (for driving SSR)	E5GN-Q03TC-FLK	E5GN-Q03P-FLK
	24 VAC/VDC		Relay	E5GN-R03TC-FLK	E5GN-R03P-FLK
			Voltage (for driving SSR)	E5GN-Q03TC-FLK	E5GN-Q03P-FLK

Note: Specify the power supply specifications when ordering.

# Specifications

# Ratings

Supply voltage		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	on	7 VA	4 VA/2.5 W		
Sensor input		Thermocouple:	K, J, T, E, L, U, N, R, S, B		
		Platinum resistance thermometer	er: Pt100, JPt100		
		Infrared temperature sensor:	10 to 70°C, 60 to 120°C, 115 to 165°C, 160 to 260°C		
		Voltage input:	0 to 50 mV		
Control output	Relay output	SPST-NO, 250 VAC, 2 A (resistiv	ve load), electrical life: 100,000 operations		
	Voltage output	12 VDC (PNP), max. load currer	nt: 21 mA, with short-circuit protection circuit		
Alarm output		SPST-NO, 250 VAC, 1 A (resistiv	SPST-NO, 250 VAC, 1 A (resistive load), electrical life: 100,000 operations		
Control method		2-PID or ON/OFF control	2-PID or ON/OFF control		
Setting method		Digital setting using front panel I	Digital setting using front panel keys		
Indication method		7-segment digital display and sir Character height: PV: 7.0 mm; S	7-segment digital display and single-lighting indicator Character height: PV: 7.0 mm; SV: 3.5 mm		
Other functions		According to controller model	According to controller model		
Ambient temperate	ure	-10 to 55°C (with no condensati	-10 to 55°C (with no condensation or icing)		
Ambient humidity		25% to 85%			
Storage temperatu	ıre	-25 to 65°C (with no condensation or icing)			

# ■ Input Ranges

### Platinum Resistance Thermometer Input/Thermocouple Input

Platinum resistance thermometer ir							
Input type	Platinum resistance	Platinum resistance thermometer					
Name	Pt100	JPt100					
1800 1700 1600 1500 1300 80 1200 1100 900 900 900 900 900 900 900 900	850 						
Set value	0 1 2	3 4					

	Thermocouple input														
Input type	Thermocouple ES1A Infrared Temperature Sensor							sor	Analog input						
Name	к	J	Т	E	L	U	N	R	S	В	K10 to 70°C	K60 to 120°C	K115 to 165°5C	K160 to 260°C	0 to 50 mV
1800 1700 1600 1500 1400 1300 1200 80 1100 900 900 900 900 900 900 900 900 9					<u>850</u>	400 400.0								269 0	Usable in the following rang- es by scaling: -1999 to 9999 or -199.9 to 999.9
Set value	0 1	2 3	4 17	5	6	7 18	8	9	10	11	12	13	14	15	16

Applicable standards by input type are as follows:

K, J, T, E, N, R, S, B: JIS C1602-1995 L: Fe-CuNi, DIN 43710-1985 U: Cu-CuNi, DIN 43710-1985 JPt100: JIS C1604-1989, JIS C1606-1989 Pt100: JIS C1604-1997, IEC751

Shaded ranges indicate default settings.

ES1A models with a temperature range of 160°C to 260°C have been discontinued.

Temperature controllers

### ■ Characteristics

Indication accuracy	Thermocouple:				
	$(\pm 0.5\%$ of indicated value or $\pm 1^{\circ}$ C,	whichever greate	er) ±1 digit max. (see note)		
	Platinum resistance thermometer: $(\pm 0.5\%)$ of indicated value or $\pm 1^{\circ}$ C.	whichever greate	er) ±1 digit max.		
	Analog input: ±0.5% FS±1 digit ma	ax.	, 3		
	CT input: ±5% FS±1 digit max.				
Hysteresis	0.1 to 999.9 EU (in units of 0.1 EU	)			
Proportional band (P)	0.1 to 999.9 EU (in units of 0.1 EU	)			
Integral time (I)	0 to 3999 s (in units of 1 s)				
Derivative time (D)	0 to 3999 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	-1999 to 9999 (decimal point posit	tion depends on i	input type)		
Sampling period	500 ms				
Insulation resistance	20 M $\Omega$ min. (at 500 VDC megger)				
Dielectric strength	2000 VAC, 50 or 60 Hz for 1 min (k	oetween different	charging terminals)		
Vibration resistance	10 to 55 Hz, 10 m/s <sup>2</sup> for 2 hours ea	ach in X, Y and Z	directions		
Shock resistance	300 m/s <sup>2</sup> , 3 times each in 3 axes, 6	3 directions (relay	/: 100 m/s²)		
Weight	Approx. 90 g	Мо	ounting bracket: approx. 10 g		
Degree of protection	Front panel: NEMA4X for indoor us	se (equivalent to	IP66), rear case: IP20, terminals: IP00		
Memory protection	EEPROM (non-volatile memory) (r	number of writes:	100,000)		
EMC	Emission Enclosure:	EN55011 Group	o 1 class A		
	Emission AC Mains:	EN55011 Group	1 Class A 4 kV contact discharge (level 2)		
		LIN01000-4-2.	8 kV air discharge (level 3)		
	Immunity RF-interference:	ENV50140:	10 V/m (amplitude modulated, 80 MHz to		
			1 GHz) (level 3)		
	Immunity Conducted Disturbance:	ENIV50141	10 V/m (pulse modulated, 900 MHZ)		
	Immunity Burst EN61001-4-4 2 kV power-line (evel 3)				
			2 kV I/O signal-line (level 4)		
Approved standards	UL3121-1, CSA22.2 No. 142, E.B.	1402C			
	Conforms to EN50081-2, EN50082	2-2, EN61010-1 (	IEC61010-1)		
	Conforms to VDE0106/part 100 (Finger Protection), when the terminal cover is mounted.				

Note: The indication of K thermocouples in the -200 to 1300°C range, and T and N thermocouples at a temperature of -100°C or less, and U and L thermocouples at any temperature is ±2°C±1 digit maximum. The indication of B thermocouples at a temperature of 400°C or less is unrestricted.

The indication of R and S thermocouples at a temperature of 200°C or less is ±3°C±1 digit maximum.

# Communications Specifications

Transmission path connection	Multiple points
Communications method	RS-485 (two-wire, half duplex)
Synchronization method	Start-stop synchronization
Baud rate	1,200/2,400/4,800/9,600/19,200 bps
Transmission code	ASCII
Data bit length (see note)	7 or 8 bits
Stop bit length (see note)	1 or 2 bits
Error detection	Vertical parity (none, even, odd) Frame check sequence (FCS): with SYSWAY Block check character (BCC): with CompoWay/F
Flow control	Not available
Interface (see note)	RS-485
Retry function	Not available
Communications buffer	40 bytes

Note: The baud rate, data bit length, stop bit length, or vertical parity can be individually set using the communications setting level.

**Cemperature** controllers

# Wiring Terminals

- The voltage output (control output) is not electrically insulated from the internal circuits. When using a grounding thermocouple, do not connect the control output terminals to the ground. If the control output terminals are connected to the ground, errors will occur in the measured temperature values as a result of leakage current.
- Standard insulation is applied to the power supply I/O sections. If reinforced insulation is required, connect the input and output terminals to a device without any exposed current-carrying parts or to a device with standard insulation suitable for the maximum operating voltage of the power supply I/O section.



Analog input

# Nomenclature



# Dimensions



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

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

Cat. No. H107-E2-08A

08A In the interest of product improvement, specifications are subject to change without notice.

# Temperature controllers

# Digital Temperature Controllers

# 1/16, 1/8, and 1/4 DIN Temperature Controllers Join the Best-selling E5 N Series

- Models available with either temperature inputs or analog inputs.
- A wide range of functions, such as three-phase heater burnout detection, two control outputs, manual outputs, and transfer outputs.
- Easy-to-read 11-segment display.
- Faster sampling at 250 ms.
- Setting Tool port provided as a standard feature for easy connection to personal computers.





# Contents

Digital Temperature Controllers	
E5CN/E5CN-U	A-31
E5EN	A-45
E5AN	A-55

# Lineup



# Digital Temperature Controllers E5CN/E5CN-U

This Best-selling General-purpose 48×48 mm Temperature Controller Is Now Even Better. USB-Serial Conversion Cable and Support Software Are Also Available.

- Controllers now available with analog inputs.
- Faster sampling at 250 ms.
- Transfer output provided for easy output to recorders.
- Voltage outputs (to drive SSRs) for both heating and cooling control. Can be used for alarms to provide three alarm outputs.
- Models available with three-phase heater burnout detection and SSR fault detection.
- Easy setting with 11-segment displays.
- Connect to either a thermocouple or platinum resistance thermometer with the same model.
- Easily see the status from a distance with PV display with threecolor switching function.
- Setting protection indicator informs operator when protection is enabled.
- Manual output provided.
- Controller available with long-life relay output.
- Models available with external power supply for ES1B Infrared Thermosensor.

Note: Refer to Precautions on CD.



CUUs CE <u>NEW</u> Note: Refer to Common on CD for information on changes in

# Features

### Improved Functions for a Wider Range of Application

# Control Analog Values, such as Pressures, Flowrates, and Levels

The E5CN Series now also includes models that accept analog inputs, enabling control applications other than for temperature, including pressure, flowrate, level, humidity, and weight control.

Note: E5CN-□L (Models with Analog Inputs)

#### Faster Sampling at 250 ms

The previous sampling time of 500 ms has been reduced by half to 250 ms. This enables the E5CN to handle application requiring even greater response speed and accuracy.

#### Easy Connector to a Recorder

A transfer output now makes it easy to connect to a recorder or PLC Analog I/O Unit.

**Note:** E5CN-C (Models with Current Outputs)

#### Voltage Outputs (to Drive SSRs) for Both Heating and Cooling Control. Can Be Used for Alarms to Provide Three Alarm Outputs.

Voltage outputs can be used for both heating and cooling for Models with Two Control Outputs. Also, control output 2 can be set for use as an alarm output, to enable using up to three alarm outputs. **Note:** E5CN- $\Box$ Q (Option Board)

Three-phase Heater Burnout Detection

comparison to previous models.

With Models with Three-phase Heater Burnout and SSR Failure Detection, two current transformers can be connected to detect both heater burnout and SSR failure at the same time, reducing costs because a separate heater burnout alarm device is not required. SSR failure detection can be used even with Models with Singlephase Heater Burnout Alarms.

Note: E5CN- HH (Option Board)

### E58-CIFQ1 USB-Serial Conversion Cable for Computer Connection

#### A personal computer connection is possible for models without communications.

The CX-Thermo Support Software (sold separately) can be used to set parameters, monitor operation, and parameter masks. The free ThermoMini Parameter Copy Software can be used to reach E5CN parameters using communications and copy them to another E5CN to increase onsite productivity.

Specifications: page 35, Dimensions: page 41



# **Model Number Structure**

### Model Number Legend

### **Controllers**

E5CN-0\_M\_-500

1 2 3 4

- 1. Output type
  - R: Relay Q: Voltage (for driving SSR) C: Current Y: Long-life relay
- 2. Number of alarms Blank: No alarm

2:Two alarms

- 3. Option Unit
  - M:Option Unit can be mounted
- 4. Input type

T: Thermocouple/platinum resistance thermometer (multi-input) L: Analog input

### **Option Units**

# E53-CN-\_\_N

#### 1. Functions

H03: Communications and heater burnout/SSR failure detection 03: Communications

- HB: Heater burnout/SSR failure detection and event inputs
- B: Event inputs
- HH03: Communications and 3-phase heater burnout/SSR failure detection
- Q03: Communications and control output 2 (voltage output)
- QH: Heater burnout/SSR failure detection and control output 2 (voltage output)
- PB: External power supply for ES1B and event inputs
- PH: External power supply for ES1B and heater burnout/SSR failure detection.
- **Note: 1.** The heating and cooling function is available for models with two alarm points.
  - 2. Current transformers (CTs) are not provided with the Units. Be sure to order CTs when ordering the E5CN and the Option Units.
  - 3. Specify the power supply specifications when ordering.

 This data sheet is provided as a guideline for selecting products. Be sure to refer to the following user manuals for application precautions and other information required for operation before attempting to use the product.

 E5CN/E5CN-U/AN/EN Temperature Controller User's Manual (Cat. No. H134)

 E5CN/EN/AN Temperature Controller Communications User's Manual (Cat. No. H135)

**Cemperatur controllers** 

# **Ordering Information**

# ■ Controllers with Temperature Inputs (Multi-input)

Size	Power supply voltage	Number of alarm points	Control outputs	Model
1/16 DIN	100 to 240 VAC	0	Relay	E5CN-RMT-500
48 × 48 × 78 (W × H × D)	)		Voltage (for driving SSR)	E5CN-QMT-500
			Current	E5CN-CMT-500
		2	Relay	E5CN-R2MT-500
			Voltage (for driving SSR)	E5CN-Q2MT-500
			Current	E5CN-C2MT-500
			Long-life relay	E5CN-Y2MT-500
	24 VAC/VDC	0	Relay	E5CN-RMT-500
			Voltage (for driving SSR)	E5CN-QMT-500
			Current	E5CN-CMT-500
		2	Relay	E5CN-R2MT-500
			Voltage (for driving SSR)	E5CN-Q2MT-500
			Current	E5CN-C2MT-500

## Controllers with Analog Inputs

Size	Power supply voltage	Number of alarm points	Control outputs	Model
1/16 DIN	100 to 240 VAC	0	Relay	E5CN-RML-500
48 × 48 × 78 (W × H × D)	)		Voltage (for driving SSR)	E5CN-QML-500
			Current	E5CN-CML-500
		2	Relay	E5CN-R2ML-500
			Voltage (for driving SSR)	E5CN-Q2ML-500
			Current	E5CN-C2ML-500
			Long-life relay	E5CN-Y2ML-500
	24 VAC/VDC	2	Relay	E5CN-R2ML-500
			Voltage (for driving SSR)	E5CN-Q2ML-500
			Current	E5CN-C2ML-500

### Option Units

The E5CN provides optional functionality when one of the following Option Units is mounted.

	Functions			Model
Communications	Heater burnout/SSR failure detection			E53-CNH03N
Communications				E53-CN03N
	Heater burnout/SSR failure detection	Event inputs		E53-CNHBN
		Event inputs		E53-CNBN
Communications	3-phase heater burnout/SSR failure detection			E53-CNHH03N
Communications			Control output 2 (voltage output)	E53-CNQ03N
	Heater burnout/SSR failure detection		Control output 2 (voltage output)	E53-CNQHN
		Event inputs	External power supply for ES1B	E53-CNPBN (See note 1.)
	Heater burnout/SSR failure detection		External power supply for ES1B	E53-CNPHN (See note 1.)

Note: 1. E53-CNPBN and E53-CNPHN cannot be mounted on E5CN-CDD (current output models).

2. Option Units cannot be used for Plug-in models.



# **Model Number Structure**

# Model Number Legend (Plug-in-type Controllers)



- Output type
   R: Relay
   Q: Voltage

   Number of alarms
- Blank: No alarm 1:One alarm 2:Two alarms

- 3. Input type
- T: Thermocouple/platinum resistance thermometer (multi-input) 4. Plug-in type
- U: Plug-in type

# **Ordering Information (Plug-in-type Controllers)**

# ■ Controllers with Temperature Inputs (Multi-input)

Size	Power supply voltage	Number of alarm points	Control outputs	Model
1/16 DIN	100 to 240 VAC	0	Relay	E5CN-RTU
			Voltage (for driving SSR)	E5CN-QTU
		1	Relay	E5CN-R1TU
			Voltage (for driving SSR)	E5CN-Q1TU
		2	Relay	E5CN-R2TU
			Voltage (for driving SSR)	E5CN-Q2TU
	24 VAC/VDC	0	Relay	E5CN-RTU
			Voltage (for driving SSR)	E5CN-QTU
		1	Relay	E5CN-R1TU
			Voltage (for driving SSR)	E5CN-Q1TU
		2	Relay	E5CN-R2TU
			Voltage (for driving SSR)	E5CN-Q2TU

**Note:** Option Units (E53-CN N) cannot be used for Plug-in models.

# Accessories (Order Separately)

### **USB-Serial Conversion Cable**

Model	
E58-CIFQ1	

### **Terminal Cover**

Connectable models	Terminal type	
Model	E53-COV10	

Note: The Terminal Cover comes with the E5CN- $\Box\Box$ -500 models.

### **Current Transformers (CTs)**

Model	E54-CT1	E54-CT3
Hole diameter	5.8 dia.	12.0 dia.

### Adapter

Connectable models	Terminal type	
Model	Y92F-45	

Note: Use this Adapter when the panel has been previously prepared for the E5B $\square$ .

### Sockets (for Models with Plug-in Connectors)

Model	P2CF-11	P2CF-11-E	P3GA-11	Y92A-48G
Туре	Front- connecting Socket	Front- connecting Socket with Finger Protection	Back- connecting Socket	Terminal Cover for Finger Protection

# **Specifications**

# ■ Ratings

Item	Power supply voltage		100 to 240 VAC, 50/60 Hz	24 VAC, 50/60 Hz or 24 VDC
Operating voltage range		85% to 110% of rated supply voltage		
Power	E5CN	7.5 VA max. (E5CN-R2T: 3.0 VA at 100 VAC)		5 VA/3 W max. (E5CN-R2T: 2.7 VA at 24 VAC)
consumption	E5CN-U	6 VA max.		3 VA/2 W max.
Sensor input		Models wit	h temperature inputs	
		Thermocouple: K, J, T, E, L, U, N, R, S, or B		
		Platinum resistance thermometer: Pt100 or JPt100		
		Infrared temperature sensor: 10 to 70°C, 60 to 120°C, 115 to 165°C, or 160 to 260°C		
		Voltage input: 0 to 50 mV		
		Models with analog inputs		
		Current input: 4 to 20 mA or 0 to 20 mA		
		Voltage input: 1 to 5 V, 0 to 5 V, or 0 to 10 V		
Input impedan	ce	Current input: 150 $\Omega$ , Voltage input: 1 M $\Omega$ (Use a 1:1 connection when connecting the ES2-HB.)		
Control output	Relay output	E5CN	SPST-NO, 250 VAC, 3 A (resistive load), e load: 5 V, 10 mA	lectrical life: 100,000 operations, minimum applicable
		E5CN-U	SPDT, 250 VAC, 3 A (resistive load), electr 5 V, 10 mA	ical life: 100,000 operations, minimum applicable load:
	Voltage output	E5CN E5CN-U	Output voltage: 12 VDC ±15% (PNP), max	. load current: 21 mA, with short-circuit protection circuit
	Current output	E5CN	4 to 20 mA DC/0 to 20 mA DC, load: 600 $\Omega$ max., resolution: approx. 2,700	
Long-life relay output		E5CN SPST-NO, 250 VAC, 3 A (resistive load), electrical life: 1,000,000 operations, load power supply voltage: 75 to 250 VAC (DC loads cannot be connected.), minimum applicable load: 5 V, 10 mA, leakage current: 5 mA max. (250 VAC, 60 Hz)		
Alarm output	n output SPST-NO, 250 VAC, 1 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 1 V,		100,000 operations, minimum applicable load: 1 V, 1 mA	
Event input Contact input Non-contact input		ON: 1 kΩ r	max., OFF: 100 kΩ min.	
		ON: Residual voltage: 1.5 V max., OFF: Leakage current: 0.1 mA max.		
		Outflow current: Approx. 7 mA per point		
External power supply for 1 ES1B		12 VDC ±10%, 20 mA, Short-circuit protection provided.		
Control metho	d	ON/OFF control or 2-PID control (with auto-tuning)		
Setting metho	d	Digital setting using front panel keys		
Indication method		11-segment digital display and individual indicators (7-segments displays also possible)		
		Character height: PV: 11 mm, SV: 6.5 mm		
Other function	Manual output, heating/cooling control, transfer output (on some models), loop break alarm, multi SP, MV limiter, input digital filter, self-tuning, temperature input shift, run/stop, protection functions, etc.			
Ambient operatemperature	nt operating -10 to 55°C (with no icing or condensation), for 3-year warranty: -10 to 50°C rature		r warranty: -10 to 50°C	
Ambient opera	ent operating humidity 25% to 85%			
Storage temperature -25 to 65°C (with no icing or condensation)				
### ■ Input Ranges

### Thermocouples/Platinum Resistance Thermometers (Multi-inputs)

_		r	-				T													-					L.				
!	Input Type		Platinum resistance thermometer		ce	Thermocouple									Infrared temperature sensor			Analog input											
I	Name	Pt100		0 JPt100		00 J		JPt100		JPt100		К		J		Т	Е	L	l	J	Ν	R	S	в	10 to 70°C	60 to 120°C	115 to 165°C	160 to 260 °C	0 to 50 mV
Temperature range (°C)	1800 1700 1600 1500 1400 1300 1200 1100 1000 900 800 800 600 500 400 300 200 100 0	850	500.0		500.0			500.0	850	400.0	400	400.0	600 600 0	850	400	400.0					70°C	120°C	165°C	260°C	Usable in the following ranges by scaling: -1999 to 9999 or -199.9 to 9999.9				
	-100.0		+					-20.0	-100	-20.0		+		-100						1		1			l				
1	-200.0	-200	-199.9		-199.9		-200				-200	-199.9			-200	-199.9	-200												
So	Hina	0	1	2	2	1	5	6	7	0	0	10	11	10	12	14	15	16	17	10	10	20	21	22	22				
nur	nber	0	1	2	3	4	5	0	/	0	3	10		12	13	14	15	10	17	10	19	20	21	22	20				

The applicable standards for the input types are as follows:

U: Cu-CuNi, DIN 43710-1985 Pt100: IEC 751 Shaded settings are the default settings.

Models with Analog Inputs

K, J, T, E, N, R, S, B: IEC584-1 L: Fe-CuNi, DIN 43710-1985

Input Type	Cur	rent	Voltage					
Input specification	4 to 20mA	0 to 20 mA	1 to 5 V	0 to 5 V	0 to 10 V			
Setting range	Usable in th	Usable in the following ranges by scaling:						
	-1999 to 9999, -199.9 to 999.9, -19.99 to 99.99 or -1.999 to 9.999							
Setting number	0	1	2	3	4			

haded settings are the default settings.

### ■ Alarm Types

Select alarm types out of the 12 alarm types listed in the following table.

Set value	Alarm type	Alarm outp	ut operation
		When X is positive	When X is negative
0	Alarm function OFF	Output OFF	
1 (See note 1.)	Upper- and lower- limit	ON OFF SP	(See note 2.)
2	Upper limit	ON OFF SP	ON X - OFF SP
3	Lower limit	ON X SP	ON X CON OFF SP
4 (See note 1.)	Upper- and lower- limit range	ON OFF SP	(See note 3.)
5 (See note 1.)	Upper- and lower- limit with standby sequence	$ON \xrightarrow{ON} \xrightarrow{L \mid H} \xrightarrow{SP}$ (See note 5.)	(See note 4.)
6	Upper-limit with standby sequence	ON OFF SP	ON OFF SP
7	Lower-limit with standby sequence	ON X SP	ON X SP
8	Absolute-value upper-limit		
9	Absolute-value lower-limit	$ \begin{array}{c} \text{ON} \\ \text{OFF} \\ 0 \end{array} $	
10	Absolute-value upper-limit with standby sequence		ON OFF 0
11	Absolute-value lower-limit with standby sequence	$\begin{array}{c} ON\\ OFF \end{array} \\ 0 \end{array}$	
12 (See note 6.)	LBA (for alarm 1 only)		

- Note: 1. With set values 1, 4 and 5, the upper and lower limit values can be set independently for each alarm type, and are expressed as "L" and "H."
  - 2. Set value: 1, Upper- and lower-limit alarm

Case 1	Case 2	Case 3 (Always ON)	H<0, L<0
H<0, L>0	H>0, L<0  H  >  L	H LSP	H<0, L>0  H  ≥  L
		SPH L	H>0, L<0  H  ≤  L

#### 3. Set value: 4, Upper- and lower-limit range

Case 1	Case 2	Case 3 (Always ON)	H<0, L<0
L H SP H<0, L>0  H  <  L	SPL H H>0, L<0  H  >  L	H LSP	H<0, L>0  H  ≥  L
		SPH L	H>0, L<0  H  ≤  L

- 4. Set value: 5, Upper- and lower-limit with standby sequence For Upper- and Lower-Limit Alarm Described Above
  - Case 1 and 2 Always OFF when the upper-limit and lower-limit hysteresis overlaps.
  - Case 3: Always OFF
- 5. Set value: 5, Upper- and lower-limit with standby sequence Always OFF when the upper-limit and lower-limit hysteresis overlaps.
- 6. Set value: 12, LBA can be set only for alarm 1.

Set the alarm types for alarms 1 to 3 independently in the initial setting level. The default setting is 2 (upper limit).

### Characteristics

Indication accu	uracy	Thermocouple: (See note 1.)
		greater) ±1 digit max.
		ESCIN-U: $(\pm 1\%)$ of indicated value or $\pm 2^{\circ}$ C, whichever is greater) $\pm 1$ digit max.
		Platinum resistance thermometer: (±0.5% of indicated value or ±1°C, whichever is
		greater) ±1 digit max. Analog input: +0.5% FS +1 digit max.
		CT input: ±5% FS ±1 digit max.
Influence of ter note 2.)	mperature (See	R, S, and B thermocouple inputs: (±1% of PV or ±10°C, whichever is greater) ±1 digit max.
Influence of vo	ltage	Other thermocouple inputs: (+1% of PV or +4°C, whichever is greater) +1 digit max.
(See note 2.)		*±10°C for -100°C or less for K sensors
		$(\pm 1\% \text{ of PV or } \pm 2^{\circ}\text{C}$ , whichever is greater) $\pm 1$ digit max.
		( $\pm$ 1% of FS) $\pm$ 1 digit max.
Hysteresis		Models with thermocouple/platinum resistance
		0.1 to 999.9 EU (in units of 0.1 EU)
		0.01 to 99.99% FS (in units of 0.01% FS)
Proportional b	and (P)	Models with thermocouple/platinum resistance
		0.1 to 999.9 EU (in units of 0.1 EU)
		Models with analog input: 0.1 to 999.9% FS (in units of 0.1% FS)
Integral time (I	)	0 to 3999 s (in units of 1 s)
Derivative time	e (D)	0 to 3999 s (in units of 1 s) (See note 3.)
Control period		0.5, 1 to 99 s (in units of 1 s)
Manual reset v	alue	0.0 to 100.0% (in units of 0.1%)
Alarm setting I	ange	<ul> <li>–1999 to 9999 (decimal point position depends on input type)</li> </ul>
Sampling perio	od	250 ms
Affect of signal source		Thermocouple: $0.1^{\circ}C/\Omega$ max. (100 $\Omega$ max.) (See note 4.)
resistance		max.)
Insulation resist	stance	20 MΩ min. (at 500 VDC)
Dielectric strer	ngth	2,000 VAC, 50 or 60 Hz for 1 min (between terminals with different charge)
Vibration resistance	Malfunction	10 to 55 Hz, 20 m/s² for 10 min each in X, Y, and Z directions
	Destruction	10 to 55 Hz, 0.75-mm single amplitude for 2 hrs each in X, Y, and Z directions
Shock resistance	Malfunction	100 m/s $^2$ min., 3 times each in X, Y, and Z directions
	Destruction	300 m/s <sup>2</sup> min., 3 times each in X, Y, and Z directions
Weight	E5CN	Controller: Approx. 150 g, Mounting Bracket: Approx. 10 g
Desires of	E5CN-U	Controller: Approx. 110 g, Mounting Bracket: Approx. 10 g
protection	ESCIN	Rear case: IP20, Terminal section: IP00
	E5CN-U	Front panel: Equivalent to IP50, rear case: IP20, terminals:
Memory protec	tion	Non-volatile memory (number of writes: 1.000.000
ineiner, preter		operations)
EMC		Emission Enclosure: EN55011 Group1 Class A Emission AC Mains: EN55011 Group1 Class A Immunity ESD: EN61000-4-2 4 kV contact discharge
		(level 2) 8 kV air discharge (level 3)
		Immunity RF-interference: EN61000-4-3 10 V/m
		(80-1000 MHz, 1.4-2.0 GHz amplitude
		10 V/m (900 MHz pulse modulated)
		EN61000-4-6 3 V
		Immunity Burst: EN61000-4-4 2 kV Power-line (level 3)
		I KV I/O signal-line (level 3) Immunity Surge: EN61000-4-5 1kV line to line Power
		line, output line (relay output) 2 kV line to ground Power line, output
		line (relay output) 1 kV line to ground Input line
		(communication) Immunity Voltage Dip/Interrupting:
		EN61000-4-11 0.5 cycle, 100% (rated voltage)
Approved stan	dards	UL 61010C-1 CSA C22 2 No 1010 1
Conformed sta	Indards	EN61326, EN61010-1, IEC61010-1
		VDE0106 Part 100 (Finger protection), when the terminal cover is mounted.

- Note: 1. The indication accuracy of K thermocouples in the –200 to 1300°C range, T and N thermocouples at a temperature of –100°C max., and U and L thermocouples at any temperature is  $\pm 2^{\circ}$ C  $\pm 1$  digit maximum. The indication accuracy of the B thermocouple at a temperature of 400°C max. is not specified. The indication accuracy of the R and S thermocouples at a temperature of 200°C max. is  $\pm 3^{\circ}$ C  $\pm 1$  digit max.
  - 2. "EU" stands for Engineering Unit and is used as the unit after scaling. For a temperature sensor, the EU is  $^\circ C$  or  $^\circ F.$
  - **3.** When robust tuning (RT) is ON, the differential time is 0.0 to 999.9 (in units of 0.1 s).
  - 4. B, R, and S sensors:  $0.2^{\circ}C/\Omega$  max. (100  $\Omega$  max.)

### ■ USB-Serial Conversion Cable

Applicable OS	Windows 2000/XP
Applicable software	Thermo Mini, CX-Thermo
Applicable models	E5CN/E5CN-U/E5AN/E5EN
USB interface standard	Conforms to USB Specification 1.1.
DTE speed	38400 bps
Connector specifications	Computer: USB (type A plug) Temperature Controller: Serial
Power supply	Bus power (Supplied from USB host controller.)
Power supply voltage	5 VDC
Current consumption	70 mA
Ambient operating temperature	0 to 55°C (with no condensation or icing)
Ambient operating humidity	10% to 80%
Storage temperature	–20 to 60°C (with no condensation or icing)
Storage humidity	10% to 80%
Altitude	2,000 m max.
Weight	Approx. 100 g

**Note:** A driver must be installed in the personal computer. Refer to installation information in the operation manual for the Conversion Cable.

### ■ Communications Specifications

Transmission line connection method	RS-485 multipoint
Communications	RS-485 (two-wire, half duplex)
Synchronization method	Start-stop synchronization
Baud rate	1200, 2400, 4800, 9600, 19200, or 38400 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) Frame check sequence (FCS) with SYSWAY Block check character (BCC) with CompoWay/F or CRC-16 Modbus
Flow control	None
Interface	RS-485
Retry function	None
Communications buffer	40 bytes
Communications response wait time	0 to 99 ms Default: 20 ms

Note: The baud rate, data bit length, stop bit length, and vertical parity can be individually set using the Communications Setting Level.

### Current Transformer (Sold Separately)

### **Ratings**

Dielectric strength	1,000 VAC for 1 min
Vibration resistance	50 Hz, 98 m/s <sup>2</sup>
Weight	E54-CT1: Approx. 11.5 g, E54-CT3: Approx. 50 g
Accessories (E54-CT3 only)	Armatures (2) Plugs (2)

### Heater Burnout Alarms and SSR Failure Detection Alarms

Maximum heater current	50 A AC
Input current indication accuracy	±5% FS ±1 digit max.
Heater burnout alarm setting range	0.1 to 49.9 A (in units of 0.1 A) 0.0 A: Heater burnout/SSR failure alarm output turned OFF. 50.0 A: Heater burnout/SSR failure alarm output turned ON. Minimum detection ON time: 190 ms (See note 1.)
SSR failure detection alarm setting range	0.1 to 49.9 A (in units of 0.1 A) 0.0 A: Heater burnout/SSR failure alarm output turned ON. 50.0 A: Heater burnout/SSR failure alarm output turned OFF. Minimum detection OFF time: 190 ms (See note 2.)

- Note: 1. If the ON time of control output 1 is less than 190 ms, heater burnout detection and the heater current will not be measured.
  - If the OFF time of control output 1 is less than 190 ms, SSR failure detection and the heater current will not be measured.
- Electrical Life Expectancy Curve for Relays (Reference Values)



Note: Do not connect a DC load to a Controller with a Long-life Relay Output.

### E54-CT1 <u>Thru-current (Io) vs. Output Voltage</u> (Eo) (Reference Values)

Maximum continuous heater current: 50 A (50/60 Hz) Number of windings: 400±2 Winding resistance: 18±2  $\Omega$ 



### E54-CT3 Thru-current (Io) vs. Output Voltage (Eo) (Reference Values)

Maximum continuous heater current: 120 A (50/60 Hz) (Maximum continuous heater current for an OMRON Temperature Controller is 50 A.) Number of windings: 400±2

Winding resistance:  $8\pm0.8 \Omega$ 



# **External Connections**

- A voltage output (control output) is not electrically insulated from the internal circuits. When using a grounding thermocouple, do not connect
  any of the control output terminals to ground. If the control output terminals are connected to ground, errors will occur in the measured
  temperature values as a result of leakage current.
- Standard insulation is applied between any of the following: power supply terminals, input terminals, output terminals, and communications terminals (for models with communications). If reinforced insulation is required, provide additional insulation, such as spacial distance or material insulation, as defined by IEC 60664 suitable for the maximum operating voltage.
- Consult with your OMRON representative before using the external power supply for the ES1B for any other purpose.





# Nomenclature

#### E5CN E5CN-U

The front panel is the same for the E5CN and E5CN-U.



# **Dimensions**





0





#### Mounted Separately

Panel Cutout



# Group Mounted $(48 \times number of units -2.5)^{+1.0}_{0}$



- Recommended panel thickness is 1 to
- •
- Recommended panel unconession .... 5 mm. Group mounting is not possible in the vertical direction. (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

### **USB-Serial Conversion Cable (Sold Separately)**

#### E58-CIFQ1





### Current Transformers (Sold Separately)

22

9.1





Fixture (Accessory)

67 × 67 87

Temperature controllers

### Adapter (Sold Separately)

Note: Use this Adapter when the panel has already been prepared for the E5B $\square$ .

Y92F-45



Pol

## E5CN-U Wiring Socket (Sold Separately)



2.2-+

-4.7

- 77.3 (to back of E5CN)

#### Back-connecting Socket P3GA-11



Note: 1. Using any other sockets will adversely affect accuracy. Use only the specified sockets.

2. A Protective Cover for finger protection (Y92A-48G) is also available.

emperature controllers

# Digital Temperature Controllers

#### This Best-selling General-purpose Temperature Controller Is Now Even Better. USB-Serial Conversion Cable and Support Software Are Also Available.

- · Controllers now available with analog inputs.
- Faster sampling at 250 ms.
- Transfer output provided for easy output to recorders.
- Voltage outputs (to drive SSRs) for both heating and cooling control.
- Models available with three-phase heater burnout detection and SSR fault detection.
- Manual output provided.
- Controller available with long-life relay output.
- Models available with external power supply for ES1B Infrared Thermosensor.
- Easy setting with 11-segment displays.
- Connect to either a thermocouple or platinum resistance thermometer with the same model.
- Easily see the status from a distance with PV display with threecolor switching function.

Note: Refer to Precautions on CD.



Note: Refer to Common on CD for information on changes in comparison to previous models.

## Features

#### Improved Functions for a Wider Range of Application

# Control Analog Values, such as Pressures, Flowrates, and Levels

The E5EN Series now also includes models that accept analog inputs, enabling control applications other than for temperature, including pressure, flowrate, level, humidity, and weight control.

#### Faster Sampling at 250 ms

The previous sampling time of 500 ms has been reduced by half to 250 ms. This enables the E5EN to handle application requiring even greater response speed and accuracy.

#### Easy Connector to a Recorder

A transfer output now makes it easy to connect to a recorder or PLC Analog I/O Unit.

# Voltage Outputs (to Drive SSRs) for Both Heating and Cooling Control.

Voltage outputs can be used for both heating and cooling for Models with Two Control Outputs.

#### **Three-phase Heater Burnout Detection**

With Models with Three-phase Heater Burnout and SSR Failure Detection, two current transformers can be connected to detect both heater burnout and SSR failure at the same time, reducing costs because a separate heater burnout alarm device is not required. SSR failure detection can be used even with Models with Singlephase Heater Burnout Alarms.

### E58-CIFQ1 USB-Serial Conversion Cable for Computer Connection

#### A personal computer connection is possible for models without communications.

The CX-Thermo Support Software (sold separately) can be used to set parameters, monitor operation, and parameter masks. (CX-Thermo support of the E5EN is scheduled for March 2005.)

Specifications: page 47, Dimensions: page 53



# **Model Number Structure**

### Model Number Legend

#### E5EN-

1 2 3 4 5 6

1. Output 1 type R: Relay

Q: Voltage for driving SSR

- C: Current
- 2. Number of alarms 3: 3 alarms
- 3. Heater burnout/SSR failure H:Heater burnout/SSR failure detection (1 CT) HH:Heater burnout/SSR failure detection (2 CT) Blank:Not available

- 4. Output 2/External power supply for ES1B
  - Q: Voltage for driving SSR
  - Y: Long-life Relay P: External Power supply for ES1B
- Blank:Not available
- 5. Option Unit
- 6. Input type
  - T: Thermocouple/platinum resistance thermometer (multi-input) L: Analog input

# **Ordering Information**

### Temperature Input (Multi Input) Standard Models

Size	Power supply voltage	Number of alarm points	Control output	Heater alarm	Model
1/8 DIN	100 to 240 VAC	3	Relay	No	E5EN-R3MT-500
$48 \times 96 \times 78 (W \times H \times D)$				Yes (1 CT)	E5EN-R3HMT-500
				Yes (2 CT)	E5EN-R3HHMT-500
			Voltage (for driving SSR)	No	E5EN-Q3MT-500
				Yes (1 CT)	E5EN-Q3HMT-500
				Yes (2 CT)	E5EN-Q3HHMT-500
			Current	No	E5EN-C3MT-500
	24 VAC/VDC	3	Relay	No	E5EN-R3MT-500
				Yes (1 CT)	E5EN-R3HMT-500
			Voltage (for driving SSR)	No	E5EN-Q3MT-500
				Yes (1 CT)	E5EN-Q3HMT-500
			Current	No	E5EN-C3MT-500

### ■ Temperature Input (Multi Input) 2 Outputs Models

Size	Power supply voltage	Number of alarm points	Control output 1	Control output 2	Power supply for ES1B	Model
$\begin{array}{l} 1/8 \text{ DIN} \\ 48 \times 96 \times 78 \text{ (W} \times \text{H} \times \text{D)} \end{array}$	100 to 240 VAC	3	Relay	Voltage (for driving SSR)	No	E5EN-R3QMT-500
			Voltage (for driving SSR)	Voltage (for driving SSR)		E5EN-Q3QMT-500
				Ling-life Relay		E5EN-Q3YMT-500
			Current	Voltage (for driving SSR)		E5EN-C3QMT-500
				Ling-life Relay		E5EN-C3YMT-500
			Relay	No	Yes	E5EN-R3PMT-500
			Voltage (for driving SSR)			E5EN-Q3PMT-500

## ■ Analog Input Models

Size	Power supply voltage	Number of alarm points	Control output 1	Heater alarm	Control output 2	Model
1/8 DIN	100 to 240 VAC	3	Relay	No	No	E5EN-R3ML-500
$48 \times 96 \times 78 (W \times H \times D)$			Voltage (for driving SSR)	No		E5EN-Q3ML-500
			Current	No		E5EN-C3ML-500
			Relay	Yes (1 CT)		E5EN-R3HML-500
			Voltage (for driving SSR)	Yes (1 CT)		E5EN-Q3HML-500
			Voltage (for driving SSR)	No	Long-life Relay	E5EN-Q3YML-500

# Option Units

Name	Function	Model		
Communication Unit	RS-232C Communication	E53-EN01		
	RS-485 Communication	E53-EN03		
Event Input Unit	Event Input	E53-AKB		

# Specifications

### ■ Ratings

Item	Power supply voltage	100 to 240 VAC, 50/60 Hz	24 VAC, 50/60 Hz or 24 VDC				
Operating voltage range		85% to 110% of rated supply voltage					
Power consum	nption	Approx. 10 VA	Approx. 5.5 VA (24 VAC)/approx. 4 W (24 VDC)				
Sensor input		Models with temperature inputs					
		Thermocouple: K, J, T, E, L, U, N, R, S, or B					
		Platinum resistance thermometer: Pt100 or JPt100	)				
		Infrared temperature sensor: 10 to 70°C, 60 to 120	°C, 115 to 165°C, or 160 to 260°C				
		Voltage input: 0 to 50 mV					
		Models with analog inputs					
		Current input: 4 to 20 mA or 0 to 20 mA					
		Voltage input: 1 to 5 V, 0 to 5 V, or 0 to 10 V					
Input impedan	ce	Current input: 150 $\Omega$ , Voltage input: 1 M $\Omega$ (Use a 1:1 $\sigma$	connection when connecting the ES2-HB.)				
Control output	Relay output	SPST-NO, 250 VAC, 5 A (resistive load), electrical life: 10 mA	: 100,000 operations, minimum applicable load: 5 V,				
	current: 40 mA, with short-circuit protection circuit (max.						
	Current output	4 to 20 mA DC/0 to 20 mA DC, load: 600 $\Omega$ max., resolution: approx. 2,700					
	Long-life relay output	SPST-NO, 250 VAC, 3 A (resistive load), electrical life: 1,000,000 operations, load power supply voltage: 75 to 250 VAC (DC loads cannot be connected.), minimum applicable load: 5 V, 10 mA, leakage current: 5 mA max. (250 VAC, 60 Hz)					
Alarm output		SPST-NO, 250 VAC, 3 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 1 V, 1 mA					
Event input	Contact input	ON: 1 kΩ max., OFF: 100 kΩ min.					
	Non-contact input	ON: Residual voltage: 1.5 V max., OFF: Leakage current: 0.1 mA max.					
		Outflow current: Approx. 7 mA per point					
External powe ES1B	r supply for	12 VDC ±10%, 20 mA, Short-circuit protection provided.					
Control metho	d	ON/OFF control or 2-PID control (with auto-tuning)					
Setting metho	d	Digital setting using front panel keys					
Indication met	hod	11-segment digital display and individual indicators (7-segments displays also possible)					
		Character height: PV: 14 mm, SV: 9.5 mm					
Other functions		Manual output, heating/cooling control, transfer output (on some models), loop break alarm, multi SP, MV limiter, input digital filter, self-tuning, temperature input shift, run/stop, protection functions, etc.					
Ambient opera temperature	iting	-10 to 55°C (with no icing or condensation), for 3-year warranty: -10 to 50°C					
Ambient opera	ting humidity	25% to 85%					
Storage tempe	erature	-25 to 65°C (with no icing or condensation)					

### Input Ranges

### Thermocouples/Platinum Resistance Thermometers (Multi-inputs)

in T	iput ype	Р	latinu the	m res rmom	istan eter	ce		Thermocouple Infrar					ared te ser	empera nsor	ature	Analog input									
N	ame		Pt100		JPt	100		К	,	J		Т	Е	L	l	J	Ν	R	S	в	10 to 70°C	60 to 120°C	115 to 165°C	160 to 260°C	0 to 50 mV
( <sub>0</sub> C)	1800 1700 1600 1500 1400 1300 1200 1100 1000 900	850					1300		850					850			1300								Usable in the following ranges by scaling: -1999 to 9999 or -199.9 to 9999.9
Temperature range	800 700 600 500 400 300 200 100 0 -100.0 -200.0		500.0	100.0	500.0	100.0	-200	500.0	-100	400.0	400	400.0	600 0 0	-100	400	400.0	-200	0		100	90	120	165	260	
Setti num	ng ber	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

The applicable standards for the input types are as follows:

U: Cu-CuNi, DIN 43710-1985 Pt100: IEC 751 Shaded settings are the default settings.

K, J, T, E, N, R, S, B: IEC 584-1 L: Fe-CuNi, DIN 43710-1985

### Models with Analog Inputs

Input Type	Cur	Current		Voltage		
Input specification	4 to 20mA	0 to 20 mA	1 to 5 V	0 to 5 V	0 to 10 V	
Setting range	Usable in th	Usable in the following ranges by scaling:				
	-1999 to 9999, -199.9 to 999.9, -19.99 to 99.99 or -1.999 to 9.9					
Setting number	0	1	2	3	4	

### ■ Alarm Types

Select alarm types out of the 12 alarm types listed in the following table.

Set value	Alarm type	Alarm outp	ut operation
		When X is positive	When X is negative
0	Alarm function OFF	Output OFF	
1 (See note 1.)	Upper- and lower- limit		(See note 2.)
2	Upper limit	ON X SP	ON X - OFF SP
3	Lower limit	ON X SP	ON X SP
4 (See note 1.)	Upper- and lower- limit range	ON L H G	(See note 3.)
5 (See note 1.)	Upper- and lower- limit with standby sequence	$ON \xrightarrow{OFF} \xrightarrow{I \mid H} \xrightarrow{F}$ SP (See note 5.)	(See note 4.)
6	Upper-limit with standby sequence	ON OFF SP	ON X -
7	Lower-limit with standby sequence	ON X SP	ON X SP
8	Absolute-value upper-limit	ON OFF 0	ON OFF 0
9	Absolute-value lower-limit	ON OFF 0	
10	Absolute-value upper-limit with standby sequence	ON OFF 0	ON OFF 0
11	Absolute-value lower-limit with standby sequence		
12 (See note 6.)	LBA (for alarm 1 only)		

- Note: 1. With set values 1, 4 and 5, the upper and lower limit values can be set independently for each alarm type, and are expressed as "L" and "H."
  - 2. Set value: 1, Upper- and lower-limit alarm

Case 1	Case 2	Case 3 (Always ON)	H<0, L<0
H<0, L>0	H>0, L<0  H  >  L	H LSP	H<0, L>0  H  ≥  L
1 1 1 1		SPH L	H>0, L<0  H  ≤  L

#### 3. Set value: 4, Upper- and lower-limit range

Case 1	Case 2	Case 3 (Always ON)	
L H SP	SPL H	H SP L	H<0, L<0
H<0, L>0  H  <  L	H>0, L<0  H  >  L	H LSP	H<0, L>0  H  ≥  L
		SPH L	H>0, L<0  H  ≤  L

- 4. Set value: 5, Upper- and lower-limit with standby sequence For Upper- and Lower-Limit Alarm Described Above
  - Case 1 and 2 Always OFF when the upper-limit and lower-limit hysteresis overlaps.
  - Case 3: Always OFF
- 5. Set value: 5, Upper- and lower-limit with standby sequence Always OFF when the upper-limit and lower-limit hysteresis overlaps.
- 6. Set value: 12, LBA can be set only for alarm 1.

Set the alarm types for alarms 1 to 3 independently in the initial setting level. The default setting is 2 (upper limit).

### Characteristics

Indication accuracy		Thermocouple: (See note 1.) $(\pm 0.5\% \text{ of indicated value or } \pm 1^{\circ}\text{C}$ , whichever is greater) $\pm 1$ digit max. Platinum resistance thermometer: $(\pm 0.5\% \text{ of indicated value or } \pm 1^{\circ}\text{C}$ , whichever is greater) $\pm 1$ digit max. Analog input: $\pm 0.5\% \text{ ES } \pm 1$ digit may
		CT input: ±5% FS ±1 digit max.
Influence of ter note 2.) Influence of vo (See note 2.)	nperature (See	<ul> <li>R, S, and B thermocouple inputs: (±1% of PV or ±10°C, whichever is greater) ±1 digit max.</li> <li>Other thermocouple inputs: (±1% of PV or ±4°C, whichever is greater) ±1 digit max.</li> <li>*±10°C for -100°C or less for K sensors</li> <li>Platinum resistance thermometer inputs: (±1% of PV or ±2°C, whichever is greater) ±1 digit max.</li> <li>Analog inputs: (±1% of FS) ±1 digit max.</li> </ul>
Hysteresis		Models with thermocouple/platinum resistance thermometer (multi-input) input: 0.1 to 999.9 EU (in units of 0.1 EU) (See note 3.) Models with analog input: 0.01 to 99.99% FS (in units of 0.01% FS)
Proportional ba	and (P)	Models with thermocouple/platinum resistance thermometer (multi-input) input: 0.1 to 999.9 EU (in units of 0.1 EU) (See note 3.) Models with analog input: 0.1 to 999.9% FS (in units of 0.1% FS)
Integral time (I)	1	0 to 3999 s (in units of 1 s)
Derivative time	(D)	0 to 3999 s (in units of 1 s) (See note 4.)
Control period	-	0.5, 1 to 99 s (in units of 1 s)
Alarm setting r	ande	-1999 to 9999 (decimal point position depends on input
,	ango	type)
Sampling perio	d	250 ms
resistance	source	Platinum resistance thermometer: $0.4^{\circ}C/\Omega$ max.) (See note 5.) max.)
Insulation resis	stance	20 MΩ min. (at 500 VDC)
Dielectric stren	gth	2,000 VAC, 50 or 60 Hz for 1 min (between terminals with different charge)
Vibration resistance	Malfunction	10 to 55 Hz, 20 m/s <sup>2</sup> for 10 min each in X, Y, and Z directions
	Destruction	10 to 55 Hz, 0.75-mm single amplitude for 2 hrs each in X, Y, and Z directions
Shock	Malfunction	100 m/s $^2$ min., 3 times each in X, Y, and Z directions
resistance	Destruction	300 m/s $^2$ min., 3 times each in X, Y, and Z directions
Weight		Controller: Approx. 260 g, Mounting Bracket: Approx. 100 g
Degree of prote	ection	Front panel: NEMA4X for indoor use (equivalent to IP66) Rear case: IP20, Terminal section: IP00
Memory protec	tion	Non-volatile memory (number of writes: 1,000,000
EMC		Immunity Surge: EN55011 Group1 Class A Emission AC Mains: EN55011 Group1 Class A Immunity ESD: EN61000-4-2 4 kV contact discharge (level 2) 8 kV air discharge (level 3) Immunity RF-interference: EN61000-4-3 10 V/m (80-1000 MHz, 1.4-2.0 GHz amplitude modulated) (level 3) 10 V/m (900 MHz pulse modulated) Immunity Conducted Disturbance: EN61000-4-6 3 V (0.15 to 80 MHz) (level 2) Immunity Burst: EN61000-4-5 1kV line to line ine, output line (level 2) Immunity Surge: EN61000-4-5 1kV line to line (communication) IkV line to ground Power line, output line (relay output) 1 kV line to ground Input line (communication) Immunity Voltage Dip/Interrupting: EN61000-4-10.5 cycle, 100% (rated
Approved stan	dards	voitage) UL 61010C-1
Conformed sta	ndards	CSA C22.2 No.1010.1 EN61326, EN61010-1, IEC61010-1 VDE0106 Part 100 (Finger protection), when the terminal cover is mounted.

Note: 1. The indication accuracy of K thermocouples in the -200 to 1300°C range, T and N thermocouples at a temperature of -100°C max., and 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 not specified. The indication accuracy of the R and S thermocouples at a temperature of 200°C max. is ±3°C ±1 digit max.

- Conditions: Ambient temperature: -10°C to 23°C to 55°C, Voltage range: -15% to +10% of rated voltage
- 3. "EU" stands for Engineering Unit and is used as the unit after scaling. For a temperature sensor, the EU is °C or °F.
- 4. When robust tuning (RT) is ON, the differential time is 0.0 to 999.9 (in units of 0.1 s).
- 5. B, R, and S sensors:  $0.2^{\circ}C/\Omega$  max. (100  $\Omega$  max.)

### ■ USB-Serial Conversion Cable

Applicable OS	Windows 2000/XP
Applicable software	Thermo Mini, CX-Thermo
Applicable models	E5CN/E5CN-U/E5AN/E5EN
USB interface standard	Conforms to USB Specification 1.1.
DTE speed	38400 bps
Connector specifications	Computer: USB (type A plug) Temperature Controller: Serial
Power supply	Bus power (Supplied from USB host controller.)
Power supply voltage	5 VDC
Current consumption	70 mA
Ambient operating temperature	0 to 55°C (with no condensation or icing)
Ambient operating humidity	10% to 80%
Storage temperature	–20 to 60°C (with no condensation or icing)
Storage humidity	10% to 80%
Altitude	2,000 m max.
Weight	Approx. 100 g

**Note:** A driver must be installed in the personal computer. Refer to installation information in the operation manual for the Conversion Cable.

### Communications Specifications

Transmission line connection method	RS-485 multipoint RS-232C
Communications	RS-485 (two-wire, half duplex), RS-232C
Synchronization method	Start-stop synchronization
Baud rate	1200, 2400, 4800, 9600, 19200, or 38400 bps
Transmission code	ASCII
Data bit length (See note.)	7 or 8 bits
Stop bit length (See note.)	1 or 2 bits
Error detection	Vertical parity (none, even, odd) Frame check sequence (FCS) with SYSWAY Block check character (BCC) with CompoWay/F or CRC-16 Modbus
Flow control	None
Interface	RS-485, RS-232C
Retry function	None
Communications buffer	40 bytes
Communications response wait time	0 to 99 ms Default: 20 ms

Note: The baud rate, data bit length, stop bit length, and vertical parity can be individually set using the Communications Setting Level.

### Current Transformer (Sold Separately) <u>Ratings</u>

Dielectric strength	1,000 VAC for 1 min
Vibration resistance	50 Hz, 98 m/s²
Weight	E54-CT1: Approx. 11.5 g, E54-CT3: Approx. 50 g
Accessories (E54-CT3 only)	Armatures (2) Plugs (2)

### Heater Burnout Alarms and SSR Failure Detection Alarms

Maximum heater current	50 A AC
Input current indication accuracy	±5% FS ±1 digit max.
Heater burnout alarm setting range	0.1 to 49.9 A (in units of 0.1 A) 0.0 A: Heater burnout/SSR failure alarm output turned OFF. 50.0 A: Heater burnout/SSR failure alarm output turned ON. Minimum detection ON time: 190 ms (See note 1.)
SSR failure detection alarm setting range	0.1 to 49.9 A (in units of 0.1 A) 0.0 A: Heater burnout/SSR failure alarm output turned ON. 50.0 A: Heater burnout/SSR failure alarm output turned OFF. Minimum detection OFF time: 190 ms (See note 2.)

- Note: 1. If the ON time of control output 1 is less than 190 ms, heater burnout detection and the heater current will not be measured.
  - If the OFF time of control output 1 is less than 190 ms, SSR failure detection and the heater current will not be measured.

### Electrical Life Expectancy Curve for Relays (Reference Values)



Note: Do not connect a DC load to a Controller with a Long-life Relay Output.

### E54-CT1 <u>Thru-current (Io) vs. Output Voltage</u> (Eo) (Reference Values)

Maximum continuous heater current: 50 A (50/60 Hz) Number of windings: 400±2 Winding resistance: 18±2  $\Omega$ 



### E54-CT3 Thru-current (Io) vs. Output Voltage (Eo) (Reference Values)

Maximum continuous heater current: 120 A (50/60 Hz) (Maximum continuous heater current for an OMRON Temperature Controller is 50 A.) Number of windings: 400±2

Winding resistance:  $8\pm0.8 \Omega$ 



Thru-current (Io) A (r.m.s.)

# **External Connections**

- The voltage output for control output 1 is not electrically insulated from the internal circuits. When using a grounding thermocouple, do not connect any of the control output terminals to ground. If the control output terminals are connected to ground, errors will occur in the measured temperature values as a result of leakage current.
- The voltage output for control output 2 is electrically insulated from the internal circuits with standard insulation.
- An R on the end of the lot number indicates that reinforced insulation is provided between the input power supply, relay outputs, and other terminals.
- Consult with your OMRON representative before using the external power supply for the ES1B for any other purpose.

#### E5EN

Relay output 250 VAC, 5 A (Resistive load)			Event input L BS-232C L BS-485
100 to 240 VAC 24 VAC/VDC (No polarity)Input powVoltage output 12 VDC, 40 mAControlCurrent output 4 to 20 mA DC 0 to 20 mA DCAlarm Alarm (Relay output), 	er supply output 1 output 3 output 2 tput 1,		$\begin{array}{c c c c c c c c c c c c c c c c c c c $
(Hesistive load) HBA/HS alarm/inp error		(9)	Note: For the CTs, use the E54-CT1 (hole dia.: 5.8 mm) or the E54-CT3 (hole dia.: 12 mm) (sold separately).

# Nomenclature

E5EN



# Dimensions



### Accessories

### USB-Serial Conversion Cable (Sold Separately)

#### E58-CIFQ1



### Current Transformers (Sold Separately)





emperature controllers

# Digital Temperature Controllers

#### This Best-selling General-purpose Temperature Controller Is Now Even Better. USB-Serial Conversion Cable and Support Software Are Also Available.

- · Controllers now available with analog inputs.
- Faster sampling at 250 ms.
- Transfer output provided for easy output to recorders.
- Voltage outputs (to drive SSRs) for both heating and cooling control.
- Models available with three-phase heater burnout detection and SSR fault detection.
- Manual output provided.
- Controller available with long-life relay output.
- Easy setting with 11-segment displays.
- Connect to either a thermocouple or platinum resistance thermometer with the same model.
- Easily see the status from a distance with PV display with threecolor switching function.

Note: Refer to Precautions on CD.

# Features

#### Improved Functions for a Wider Range of Application

# Control Analog Values, such as Pressures, Flowrates, and Levels

The E5AN Series now also includes models that accept analog inputs, enabling control applications other than for temperature, including pressure, flowrate, level, humidity, and weight control.

#### Faster Sampling at 250 ms

The previous sampling time of 500 ms has been reduced by half to 250 ms. This enables the E5AN to handle application requiring even greater response speed and accuracy.

#### Easy Connector to a Recorder

A transfer output now makes it easy to connect to a recorder or PLC Analog I/O Unit.

# Voltage Outputs (to Drive SSRs) for Both Heating and Cooling Control.

Voltage outputs can be used for both heating and cooling for Models with Two Control Outputs.

#### **Three-phase Heater Burnout Detection**

With Models with Three-phase Heater Burnout and SSR Failure Detection, two current transformers can be connected to detect both heater burnout and SSR failure at the same time, reducing costs because a separate heater burnout alarm device is not required. SSR failure detection can be used even with Models with Singlephase Heater Burnout Alarms.

#### E58-CIFQ1 USB-Serial Conversion Cable for Computer Connection

#### A personal computer connection is possible for models without communications.

The CX-Thermo Support Software (sold separately) can be used to set parameters, monitor operation, and parameter masks. (CX-Thermo support of the E5AN is scheduled for March 2005.)

Specifications: page 57, Dimensions: page 63





Note: Refer to Common on CD for information on changes in comparison to previous models.

# **Model Number Structure**

### Model Number Legend

### E5AN-\_\_\_\_M\_-500

1 2 3 4 5 6

**1. Output 1 type** R: Relay

Q: Voltage for driving SSR

C: Current 2. Number of alarms

3: 3 alarms

3. Heater burnout/SSR failure

H: Heater burnout/SSR failure detection (1 CT) HH: Heater burnout/SSR failure detection (2 CT) Blank:Not available

#### 4. Output 2 type

- Q: Voltage for driving SSR Y: Long-life Relay Blank:Not available
- 5. Option Unit
- 6. Input type
  - T: Thermocouple/platinum resistance thermometer (multi-input) L: Analog input

# **Ordering Information**

### ■ Temperature Input (Multi Input) Standard Models

Size	Power supply voltage	Number of alarm points	Control output	Heater alarm	Model
1/4 DIN	100 to 240 VAC	3	Relay	No	E5AN-R3MT-500
$96 \times 96 \times 78 (W \times H \times D)$				Yes (1 CT)	E5AN-R3HMT-500
				Yes (2 CT)	E5AN-R3HHMT-500
			Voltage (for driving SSR)	No	E5AN-Q3MT-500
				Yes (1 CT)	E5AN-Q3HMT-500
				Yes (2 CT)	E5AN-Q3HHMT-500
			Current	No	E5AN-C3MT-500
	24 VAC/VDC	3	Relay	No	E5AN-R3MT-500
				Yes (1 CT)	E5AN-R3HMT-500
			Voltage (for driving SSR)	No	E5AN-Q3MT-500
				Yes (1 CT)	E5AN-Q3HMT-500
			Current	No	E5AN-C3MT-500

### ■ Temperature Input (Multi Input) 2 Outputs Models

Size	Power supply voltage	Number of alarm points	Control output 1	Control output 2	Model
1/4 DIN	100 to 240 VAC	3	Relay	Voltage (for driving SSR)	E5AN-R3QMT-500
$96 \times 96 \times 78 (W \times H \times D)$			Voltage (for driving SSR)	Voltage (for driving SSR)	E5AN-Q3QMT-500
				Long-life Relay	E5AN-Q3YMT-500
			Current	Voltage (for driving SSR)	E5AN-C3QMT-500
				Long-life Relay	E5AN-C3YMT-500

### Analog Input Models

Size	Power supply voltage	Number of alarm points	Control output	heater alarm	Model
1/4 DIN	100 to 240 VAC	3	Relay	Yes (1 CT)	E5AN-R3HML-500
$96 \times 96 \times 78 (W \times H \times D)$			Voltage (for driving SSR)	Yes (1 CT)	E5AN-Q3HML-500

### ■ Option Units

Name	Function	Model
Communication Unit	RS-232C Communication	E53-EN01
	RS-485 Communication	E53-EN03
Event Input Unit	Event Input	E53-AKB

# Specifications

# ■ Ratings

Item	Power supply voltage	100 to 240 VAC, 50/60 Hz	24 VAC, 50/60 Hz or 24 VDC					
Operating volt	age range	85% to 110% of rated supply voltage						
Power consum	nption	Approx. 11 VA	Approx. 5.5 VA (24 VAC)/approx. 4 W (24 VDC)					
Sensor input		Models with temperature inputs						
		Thermocouple: K, J, T, E, L, U, N, R, S, or B						
		Platinum resistance thermometer: Pt100 or JPt100						
		Infrared temperature sensor: 10 to 70°C, 60 to 120	°C, 115 to 165°C, or 160 to 260°C					
		Voltage input: 0 to 50 mV						
		Models with analog inputs						
		Current input: 4 to 20 mA or 0 to 20 mA						
		Voltage input: 1 to 5 V, 0 to 5 V, or 0 to 10 V						
Input impedan	ce	Current input: 150 $\Omega$ , Voltage input: 1 M $\Omega$ (Use a 1:1 $\sigma$	connection when connecting the ES2-HB.)					
Control output	Relay output	SPST-NO, 250 VAC, 5 A (resistive load), electrical life: 10 mA	100,000 operations, minimum applicable load: 5 V,					
	Voltage output	Output voltage: 12 VDC +15/-20% (PNP), max. load current: 40 mA, with short-circuit protection circuit (max. load current for control output 2: 21 mA)						
	Current output	4 to 20 mA DC/0 to 20 mA DC, load: 600 $\Omega$ max., resolution: approx. 2,700						
	Long-life relay output	SPST-NO, 250 VAC, 3 A (resistive load), electrical life: 1,000,000 operations, load power supply voltage: 75 to 250 VAC (DC loads cannot be connected.), minimum applicable load: 5 V, 10 mA, leakage current: 5 mA max. (250 VAC, 60 Hz)						
Alarm output		SPST-NO, 250 VAC, 3 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 1 V, 1 mA						
Event input	Contact input	ON: 1 kΩ max., OFF: 100 kΩ min.						
	Non-contact input	ON: Residual voltage: 1.5 V max., OFF: Leakage current: 0.1 mA max.						
		Outflow current: Approx. 7 mA per point						
Control metho	d	ON/OFF control or 2-PID control (with auto-tuning)						
Setting metho	d	Digital setting using front panel keys						
Indication met	hod	11-segment digital display and individual indicators (7	-segments displays also possible)					
		Character height: PV: 15 mm, SV: 9.5 mm						
Other functions		Manual output, heating/cooling control, transfer output (on some models), loop break alarm, multi SP, MV limiter, input digital filter, self-tuning, temperature input shift, run/stop, protection functions, etc.						
Ambient operatemperature	ating	-10 to 55°C (with no icing or condensation), for 3-year warranty: -10 to 50°C						
Ambient opera	ating humidity	25% to 85%						
Storage tempe	erature	-25 to 65°C (with no icing or condensation)						

### ■ Input Ranges

### Thermocouples/Platinum Resistance Thermometers (Multi-inputs)

_		r	-				T													-					L.
!	input Type	F	latinu the	m res	istan eter	ce						т	hermo	ocoup	le						Infr	ared te sei	empera nsor	ature	Analog input
N	Name		Pt100	)	JPt	100		К		J		Т	Е	L	l	J	Ν	R	S	в	10 to 70°C	60 to 120°C	115 to 165°C	160 to 260 °C	0 to 50 mV
Temperature range (°C)	1800 1700 1600 1500 1400 1300 1200 1100 1000 900 800 800 600 500 400 300 200 100 0	850	500.0		500.0			500.0	850	400.0	400	400.0	600 600 0	850	400	400.0					70°C	120°C	165°C	260°C	Usable in the following ranges by scaling: -1999 to 9999 or -199.9 to 9999.9
	-100.0		+					-20.0	-100	-20.0		+		-100						1		1			l
1	-200.0	-200	-199.9		-199.9		-200				-200	-199.9			-200	-199.9	-200								
So	Hina	0	1	2	2	1	5	6	7	0	0	10	11	10	12	14	15	16	17	10	10	20	21	22	22
nur	nber	0	1	2	3	4	5	0	/	0	3			12	13	14	15	10	17	10	19	20	21	22	20

The applicable standards for the input types are as follows:

K, J, T, E, N, R, S, B: IEC 584-1 L: Fe-CuNi, DIN 43710-1985 U: Cu-CuNi, DIN 43710-1985 Pt100: IEC 751 Shaded settings are the default settings.

Models with Analog Inputs

Input Type	Cur	rent		Voltage				
Input specification	4 to 20mA	0 to 20 mA	1 to 5 V	0 to 5 V	0 to 10 V			
Setting range	Usable in th	e following r	ranges by scaling:					
	-1999 to 999	9, –199.9 to 9	99.9, -19.99	to 99.99 or -1	.999 to 9.999			
Setting number	0	1	2	3	4			

### ■ Alarm Types

Select alarm types out of the 12 alarm types listed in the following table.

Set value	Alarm type	Alarm outp	ut operation
		When X is positive	When X is negative
0	Alarm function OFF	Output OFF	
1 (See note 1.)	Upper- and lower- limit		(See note 2.)
2	Upper limit	ON X SP	ON X - OFF SP
3	Lower limit	ON X SP	ON X CON SP
4 (See note 1.)	Upper- and lower- limit range	ON OFF SP	(See note 3.)
5 (See note 1.)	Upper- and lower- limit with standby sequence	$ON \xrightarrow{OFF} \square SP$ (See note 5.)	(See note 4.)
6	Upper-limit with standby sequence	ON OFF SP	ON OFF SP
7	Lower-limit with standby sequence	ON X SP	ON X SP
8	Absolute-value upper-limit	ON OFF 0	ON OFF 0
9	Absolute-value lower-limit	ON OFF 0	
10	Absolute-value upper-limit with standby sequence	ON OFF 0	
11	Absolute-value lower-limit with standby sequence		
12 (See note 6.)	LBA (for alarm 1 only)		

- Note: 1. With set values 1, 4 and 5, the upper and lower limit values can be set independently for each alarm type, and are expressed as "L" and "H."
  - 2. Set value: 1, Upper- and lower-limit alarm

Case 1	Case 2	Case 3 (Always ON)	H<0, L<0
H<0, L>0	H>0, L<0  H  >  L	H LSP	H<0, L>0  H  ≥  L
		SPH L	H>0, L<0  H  ≤  L

#### 3. Set value: 4, Upper- and lower-limit range

Case 1	Case 2	Case 3 (Always ON)	
L H SP	SPL H	H SP L	H<0, L<0
H<0, L>0  H  <  L	H>0, L<0  H  >  L	H LSP	H<0, L>0  H  ≥  L
		SPH L	H>0, L<0  H  ≤  L

- 4. Set value: 5, Upper- and lower-limit with standby sequence For Upper- and Lower-Limit Alarm Described Above
  - Case 1 and 2 Always OFF when the upper-limit and lower-limit hysteresis overlaps.
  - Case 3: Always OFF
- 5. Set value: 5, Upper- and lower-limit with standby sequence Always OFF when the upper-limit and lower-limit hysteresis overlaps.
- 6. Set value: 12, LBA can be set only for alarm 1.

Set the alarm types for alarms 1 to 3 independently in the initial setting level. The default setting is 2 (upper limit).

### Characteristics

Indication accuracy		Thermocouple: (See note 1.) ( $\pm 0.5\%$ of indicated value or $\pm 1^{\circ}$ C, whichever is greater) $\pm 1$ digit max. Platinum resistance thermometer: ( $\pm 0.5\%$ of indicated value or $\pm 1^{\circ}$ C, whichever is greater) $\pm 1$ digit max. Analog input: $\pm 0.5\%$ FS $\pm 1$ digit max. CT input: $\pm 5\%$ FS $\pm 1$ digit max.
Influence of ter note 2.)	nperature (See	(±1% of PV or ±10°C, whichever is greater) ±1 digit max.
Influence of voltage (See note 2.)		Other thermocouple inputs: $(\pm 1\% \text{ of PV or } \pm 4^\circ \mathbb{C}$ , whichever is greater) $\pm 1$ digit max. $^{\pm}10^\circ \mathbb{C}$ for $-100^\circ \mathbb{C}$ or less for K sensors Platinum resistance thermometer inputs: $(\pm 1\% \text{ of PV or } \pm 2^\circ \mathbb{C}$ , whichever is greater) $\pm 1$ digit max. Analog inputs: $(\pm 1\% \text{ of FS}) \pm 1$ digit max.
Hysteresis		Models with thermocouple/platinum resistance thermometer (multi-input) input: 0.1 to 999.9 EU (in units of 0.1 EU) (See note 3.) Models with analog input: 0.01 to 99.99% FS (in units of 0.01% FS)
Proportional ba	and (P)	Models with thermocouple/platinum resistance thermometer (multi-input) input: 0.1 to 999.9 EU (in units of 0.1 EU) (See note 3.) Models with analog input: 0.1 to 999.9% FS (in units of 0.1% FS)
Integral time (I)		0 to 3999 s (in units of 1 s)
Derivative time	(D)	0 to 3999 s (in units of 1 s) (See note 4.)
Control period	( )	0.5. 1 to 99 s (in units of 1 s)
Manual reset v	alue	0.0 to 100.0% (in units of 0.1%)
Alarm setting r	ange	-1999 to 9999 (decimal point position depends on input
Sampling perio	bd	250 ms
Affect of signa resistance	I source	Thermocouple: $0.1^{\circ}C/\Omega$ max. (100 $\Omega$ max.) (See note 5.) Platinum resistance thermometer: $0.4^{\circ}C/\Omega$ max. (10 $\Omega$ max.)
Insulation resis	stance	20 MΩ min. (at 500 VDC)
Dielectric stren	igth	$2{,}000\ \text{VAC},\ 50\ \text{or}\ 60\ \text{Hz}\ \text{for}\ 1\ \text{min}\ (\text{between terminals with different charge})$
Vibration resistance	Malfunction	10 to 55 Hz, 20 m/s <sup>2</sup> for 10 min each in X, Y, and Z directions
	Destruction	10 to 55 Hz, 0.75-mm single amplitude for 2 hrs each in X, Y, and Z directions
Shock	Malfunction	100 m/s $^2$ min., 3 times each in X, Y, and Z directions
resistance	Destruction	300 m/s $^2$ min., 3 times each in X, Y, and Z directions
Weight		Controller: Approx. 310 g, Mounting Bracket: Approx. 100 g
Degree of prote	ection	Front panel: NEMA4X for indoor use (equivalent to IP66) Rear case: IP20, Terminal section: IP00
Memory protect	tion	Non-volatile memory (number of writes: 1,000,000 operations)
EMC		Emission Enclosure: EN55011 Group1 Class A Emission AC Mains: EN55011 Group1 Class A Immunity ESD: EN61000-4-2 4 kV contact discharge (level 2) 8 kV air discharge (level 3) Immunity RF-interference: EN61000-4-3 10 V/m (80-1000 MHz, 1,4-2.0 GHz amplitude modulated (interference)
		Inocurated) (level 3) 10 V/m (900 MHz pulse modulated) Immunity Conducted Disturbance: EN61000-4-6 3 V (0,15 to 80 MHz) (level 2)
		Immunity Burst: EN61000-4-4 2 kV Power-line (level 3) 1 kV I/O signal-line (level 3) Immunity Surge: EN61000-4-5 1 kV line to line Power line, output line (relay output) 2 kV line to ground Power line, output line (relay output) 1 kV line to ground Input line
		Immunity Voltage Dip/Interrupting: EN61000-4-11 0.5 cycle, 100% (rated voltage)
Approved stan	dards	UL 61010C-1 CSA C22.2 No.1010.1
Conformed sta	ndards	EN61326, EN61010-1, IEC61010-1 VDE0106 Part 100 (Finger protection), when the terminal cover is mounted.

Note: 1. The indication accuracy of K thermocouples in the -200 to 1300°C range, T and N thermocouples at a temperature of -100°C max., and 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 not specified. The indication accuracy of the R and S thermocouples at a temperature of 200°C max. is ±3°C ±1 digit max.

- Conditions: Ambient temperature: -10°C to 23°C to 55°C, Voltage range: -15% to +10% of rated voltage
- 3. "EU" stands for Engineering Unit and is used as the unit after scaling. For a temperature sensor, the EU is °C or °F.
- 4. When robust tuning (RT) is ON, the differential time is 0.0 to 999.9 (in units of 0.1 s).
- 5. B, R, and S sensors: 0.2°C/ $\Omega$  max. (100  $\Omega$  max.)

### ■ USB-Serial Conversion Cable

Windows 2000/XP
Thermo Mini, CX-Thermo
E5CN/E5CN-U/E5AN/E5EN
Conforms to USB Specification 1.1.
38400 bps
Computer: USB (type A plug) Temperature Controller: Serial
Bus power (Supplied from USB host controller.)
5 VDC
70 mA
0 to 55°C (with no condensation or icing)
10% to 80%
–20 to 60°C (with no condensation or icing)
10% to 80%
2,000 m max.
Approx. 100 g

**Note:** A driver must be installed in the personal computer. Refer to installation information in the operation manual for the Conversion Cable.

### Communications Specifications

	_
Transmission line connection method	RS-485 multipoint RS-232C
Communications	RS-485 (two-wire, half duplex), RS-232C
Synchronization method	Start-stop synchronization
Baud rate	1200, 2400, 4800, 9600, 19200, or 38400 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) Frame check sequence (FCS) with SYSWAY Block check character (BCC) with CompoWay/F or CRC-16 Modbus
Flow control	None
Interface	RS-485, RS-232C
Retry function	None
Communications buffer	40 bytes
Communications response wait time	0 to 99 ms Default: 20 ms

Note: The baud rate, data bit length, stop bit length, and vertical parity can be individually set using the Communications Setting Level.

### Current Transformer (Sold Separately) Ratings

Dielectric strength	1,000 VAC for 1 min
Vibration resistance	50 Hz, 98 m/s²
Weight	E54-CT1: Approx. 11.5 g, E54-CT3: Approx. 50 g
Accessories (E54-CT3 only)	Armatures (2) Plugs (2)

### Heater Burnout Alarms and SSR Failure Detection Alarms

Maximum heater current	50 A AC
Input current indication accuracy	±5% FS ±1 digit max.
Heater burnout alarm setting range	0.1 to 49.9 A (in units of 0.1 A) 0.0 A: Heater burnout/SSR failure alarm output turned OFF. 50.0 A: Heater burnout/SSR failure alarm output turned ON. Minimum detection ON time: 190 ms (See note 1.)
SSR failure detection alarm setting range	0.1 to 49.9 A (in units of 0.1 A) 0.0 A: Heater burnout/SSR failure alarm output turned ON. 50.0 A: Heater burnout/SSR failure alarm output turned OFF. Minimum detection OFF time: 190 ms (See note 2.)

- Note: 1. If the ON time of control output 1 is less than 190 ms, heater burnout detection and the heater current will not be measured.
  - If the OFF time of control output 1 is less than 190 ms, SSR failure detection and the heater current will not be measured.

### Electrical Life Expectancy Curve for Relays (Reference Values)



Note: Do not connect a DC load to a Controller with a Long-life Relay Output.

### E54-CT1 Thru-current (Io) vs. Output Voltage (Eo) (Reference Values)

Maximum continuous heater current: 50 A (50/60 Hz) Number of windings: 400±2 Winding resistance: 18±2  $\Omega$ 



### E54-CT3 Thru-current (Io) vs. Output Voltage (Eo) (Reference Values)

Maximum continuous heater current: 120 A (50/60 Hz) (Maximum continuous heater current for an OMRON Temperature Controller is 50 A.)

Number of windings:  $400\pm 2$ Winding resistance:  $8\pm 0.8 \Omega$ 



# **External Connections**

- The voltage output for control output 1 is not electrically insulated from the internal circuits. When using a grounding thermocouple, do not connect any of the control output terminals to ground. If the control output terminals are connected to ground, errors will occur in the measured temperature values as a result of leakage current.
- The voltage output for control output 2 is electrically insulated from the internal circuits with standard insulation.
- An R on the end of the lot number indicates that reinforced insulation is provided between the input power supply, relay outputs, and other terminals.

#### E5AN



# Nomenclature

E5AN



# **Dimensions**

E5AN





Note: To remove the Controller from the case, loosen the screw at the bottom of the front panel with a screwdriver while pressing down on the hook at the top of the front panel.

Group mounting does not allow waterproofin
Recommended panel thickness is 1 to 8 mm.
Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers.)
To mount the Controller so that it is waterproof, insert the waterproof packing onto the Controller.
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

### **USB-Serial Conversion Cable (Sold Separately)**

E58-CIFQ1





### **Terminal Cover (Sold Separately)**



### Current Transformers (Sold Separately)





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

Cat. No. H136-E2-01

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

# **Modular Temperature Controller**

#### **New DIN-rail Mounting Temperature** Controller

- Two channels of temperature control available despite width of only 22.5 mm.
- The Temperature Controller itself can be replaced without changing terminal wiring.
- . Use in combination with a compact Setting Display Unit to reduce communications programming requirements.
- A wide variety of operation indicators (single-color LEDs) enable easy operation monitoring.
- · Power supply and communications wiring not required between Units when mounted side-by-side.



# **Model Number Structure**

# Model Number Legend

#### E5ZN- 2 🗌 🗆 🗆 🗆 -FLK 6 7

#### 1 2 345

- 1. Control points 2: Two points
- 2. Control output
  - Q: Voltage (for driving SSR)
  - T: Transistor
  - C: Current
- 3. Auxiliary output
  - P: Transistor (sourcing)
  - Transistor (sinking) N:
- 4. Option
  - H: Heater burnout alarm
- F: Transfer output
- 5. Communications 03: RS-485
- 6. Input type
  - TC: Thermocouple
  - P: Platinum resistance thermometer
- 7. CompoWay/F serial communications -FLK: CompoWay/F serial communications

# **Ordering Information**

### ■ List of Models

Name	Power supply	No. of control points	Control output	Auxiliary output	Fund	tions	Communica- tions func- tions	Input type (See note 5.)	Model
				Transistor				Thermocouple	E5ZN-2QNH03TC-FLK
			Voltage	output: 2 pts (sinking)	g)			Platinum resistance thermometer	E5ZN-2QNH03P-FLK
			(for SSRs)	Transistor				Thermocouple	E5ZN-2QPH03TC-FLK
Temperature				output: 2 pts (sourcing)	Heater			Platinum resistance thermometer	E5ZN-2QPH03P-FLK
			Transistor	(See note 3.)	.) Heating or		Thermocouple	E5ZN-2TNH03TC-FLK	
			( Transistor	output: 2 pts (sinking)	ut: 2 pts ing) sistor ut: 2 pts rcing)	heat/cool control is selectable (See note 4.) Event input: 1 point per Unit	RS-485	Platinum resistance thermometer	E5ZN-2TNH03P-FLK
note 1.)	24 VDC	Analog output (current output) (See note 2.)	output	Transistor				Thermocouple	E5ZN-2TPH03TC-FLK
			(sourcing)	output: 2 pts (sourcing)				Platinum resistance thermometer	E5ZN-2TPH03P-FLK
			Analog	nalog Transistor	Transfer out-			Thermocouple	E5ZN-2CNF03TC-FLK
			(sinking)	voltage out- put) (See note 2.)			Platinum resistance thermometer	E5ZN-2CNF03P-FLK	
			Transistor	Transistor	,,			Thermocouple	E5ZN-2CPF03TC-FLK
				(sourcing)				Platinum resistance thermometer	E5ZN-2CPF03P-FLK

Note: 1. Terminal Units are required for wiring. Purchase separately.

2. When connecting the load of the controlled system, heat control output or cool control output can be allocated to the control output or auxiliary output. When connecting a recording device or Digital Panel Meter, transfer output can be allocated to control output or auxiliary output 3 or 4 of analog output models.

3. When using the heater burnout alarm, purchase a Current Transformer (CT) separately.

- 4. When using heating and cooling control functionality, the auxiliary output will be either heating control output or cooling control output.
- 5. Analog input and infrared temperature sensors (ES1A-A) can also be used with thermocouple models.

Name	No. of terminals	Functions	Model
Terminal Unit (Includes bus system with- out backplane.)	24	Equipped with communications terminals for power supply, commu- nications, and setting devices.	E5ZN-SCT24S-500
	18 (See note 1.)	Not equipped with communications terminals for power supply, communications, and setting devices.	E5ZN-SCT18S-500

Note: 1. When using 2 or more E5ZNs mounted side-by-side, use the E5ZN-SCT18S-500 for the second and subsequent Units. When using E5ZNs separately, be sure to use the E5ZN-SCT24S-500.

2. Two End Plates are provided with E5ZN-SCT24S-500 Terminal Units. When mounting to a DIN-rail, be sure to mount End Plates on both sides.

### <u>Current Transformer (CT) (Order</u> Separately)

Model	E54-CT1	E54-CT3
Diameter	5.8 dia.	12.0 dia.

### Terminal Cover

Model	E53-COV12	E53-COV13
Туре	For SCT24S-500 models	For SCT18S-500 models

Note: The Terminal Cover comes with the Terminal Unit and does not have to be purchased separately.

### Sockets (for Setting Display Unit - Order Separately)

Model	P2CF-11	P2CF-11-E	P3GA-11	Y92A-48G
Туре	Front-connecting socket	Front-connecting socket (with finger protection)	Back-connecting socket	Terminal cover for finger protection

Note: Refer to the following manual for precautionary information and other information necessary to use the E5ZN: E5ZN Temperature Controller Operation Manual (Cat. No. H113).

### Setting Display Unit (Order Separately)

Name	Power supply	Model
Setting Display Unit (See note.)	24 VDC	E5ZN-SDL

Note: Purchase sockets for wiring (shown on page A-66) separately.

# **Specifications**

### ■ Ratings

Power supply voltage	24 VDC				
Allowable voltage range	85% to 110% of the rated power supply voltage				
Power consumption	Approx. 3 W				
Sensor input	Thermocouple: K, J, T, E, L, U, N, R, S, B Infrared temperature sensor (ES1A series): 10 to 70×C, 60 to 120×C, 115 to 165×C, 160 to 260×C (See note 1.) Voltage input: 0 to 50 mV				
	Platinum resistance thermometer: Pt100, JPt100				
	Voltage output (for driving SSR)	Output voltage: 12 VDC ±15% (PNP); Maximum load current: 21 mA; Equipped with short-circuit protection circuit			
Control output	Transistor output	Maximum operational voltage: 30 VDC; Maximum load current: 100 mA; Residual voltage: 1.5 V max.; Leakage current: 0.4 mA max.			
	Current output	Current output range: 4 to 20/0 to 20 mA DC; Load: $350 \Omega$ max. (See note 2.)			
	Transistor output	Sourcing	Maximum operating voltage: 30 VDC; Maximum load current: 50 mA; Desidue whereas to 50 max;		
Auxiliary output		Sinking	Leakage current: 0.4 mA max.		
	Linear voltage output		Voltage output range: 1 to 5/0 to 5 VDC; Load: 10 kΩ min.		
Event input	Contact output	act output ON: 1 kΩ max., OFF: 100 kΩ min. Discharge current: Approx. 7 mA			
Event input	Non-contact output	on-contact output ON: Residual voltage: 1.5 V max., OFF: Leakage current: 0.1 mA max. Discharge current: Approx. 7 mA			
Number of input and control points	Input points: 2, Control points:	2			
Setting method	Via communications or using the Setting Display Unit (E5ZN-SDL)				
Control method	2-PID or ON/OFF control				
Other functions	Heater burnout detection function, transfer output function Multi-SP and RUN/STOP switching using event input				
Ambient operating temperature	–10 to 55×C (with no icing or condensation) For 3 years of assured use: –10 to 50×C				
Ambient operating humidity	25% to 85%				
Storage temperature	−25 to 65×C (with no icing or condensation)				

Note: 1. ES1A models with a temperature range of 160×C to 260×C have been discontinued.

2. OMRON G32A-EA Cycle Controller Unit (load impedance 352  $\Omega$ ) can be used.

### Input Range

### Platinum Resistance Thermometer Models and Thermocouple Models

	1	Platinum resistance thermometer models				Thermocouple models																				
Input type	/pe Platinum resistance thermometer				Thermocouple Infrared tempe sensor (ES											mpera (ES1A	iture A)	Analog input								
Name		Pt1	00		JPt	100		K		,	J		т	E	L		U	N	R	s	в	10 to 70°C	60 to 120°C	115 to 165°C	160 to 260°C	0 to 50 mV
1800 1700 1500 1400 1400 (C) 1300 (C) 100 100 100 100 100 100 100 100 100 10		500	0.0 100		500.0	100.0		500		350	400.0 20.0	400	400.0	600	850	400	400.0			1700			120 0	165 0	260	-1999 to 9999 or -199.9 to 999.9 by scaling
Setting number	0	1	2		3	4	0	1		2	3	4	17	5	6	7	18	8	9	10	11	12	13	14	15	16

The applicable standards for the input types are as follows:

• K, J, T, E, N, R, S, B: JIS C1602-1995, IEC584-1

• L: Fe-CuNi, DIN 43710-1985

U: Cu-CuNi, DIN 43710-1985
 JPt100: JIS C 1604-1989, JIS C 1606-1989
 Pt100: JIS C 1604-1997 IEC 751

Shaded parts indicate the settings at the time of purchase.

Note: ES1A models with a temperature range of 160×C to 260×C have been discontinued.

### ■ Characteristics

	Thermocouple:	(Indicated value -	$\pm 0.5\%$ or $\pm 1\times C$ whichever is greater) $\pm 1.c$	ligit max (See note 1.)					
	Platinum resist	ance thermometer	r: (Indicated value $\pm 0.5\%$ or $\pm 1\times C$ , which	ever is greater) +1 digit max. (See					
Indication	note 1.)								
accuracy	Analog input: ±0.5% or ±1 digit max.								
	CT input: ±5%	FS ±1 digit max.							
Transfer output	Accuracy: ±0.59	% FS (See note 2	!.)						
Hystorasis	0.1 to 999.9 EU (in units of 0.1 EU)								
	(See note 3.)								
Proportional band (P)	0.1 to 999.9 EU (in units of 0.1 EU)								
	(See note 3.)								
Integral time (I)	0 to 3,999 s (in units of 1 s)								
Derivative 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	) (Position of decir	mal point depends on input type.)						
Sampling period	500 ms								
Insulation resistance	20 MW min. (at 500 VDC)								
Dielectric strength	600 VAC for 1 minute at 50 or 60 Hz (between unlike terminals of charged parts)								
Vibration resistance	10 to 55 Hz, 10 m/s <sup>2</sup> for 2 hrs each in X, Y, and Z directions								
Shock resistance	150 m/s <sup>2</sup> max., 3 times each in $\pm$ X, $\pm$ Y, and $\pm$ Z directions								
Enclosure rating	Temperature Co Terminal Unit: I	ontroller: IP00 P00							
Memory protection	EEPROM (non-	-volatile memory)	(Number of write operations: 100,000)						
	Temperature Controller: Approx. 90 g								
Weight	Terminal Unit (18): Approx. 80 g								
		-+). Applox. 100 g	F200503						
	CSA File No.:		203889-1140084						
	CF FMS:	FSD	EN61326, EN61000-4-2 (4 kV/contact, 8	kV/air)					
		REM field	EN61326, EN61000-4-3 (10 V/m)	( ( v) all )					
Approved standards		Fast transient	EN61326, EN61000-4-4 (2 kV/DC power	r. 1 kV/I/O)					
(See note 4.)		Surge immunity	EN61326, EN61000-4-5 (line to ground:	2 kV/DC power					
		5 ,		1 kV/l/O					
			line to line:	1 kV/DC power)					
		Conducted RF	EN61326, EN61000-4-6 (10 V)	. ,					
	EMI:	Radiated	EN61326 Class A						

Note: 1. The indication accuracy for T and N thermocouples at -100×C, and for U and L thermocouples is ±2×C ±1 digit max. There is no specification for the indication accuracy for the B thermocouple used at 400×C max. The indication accuracy for R and S thermocouples at 200×C max. is ±3×C ±1 digit max.

2. The transfer output accuracy for 0 to 4 mA when 0 to 20 mA DC is selected is  $\pm 0.5\%$  FS +0.7 mA. The transfer output accuracy for 0 to 1 V when 0 to 5 VDC is selected is  $\pm 0.5\%$  FS +0.175 V.

3. "EU" stands for "Engineering Unit."

4. In order to satisfy the EN61326 Class A standard for conducted emissions, install a noise filter (Densei-Lambda MXB-1206-33 or equivalent) in a DC power line as close to the E5ZN as possible.

### Communications (Host Communications)

Transmission line connection method	RS-485 multipoint						
Communications method	RS-485 (2-wire, half-duplex)						
Synchronization method	Start-stop synchronization						
Baud rate	4,800, 9,600, 19,200, or 38,400 bps						
Transmission code	ASCII						
Data bit length (See note.)	7 or 8 bits						
Stop bit length (See note.)	1 or 2 bits						
Error dotaction	Vertical parity (none, even, odd)						
	BCC (block check character)						
Flow control	None						
Interface	RS-485						
Retry function	None						
Number of Units that can be connected in parallel	16 Units max. (32 channels)						

**Note:** The baud rate, data bit length, stop bit length, and vertical parity can all be set independently as host communications settings.

### Setting Display Unit (Order Separately) Ratings and Characteristics

Power supply voltage	
Fower supply voltage	
Allowable voltage	85% to 110% of the rated power supply
range	voltage
Power consumption	Approx. 1 W
Display method	7-segment digital display and single-color display
Ambient energing	-10 to 55×C (with no icing or condensa-
temperature	tion)
lemperature	For 3 years of assured use: -10 to 50×C
Ambient operating hu- midity	25% to 85%
Storage temperature	-25 to 65×C (with no icing or condensa- tion)
Communications method	RS-485 (half-duplex)
Communications for- mat	Fixed
Insulation resistance	20 MW min. (at 500 VDC)
Dielectric strength	1,500 VAC for 1 minute at 50 or 60 Hz (be- tween unlike terminals of charged parts)
Vibration resistance	10 to 55 Hz, 20 m/s <sup>2</sup> for 2 hrs each in X, Y, and Z directions
Shock resistance	300 m/s <sup>2</sup> max., 3 times each in $\pm X$ , $\pm Y$ , and $\pm Z$ directions
Enclosure ratings	Front panel: IP50 Rear case: IP20 Terminal case: IP00
Memory protection	EEPROM (non-volatile memory) (Number of writes: 100,000)
Weight	Approx. 100 g Mounting bracket: Approx. 10 g

## Current Transformer (CT) Ratings (Order Separately)

Dielectric strength	1,000 VAC (1 minute)					
Vibration resistance	50 Hz, 98 m/s²					
Weight	E54-CT1: Approx. 11.5 g E54-CT3: Approx. 50 g					
Accessories (E54-CT3 only)	Armature (2) Plug (2)					

### Heater Burnout Alarm Characteristics

Maximum heater current	Single-phase, 50 A AC (See note 1.)					
Input current readout accuracy	±5% FS ±1 digit max.					
Heater burnout alarm setting range	0.0 to 50.0 A (in units of 0.1 A) (See note 2.)					
Minimum detection ON time	190 ms (See note 3.)					

Note: 1. Use the K2CU-F A- GS (with GATE input terminal) for burnout detection of 3-phase heaters.

- 2. If the heater burnout alarm setting is set to 0.0 A, the alarm is always OFF, and if it is set to 50.0 A the alarm is always ON.
- **3.** If the ON time for control output is less than 190 ms, heater burnout detection and heater current measurement will not be performed.

### DUBU

# Nomenclature

#### E5ZN-2



#### E5ZN-SDL



# **Dimensions**

Note: All units are in millimeters unless otherwise indicated.

#### E5ZN-2 03 -FLK Connected to E5ZN-SCT24S-500





#### E5ZN-2 03 -FLK Connected to E5ZN-SCT18S-500





Note: Refer to the following manual for precautionary information and other information necessary to use the E5ZN: E5ZN Modular Temperature Controller User's Manual (Cat. No. H113).

**Spacer** 

PFP-S

### **End Plate**

PFP-M



Note: End Plates are provided with the E5ZN-SCT24-500. Be sure to mount End Plates at both ends of Unit blocks.

### **Current Transformer (Order Separately)**



### Mounting DIN-rail (for DIN-rail Mounting - Order Separately)

**PFP-100N** PFP-50N



\* Indicates dimensions for the PFP-50N.






### Setting Display Unit E5ZN-SDL



# Installation

# ■ Connection Diagrams

- Voltage output (control output) is not electrically isolated from internal circuitry. Therefore, when using grounded thermocouples, do not ground control output terminals. (Doing so may result in temperature measurement errors due to unwanted current paths.)
- There is basic insulation between the power supply inputs and outputs for this product. If reinforced insulation is required, connect the input and output terminals to equipment without any exposed charge-carrying parts, or to equipment with basic insulation sufficient for the maximum operating voltage of the power supply and the inputs and outputs.

### Using with the E5ZN-SCT24S-500



Wiring for terminals 1 to 18 is the same as for the E5ZN-SCT18-500. See below.

\*Power supply: recommended power supply; eg. OMRON S8VS

### Using with the E5ZN-SCT18S-500



2

1

11

0

4

side. 2. Do not connect anything to terminals 1, 2, 5, and 6.

internally at the E5ZN-SDL

Note: Purchase either a P2CF-11 or a P3GA-11 Socket separately. (Refer to page A-72.)

Do not use.

# Operation





### Examples of Functions Using as a Temperature Input Signal Converter

#### Transfer Output Types

- The ten types of data shown below can be allocated for transfer output using the control output 1 allocation, control output 2 allocation, auxiliary output 3 allocation, and auxiliary output 4 allocation (initial setting level).
- Transfer output is supported by analog output models only.

ch1	ch2
Transfer output for ch1 set point	Transfer output for ch2 set point
Transfer output for ch1 ramp set point	Transfer output for ch2 ramp set point
Transfer output for ch1 process value	Transfer output for ch2 process value
Transfer output for ch1 heating control MV	Transfer output for ch2 heating control MV
Transfer output for ch1 cooling control MV	Transfer output for ch2 cooling control MV

Note: Control outputs 1 and 2 use current output and auxiliary outputs 3 and 4 use linear voltage output.

### **Transfer Output Scaling**

- The range set by the transfer output upper limit and transfer output lower limit (initial setting level) can be scaled to the output range for the transfer output (4 to 20 mA DC or 0 to 20 mA DC for control outputs 1 and 2, and to 1 to 5 VDC or 0 to 5 VDC for auxiliary outputs 3 and 4).
- The scale can be expanded by setting a small range between the transfer output upper and lower limits. Reverse scaling can be performed by setting the transfer output upper limit to a value smaller than the transfer output lower limit. The following figure shows a scaling example where the heating control MV transfer output is scaled to 1 to 5 VDC.

#### Example: Scaling to 1 to 5 VDC



### Reading Temperatures for Multiple E5ZN Units

With conventional models, if the present temperature is read from multiple Temperature Controllers using host communications, there are time differences in the process temperatures read from each Temperature Controller, making it difficult to obtain concurrent data.

With the E5ZN, the PV hold function can be used to ensure that the data is concurrent to within 500 ms.

### **PV Hold**

The PV hold function temporarily stores the present temperature for that moment as the PV hold value, when the "PV hold" operation command sent by host communications is received. (See fig. 1.)

#### Example 2: Displaying the ch2 Process Values on an External Meter Using Transfer Output

 Temperature Controller:
 E5ZN-2C□F03P-FLK
 (current output, output, platinum resistance thermometer input)

 Meter:
 K3MA-J 24 VAC/VDC (Process Meter)

#### **Temperature Controller Settings:**

Sensor input type (initial setting level): 2 (platinum resistance thermometer, 0.0°C to 100.0°C) Control output allocation 2 (initial setting level): 17 (process value

transfer output for ch2) OUT2 transfer output upper limit (initial setting level): 100.0 (°C) OUT2 transfer output lower limit (initial setting level): 0 (°C) Current output type (initial setting level): 0 (4 to 20 mA DC)

### Meter Setting Example:

Inputs for 4 to 20 mA DC are scaled to 0.0 to 100.0°C. Input type (initial setting level:  $i_{D}-b$ ): 4 to 20 mA DC (4-20) Scaling input value 1 (initial setting level:  $i_{D}P$ . I): 4 mA (4.00) Scaling display value 1 (initial setting level: dSP. I): 0 (00000) Scaling input value 2 (initial setting level: dSP. I): 0 (00000) Scaling display value 2 (initial setting level: dSP. I): 0 (00000) Scaling display value 2 (initial setting level: dSP. I): 100 (00000) Decimal point (initial setting level: dSP. I): 00 (00000)





- Note: 1. PV hold values are overwritten every time the "PV hold" operation command is executed. Once the PV hold values have been read for channels that require simultaneous reading of present temperatures, execute the next "PV hold" operation command.
  - 2. The "PV hold" operation command cannot be executed and the "PV hold value" cannot be read from the E5ZN-SDL Setting Display Unit.
  - 3. When the power is turned OFF, the PV hold values change to 0.

# General Precautions

The user must operate the product according to the performance specifications described in the operation manual.

Before using the product under conditions that are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

# ■ Safety Precautions

### **Definition of Precautionary Information**

### 

The above symbol indicates a situation that may result in injury or property damage.

### Warnings

#### 

Do not allow metal fragments or lead wire scraps to fall inside this product.

These may cause electric shock, fire, or malfunction.

### 

Do not use the product in locations subject to flammable or explosive gases. Doing so may result in explosion.

### — 🕂 WARNING-

Do not touch any of the terminals while the power is ON. Doing so may result in electric shock.

### 

Provide at least one power-interruption switch to ensure that the power is OFF before wiring. Not doing so may result in electric shock.

### 

To maintain safety in the event of a product malfunction, always take appropriate safety measures, such as installing an alarm on a separate line to prevent excessive temperature rises. If a malfunction prevents proper control, a major accident may result.

### 

Do not attempt to disassemble, repair, or modify the product. Any attempt to do so may result in malfunction, fire, or electric shock.

### — 🕂 WARNING-

Tighten screws to the specified torques given below. Loose screws may result in burning or malfunction. E5ZN-SCT $\Box$ S-500: 0.40 to 0.56 N·m E5ZN-SDL: 0.74 to 0.90 N·m

### 

Set all settings according to the control target of the product. If the settings are not appropriate for the control target, the product may operate in an unexpected manner, resulting in damage to the product or accidents.

# Application and Operating Environment Precautions

Observe the following points to ensure safe operation.

- 1. Use and store the product within the specified temperature and humidity ranges. Cool the product (e.g., using fans) where necessary.
- 2. Do not touch the electronic components or pattern of the PCB. Hold the product by the case.
- **3.** To ensure proper heat dissipation, leave a space around the product. Do not block the product's ventilating holes.
- **4.** Use at the rated power supply voltage with the rated load.
- 5. Be sure to connect terminals with the correct polarity.
- 6. Perform wiring using crimp terminals of the specified size. (E5ZN-SCT□S-500: M3.0, width 5.8 mm max.; E5ZN-SDL: M3.5, width 7.2 max.)

7. Be sure to use wires satisfying the following specifications for connection using bare wires.
 Power supply terminals: AWG 22 to 14
 Other terminals: AWG 28 to 16
 (Length of exposed part: 6 to 8 mm)

- 8. Do not connect anything to unused terminals.
- **9.** Ensure that the rated voltage is reached within 2 seconds of turning power ON.
- 10.Allow 30 seconds' warm-up time.
- **11.**Install the product as far away as possible from devices that generate strong, high-frequency noise and devices that generate surges.
- **12.**Keep wiring separate from high-voltage power lines or power lines carrying large currents. Do not wire in parallel with or together with power lines.
- **13.**Install switches or circuit-breakers so that the user can turn the power OFF immediately, and indicate these accordingly.
- **14.**Do not use the product in the following locations:
  - Locations subject to dust or corrosive gases (in particular, sulfide gas and ammonia gas)
  - · Locations subject to freezing or condensation
  - · Locations exposed to direct sunlight
  - Locations subject to vibrations or shocks
  - · Locations subject to exposure to water or oil
  - Locations subject to heat radiated directly from heating equipment
  - Locations subject to intense temperature changes
- **15.**When the Terminal Unit is separated from the Temperature Controller, under no circumstances touch the electrical components or apply shock to the Temperature Controller.
- 16.Do not use solvents to clean the product. Use commercial alcohol.
- 17.After wiring is completed remove the dust-protection label to allow proper heat dissipation.
- **18.**When mounting the Temperature Controller to the Terminal Unit, make sure that the hook on the side of the Temperature Controller facing the Terminal Unit is inserted properly.
- 19.Install the DIN-rail vertically.

### Correct Use

### Service Life

Use within the following temperature and humidity ranges:

- Temperature: -10 to 55×C (with no icing or condensation)
- Humidity: 25% to 85%



If the product is installed inside a control panel, the temperature around the product (and not the temperature around the control panel) must be kept below  $55 \times C$ .

With electronic devices like the E5ZN, the service life will depend not only on the number of switching operations performed by the relay but also on the service life of the internal electronic components. The service life of these components depends on the ambient temperature; it will be shorter if the ambient temperature is high, and longer if the ambient temperature is low. For this reason, the service life of the product can be lengthened by keeping the inside of the E5ZN at a low temperature.

If several Units are mounted side-by-side or are arranged vertically, the heat generated may cause the internal temperature of the Units to rise, reducing service life. To prevent this, take steps to ensure that the Units are cooled, such as installing fans.

Ensure, however, that the terminals are not also cooled, otherwise correct temperature measurement will not be possible.

#### **Measurement Accuracy**

When extending the lead wires for thermocouples, use a compensating conductor appropriate for the type of thermocouple used. When extending the lead wires for platinum resistance thermome-

ters, use lead wires with a low resistance, and make the resistance in the 3 lead wires equal.

Mount the E5ZN horizontally.

If significant errors occur, check that input compensation has been set correctly.

### Waterproofing

The enclosure ratings are given below. Parts for which the enclosure rating is not clearly indicated, and parts with IP $\square$ 0 ratings (where  $\square$  is not 0) do not have waterproof specifications.

Temperature Controller: IP00

Terminal Unit: IP00

### **Mounting and Dismounting**

• To mount using a mounting track, first hook part A (see below) onto the track and then push down on part B.



• To dismount, insert a flat-bladed screwdriver into part C, pull the hook down, and then lift the bottom part of the E5ZN upwards.



 Mount the E5ZN at least 30 mm away from other devices to ensure easy mounting and dismounting.

Note: Refer to the following manual for precautionary information and other information necessary to use the E5ZN: E5ZN Temperature Controller Operation Manual (Cat. No. H113).

### ■ WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DIS-CLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

# ■ LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS, OR COMMER-CIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLI-GENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

# **Application Considerations**

# ■ SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products.

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

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

Cat. No. H116-E2-02A

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

l emperatur controll<u>ers</u>

# DeviceNet Communications Unit E5ZN-DRT

# Connect the E5ZN Modular Temperature Controller to DeviceNet

- The I/O link function allows setting and monitoring (e.g., of present values) for the E5ZN Modular Temperature Controller to be performed without communications programming.
- Up to 16 E5ZN Modular Temperature Controllers can be connected to one Unit.
- All the parameters for the E5ZN can be uploaded or downloaded in one operation using DeviceNet Configurator.



**GRU**US CE

# **Ordering Information**

# ■ List of Models

Name	External input power supply voltage	Applicable Temperature Controller	Model
DeviceNet Communications Unit	24 VDC	E5ZN	E5ZN-DRT

Note: A DeviceNet Communications Unit and Terminal Unit are required to connect to DeviceNet. (For details on the Terminal Unit, refer to page A-84 or to the E5ZN Catalog (H116-E2-02).) Two End Plates are provided with E5ZN-SCT24S Terminal Units. When mounting to a DIN-rail, be sure to mount End Plates on both sides.

# Specifications

# ■ Ratings

Power supply voltage	DeviceNet	24 VDC (for internal circuits)			
	External input power supply	24 VDC (for RS-485 communications circuits and Temperature Controllers)			
Allowable voltage	DeviceNet	11 to 25 VDC			
range	External input power supply	20.4 to 26.4 VDC			
Power consumption	DeviceNet	Approx. 1.1 W (for a current of 45 mA at 24 VDC)			
(See note.)	External input power supply	Approx. 0.5 W (for a current of 20 mA at 24 VDC)			
Connectable Temperat	ure Controllers	E5ZN Series			
Maximum number of connectable Temperature Controllers		16			
Ambient operating temperature		-10 to 55°C (with no icing or condensation)			
Ambient operating humidity		25% to 85%			
Ambient storage temp	erature	-25 to 65°C (with no icing or condensation)			

Note: The power consumption for the Temperature Controllers is not included.

# Characteristics

	20 MΩ min. (at 100 VDC)				
500 VAC, 50/60 Hz for 1 min between the DIN-rail and all DeviceNet connector terminals and between the DIN-rail and all terminal socket terminals					
0 to 55 Hz,	10 m/s² for 2 hrs each in $\pm X,\pm Y,$ ar	nd ±Z directions			
150 m/s <sup>2</sup> , 3 times each in $\pm$ X, $\pm$ Y, and $\pm$ Z directions					
100 g max.					
ULus508					
MS:	Electrostatic Discharge (ESD) Radiated Electromagnetic Fields Electrical Fast transients/BURST Surge Transients Conducted Disturbances Radiated Emissions (electric field)	EN61006-2, EN61000-4-2 ( EN61006-2, EN61000-4-3 ( EN61006-2, EN61000-4-4 ( EN61006-2, EN61000-4-5 ( EN61006-2, EN61000-4-6 ( EN50081-2 Class A	4 kV/contact, 8 10 V/m) 2 kV/DC power- line to ground line to line 10 V)	kV/air) line, 1 kV/Signal-line) : 1 kV/DC power-line) : 2 kV/Signal-line : 0.5 kV/DC power-line)	
	0 VAC, 50 terminal s to 55 Hz, 0 m/s <sup>2</sup> , 3 t 0 g max. Lus508 IS:	<ul> <li>0 VAC, 50/60 Hz for 1 min between the DIN-raterminal socket terminals</li> <li>to 55 Hz, 10 m/s<sup>2</sup> for 2 hrs each in ±X, ±Y, ard 0 m/s<sup>2</sup>, 3 times each in ±X, ±Y, and ±Z direction 0 g max.</li> <li>Lus508</li> <li>US: Electrostatic Discharge (ESD) Radiated Electromagnetic Fields Electrical Fast transients/BURST Surge Transients</li> <li>II: Radiated Emissions (electric field)</li> </ul>	<ul> <li>0 VAC, 50/60 Hz for 1 min between the DIN-rail and all DeviceNet connect terminal socket terminals</li> <li>to 55 Hz, 10 m/s<sup>2</sup> for 2 hrs each in ±X, ±Y, and ±Z directions</li> <li>0 m/s<sup>2</sup>, 3 times each in ±X, ±Y, and ±Z directions</li> <li>0 g max.</li> <li>Lus508</li> <li>IS: Electrostatic Discharge (ESD) Radiated Electromagnetic Fields Electrical Fast transients/BURST Surge Transients</li> <li>Conducted Disturbances</li> <li>II: Radiated Emissions (electric field)</li> <li>EN61006-2, EN61000-4-6 (EN61006-2, EN61000-4-6 (EN61006-2, EN61000-4-6 (EN61006-2, EN61000-4-6 (EN61006-2, EN61000-4-6 (EN50081-2 Class A)</li> </ul>	<ul> <li>0 VAC, 50/60 Hz for 1 min between the DIN-rail and all DeviceNet connector terminals and terminal socket terminals</li> <li>10 m/s<sup>2</sup> for 2 hrs each in ±X, ±Y, and ±Z directions</li> <li>10 m/s<sup>2</sup>, 3 times each in ±X, ±Y, and ±Z directions</li> <li>10 m/s<sup>2</sup>, 3 times each in ±X, ±Y, and ±Z directions</li> <li>10 m/s<sup>2</sup>, 3 times each in ±X, ±Y, and ±Z directions</li> <li>10 m/s<sup>2</sup>, 3 times each in ±X, ±Y, and ±Z directions</li> <li>11 met o line</li> <li>12 Conducted Disturbances</li> <li>12 Radiated Emissions (electric field)</li> <li>13 Radiated Emissions (electric field)</li> </ul>	

# ■ Communications (for Temperature Controller Expansion)

Transmission line connection method	RS-485 multipoint
Communications method	RS-485 (2-wire, half-duplex)
Synchronization method	Start-stop synchronization
Baud rate	38,400 bps
Transmission code	ASCII
Data bit length	7 bits
Stop bit length	2 bits
Error detection	Vertical parity (even)
	BCC (block check character)
Flow control	None
Number of Units that can be connected in parallel	16 Units max. (32 channels)

# **Connections**

### Terminal Arrangement

E5ZN-DRT





#### E5ZN-SCT24S



# Nomenclature

#### E5ZN-DRT



# Dimensions

Note: All units are in millimeters unless otherwise indicated.

#### E5ZN-DRT





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# **E5ZN Modular Temperature Controllers**

### ■ List of Models

Name	Power supply	No. of control points	Control output	Auxiliary output	Functions		Communi- cations functions	Input type (See note 5.)	Model																				
				Transistor				Thermocouple	E5ZN-2QNH03TC-FLK																				
			Voltage	output: 2 pts (sinking)				Platinum resistance thermometer	E5ZN-2QNH03P-FLK																				
			(for SSRs)	Transistor				Thermocouple	E5ZN-2QPH03TC-FLK																				
				output: 2 pts (sourcing)	Heater burnout	Heater burnout	Heater burnout	Heater burnout	Heater burnout	Heater burnout	Heater burnout	Heater burnout	Heater burnout	Heater burnout	Heater burnout	Heater burnout	Heater burnout	Heater burnout	Heater burnout	Heater burnout	Heater burnout	Heater burnout	Heater burnout	Heater burnout	Harden an	11. starter and		Platinum resistance thermometer	E5ZN-2QPH03P-FLK
				Transistor	alarm (See	heat/cool		Thermocouple	E5ZN-2TNH03TC-FLK																				
Temperature	04.VDC	0	Transistor	(sinking)	control is selectable (See note	note 3.)	control is selectable (See note	control is selectable (See note	DC 495	Platinum resistance thermometer	E5ZN-2TNH03P-FLK																		
(See note 1.)	24 VDC	2	output	Transistor		4.)	NO-400	Thermocouple	E5ZN-2TPH03TC-FLK																				
,				output: 2 pts (sourcing)		Event input: 1 point per Unit		Platinum resistance thermometer	E5ZN-2TPH03P-FLK																				
			Analog	Transistor	Transfer out-	Onit		Thermocouple	E5ZN-2CNF03TC-FLK																				
			output (current output)	output: 2 pts (sinking)	output: 2 pts (sinking)	output: 2 pts (sinking)	output: 2 pts (sinking)	put (linear voltage out- put)	sinking) voltage out- put)					t-	out (linear roltage out- out)	put (linear voltage out- put)	ar out-		Platinum resistance thermometer	E5ZN-2CNF03P-FLK									
			2.)	Transistor	2.)			Thermocouple	E5ZN-2CPF03TC-FLK																				
				output: 2 pts (sourcing)				Platinum resistance thermometer	E5ZN-2CPF03P-FLK																				

Note: 1. Terminal Units are required for wiring. Purchase separately.

2. When connecting the load of the controlled system, heat control output or cool control output can be allocated to the control output or auxiliary output. When connecting a recording device or Digital Panel Meter, transfer output can be allocated to control output or auxiliary output 3 or 4 of analog output models.

- 3. When using the heater burnout alarm, purchase a Current Transformer (CT) separately.
- 4. When using heating and cooling control functionality, the auxiliary output will be either heating control output or cooling control output.
- 5. Analog input and infrared temperature sensors (ES1A-A) can also be used with thermocouple models.

Name	No. of terminals	Functions	Model
Terminal Unit	24	Equipped with communications terminals for power supply, communications, and setting devices.	E5ZN-SCT24S-500
without backplane.)	18 (See note 1.)	Not equipped with communications terminals for power supply, communications, and setting devices.	E5ZN-SCT18S-500

Note: 1. When using 2 or more E5ZNs mounted side-by-side, use the E5ZN-SCT18S-500 for the second and subsequent Units. When using E5ZNs separately, be sure to use the E5ZN-SCT24S-500.

2. Two End Plates are provided with E5ZN-SCT24S-500 Terminal Units. When mounting to a DIN-rail, be sure to mount End Plates on both sides.

### Setting Display Unit (Order Separately)

Name	Power supply	Model
Setting Display Unit (See note.)	24 VDC	E5ZN-SDL

Note: Purchase sockets for wiring separately.

### ■ WARRANTY

Omron's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WAR-RANTIES, EXPRESS OR IMPLIED.

# ■ LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDI-RECT OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY.

In no event shall responsibility of Omron for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WAR-RANTY, REPAIR OR OTHER CLAIMS REGARDING THE PROD-UCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

# **Application Considerations**

# SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the product in the customer's application or use of the product.

Take all necessary steps to determine the suitability of the product for the systems, machines and equipment with which it will be used.

Know and observe all prohibitions of use applicable to this product.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

# Precautions

# Definition of Precautionary Information

#### —<u>∕</u> WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

#### -/ Caution -

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

### 

Provide safety measures (such as emergency stop circuits, interlock circuits, and limit circuits) in external circuits in order to ensure safety in the system if an abnormality occurs due to malfunction of the PC or another external factor affecting the PC operation. Not doing so may result in serious accidents.

#### − A Caution

Tighten screws to the specified torques given below. Loose screws may result in burning or malfunction. Connector screws: 0.25 to 0.3 N  $\cdot$  m; Terminal screws: 0.40 to 0.56 N  $\cdot$  m

Confirm safety at the destination node before transferring a program to another node or changing contents of the I/O memory area. Doing either of these without confirming safety may result in injury.

Execute online edit only after confirming that no adverse effects will be caused by extending the cycle time. Otherwise, the input signals may not be readable.

Do not touch any of the terminals while the power is being supplied. Doing so may result in electric shock.

Do not attempt to take any Unit apart while the power is being supplied. Doing so may result in electric shock.

Do not allow metal fragments or lead wire scraps to fall inside this product. These may cause electric shock, fire, or malfunction.



#### Notice

Observe the following points to ensure safe operation.

- Set the communications distance to within the range specified in the E5ZN-DRT User's Manual (Cat. No. H119).
- Do not place communications cables close to or parallel to highvoltage lines or power lines.
- Use the communications cables specified in the E5ZN-DRT User's Manual (Cat. No. H119).
- Do not attempt to disassemble, repair, or modify the product.
- Do not drop the product or expose it to excessive shocks or vibrations. Doing so may result in malfunctions.
- Always use the power supply voltage within the specified range.
- Do not pull on the cables or bend the cables beyond their natural limit.
- · Confirm that the power is OFF before wiring.
- Be sure to perform wiring for communications lines and power supplies correctly. Be sure to wire to terminals with the correct polarity. Incorrect wiring may result in malfunctions.
- Confirm that the power is OFF before mounting or removing connectors. Mounting or removing connectors with the power ON may result in malfunctions.
- Double-check all wiring and switch settings before turning ON the power supply.

#### Notice

- Do not use the product in the following locations
   Locations exposed to direct sunlight
   Locations subject to intense temperature changes
   Locations subject to freezing or condensation
   Locations subject to dust or corrosive gases (in particular, sulfide
   gas and ammonia gas)
   Locations subject to exposure to water or oil
   Locations subject to vibrations or shocks
   Take appropriate and sufficient countermeasures when installing
- systems in the following locations: Locations subject to static electricity or other forms of noise. Locations subject to strong electromagnetic fields. Locations subject to possible exposure to radioactivity.
  - Locations close to power lines with high voltage or large current.
- Use the product within the specified temperature and humidity ranges.
- Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied in places where the power supply is unstable.
- Do not use solvents to clean the product.
- Confirm that the power is OFF before replacing the product.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

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

Cat. No. H120-E2-01

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

# Digital Controllers

New DeviceNet-compatible models offer high-speed and high-precision as generalpurpose Digital Controllers with an even broader range of application.







E5 R Series

### **Contents**

Digital Controllers	
E5AR	A-91
E5ER	A-105

### ■ E5□R Selection Guide

### Standard type



### DeviceNet type



# Applications



### ■ Features Easily Coordinate Control with PLCs Using Various I/O

#### • Up to 6 Event Inputs

Externally control bank switching (4/8 banks), RUN/STOP, auto/manual, SP mode, communications write enable/disable, and other operations with event inputs.

#### Up to 2 Transfer Outputs

Externally output PVs, SPs, MVs, and ramp SP monitor values for each loop.

#### • Up to 4 Auxiliary Outputs

Externally output warnings for 11 alarm modes and input errors.

#### • RS-485 Serial Communications

Simply share data, such as PVs and SPs, with an OMRON PLC (without requiring special programming). Only settings are required.

#### DeviceNet Communications

Perform high-speed data communications with the PLC without requiring special programming. Unified management of communications from a DeviceNet Configurator is also possible.



### Control Up to 4 Loops with a Single Unit

Models with 1, 2, and 4 analog inputs are available (see note). Various control modes can also be selected in the software settings, including standard control, heating/cooling control, cascade control, position-proportional control, and remote SP control. This allows a single Unit to perform multipoint control (up to 4 loops for the E5AR, and up to 2 loops for the E5ER), cascade control, and proportional control.

Temperature, humidity, and pressure can be controlled simultaneously for up to 4 points from a single Unit, contributing to reduced costs and smaller panels.

Note: Models with 4 analog inputs are 96 x 96 mm (E5AR only).







# Digital Controllers

E5AR Digital Controllers offer high speed, high precision, and multiple I/O and use a 5digit, 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.
- Bar graph to show MV (manipulated variable), valve opening, or deviation.
- Multiloop control, cascade control, and proportional control are possible with a single Controller.
- When using models with communications functions, initial settings can be downloaded and settings can be masked using Support Software (Thermo Tools).
- 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.

# **Model Number Structure**





# Model Number Legend

- E5AR-
- 1 2 3 4 5 6 7 8 9 1. Constant values/Program
- None: Constant values/Prog
- 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

#### 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: Multi-input and 2 event inputs
  - F: Multi-input and FB (Potentiometer input)
  - W: Multi-input and multi-input
- 9. Input 2
  - Blank:None
  - W: Multi-input and multi-input
- 10.Communications Method
- Blank:None
- FLK: RS-485 (CompoWay F/MODBUS)
- DRT: DeviceNet

# ■ Digital Controllers

### **Standard Controllers**

Size	Control type	Control mode	Outputs	Opt	ional fund	ctions	Model
			(control/transfer)	Auxiliary outputs (SUB)	Event inputs	Serial communi- cations	
96×96 mm	Basic control (1 loop)	Single-loop standard control Single-loop heating and cooling control	2 points: Pulse volt- age and Pulse volt- age/current	4 2	2	No	E5AR-Q4B
			2 points: Current and Current				E5AR-C4B
			2 points: Pulse volt- age and Pulse volt- age/current			RS-485	E5AR-Q43B-FLK (See note 2.)
			2 points: Current and Current				E5AR-C43B-FLK (See note 2.)
			2 points: Pulse volt- age and Pulse volt- age/current		6		E5AR-Q43DB-FLK (See note 2.)
			2 points: Current and Current				E5AR-C43DB-FLK (See note 2.)
			4 points: Pulse volt- age and Pulse volt- age/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	2 points: Pulse volt- age and Pulse volt- age/current	4	4	RS-485	E5AR-Q43DW-FLK (See note 2.)
		Single-loop control with remote SP Single-loop proportional control	2 points: Current and Current				E5AR-C43DW-FLK (See note 2.)
		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 volt- age (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 out- put (4 points)	4	4	RS-485	E5AR-CC43DWW- FLK
			4 points: Pulse volt- age (2 points) and Pulse voltage/current (2 points)				E5AR-QQ43DWW- FLK (See note 2.)
	Position-pro- portional con-	Single-loop position-proportional control	Relay output (1 open, 1 close)	4	4	No	E5AR-PR4DF
	trol (1 loop)		Relay output (1 open, 1 close) and 1 current (transfer) output			RS-485	E5AR-PRQ43DF-FLK

Note 1: Specify the power supply specifications when ordering. Model numbers for 100 to 240 VAC are different from those for 24 VAC/VDC.2: These models are for 100 to 240 VAC only.

### **DeviceNet-compatible Controllers**

Size	Control type	Control mode	Outputs	Opt	ional fun	ctions	Model
			(control/transfer)	Auxiliary outputs (SUB)	Event inputs	DeviceNet communi- cations	
96 × 96 mm	Basic control (1 loop)	1 loop for standard control Single-loop heating and cooling control	2 points: Pulse volt- age and Pulse volt- age/current	4	2	Yes	E5AR-Q4B-DRT
			2 points: Current and Current				E5AR-C4B-DRT
			4 points: Pulse volt- age and Pulse volt- age/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 volt- age (2 points) and Pulse voltage/cur- rent (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-pro- portional con-	Single-loop position-proportional con- trol	Relay output (1 open, 1 close)	4	None	Yes	E5AR-PR4F-DRT
	trol (1 loop)		Relay output (1 open, 1 close) and Current (transfer) output (1 point)				E5AR-PRQ4F-DRT

Note: Specify the power supply specifications when ordering. Model numbers for 100 to 240 VAC are different from those for 24 VAC/VDC.

### **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

### Terminal Cover (Sold Separately)

Descriptions	Model
Terminal Cover for E5AR	E53-COV14

# **Specifications**

# Ratings

Item Supply voltage (See note 1.)		100 to 240 VAC, 50/60 Hz	24 VAC, 50/60 Hz; 24 VDC				
Operating voltag	e range	85% to 110% of rated supply voltage					
Power consumpt	tion	22 VA max. (with maximum load)	15 VA/10 W max. (with maximum load)				
Sensor input (Se	e 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 Q for current input approx, 1 MQ for voltage input)					
Control output	Voltage (pulse) output	12 VDC, 40 mA max. with short-circuit protection c	ircuit (E5AR-QQ⊟WW-⊟: 21 mA max.)				
	Current output	0 to 20 mA DC, 4 to 20 mA DC; load: 500 $\Omega$ max. (Resolution: Approx. 54,000 for 0 to 20 mA DC; Ap	(including transfer output) prox. 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>Helay 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 in	put	100 Ω to 2.5 kΩ					
Event input	Contact	Input ON: 1 k $\Omega$ max.; OFF: 100 k $\Omega$ min.					
	No-contact	Input ON: Residual voltage of 1.5 V max.; OFF: Le	akage current of 0.1 mA max.				
		Short-circuit: Approx. 4 mA					
Remote SP input	t	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 usir	g serial communications				
Indication metho	d	7-segment digital display and single-lighting indica	tor				
		Character Height No. 1 display: 12.8 mm; No. 2 display: 7.7 mm; No. 3 display: 7.7 mm					
Other functions		Depends on model.					
Ambient operatir	ng 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 operatin	ng humidity	25% to 85%					
Storage tempera	ture	-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.



# ■ Input Ranges

The E5AR has multi-inputs. The default setting is 2 (K-type thermocouple, -200.0 to 1300.0°C or -300.0 to 2300.0°F).

### Platinum Resistance Thermometer Input

Input		Pt100			
Range	°C	–200.0 to 850.0	-150.00 to 150.00		
	°F	–300.0 to 1500.0	-199.99 to 300.00		
Setting		0	1		
Minimum settir	ng unit (SP and alarm)	0.1	0.01		
Input type setti	ng switch	Set to TC.PT.			

### Thermocouple Input

Input		K	ζ.	J		Т	E	L	U	Ν	R	S	В	W
Range	°C	–200.0 to 1300.0	-20.0 to 500.0	-100.0 to 850.0	-20.0 to 400.0	-200.0 to 400.0	0.0 to 600.0	-100.0 to 850.0	-200.0 to 400.0	-200.0 to 1300.0	0.0 to 1700.0	0.0 to 1700.0	100.0 to 1800.0	0.0 to 2300.0
	°F	–300.0 to 2300.0	0.0 to 900.0	-100.0 to 1500.0	0.0 to 750.0	-300.0 to 700.0	0.0 to 1100.0	-100.0 to 1500.0	-300.0 to 700.0	-300.0 to 2300.0	0.0 to 3000.0	0.0 to 3000.0	300.0 to 3200.0	0.0 to 4100.0
Setting		2	3	4	5	6	7	8	9	10	11	12	13	14
Minimu ting uni and ala	m set- it (SP rm)	0.1												
Input ty setting	pe switch	Set to TC.	PT.	TC.PT † IN1 TYPE + ANALOG										

### Current/Voltage Input

Input	Cui	rrent	Voltage						
	4 to 20 mA	0 to 20 mA	1 to 5 V	0 to 5 V	0 to 10 V				
Range	ange Depending on the scaling settings, one of the following ranges will be displayed.								
	-19999 to 99999								
	-1999.9 to 9999.9								
	-199.99 to 999.99								
	-19.999 to 99.999								
	-1.9999 to 9.9999								
Setting	15	16	17	18	19				
Input type setting switch	Set to ANALOG.	TC.PT INI TYPE ANALOG							

# ■ 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)					
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/s² for 10 min each in X, Y, and Z directions					
Shock resistance	100 m/s², 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	E5AR: Controller only: Approx. 450 g; Mounting bracket: Approx. 60 g; Terminal cover: Approx. 30 g E5ER: Controller only: Approx. 330 g; Mounting bracket: Approx. 60 g; Terminal cover: Approx. 16 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	UL3121-1, CSA C22.2 No. 1010-1 EN61010-1 (IEC61010-1): Pollution degree 2/overvoltage category 2					
EMC	EMI: EN61326 Radiated Interference Electromagnetic Field Strength: EN55011 Group 1 Class A Noise Terminal Voltage: EN55011 Group 1 Class A EMS: EN61326 ESD Immunity: EN61000-4-2: Burst Noise Immunity: EN61000-4-3: Burst Noise Immunity: EN61000-4-4: Surge Immunity: EN61000-4-5: Conducted Disturbance Immunity: EN61000-4-5: Surge Immunity: EN61000-4-5: Power Frequency Magnetic Field Immunity: EN61000-4-1: 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.

# ■ Communications Specifications

### **RS-485 Serial Communications**

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 (CompoWay/F), RTU Remote Terminal Unit (MODBUS)
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) Start-stop synchronization data format
Flow control	None
Interface	RS-485
Retry function	None

# **DeviceNet**

Item		Specifications						
Communications proto	col	Conforms to DeviceNet						
Communications func-	Remote I/O communi-	Master-slave c	onnections (polling, bit-strobe	, COS, or cyclic)				
tions	cations	Conform to DeviceNet specifications.						
	I/O allocations	Can allocate a	ny I/O data from the Configura	itor.				
		<ul> <li>Can allocate a ler variable are</li> </ul>	ny data, such as parameters s a.	specific to the DeviceNe	t and the Digital Control-			
		<ul> <li>Up to 2 blocks</li> </ul>	for the IN Area, up to a total of	f 100 words.				
		<ul> <li>One block for the OUT Area, up to 100 words (first word is always allocated to Our Bits).</li> </ul>						
	Message communica-	<ul> <li>Explicit message</li> </ul>	ge communications					
	tions	<ul> <li>CompoWay/F sage format).</li> </ul>	communications commands c	an be sent (commands	are sent in explicit mes-			
Connection format		Combination of r	multidrop and T-branch conne	ctions (for trunk and dro	p lines)			
Baud rate		DeviceNet: 500, 250, or 125 kbps, or automatic detection of master baud rate						
Communications media	à	Special 5-wire cable (2 signal lines, 2 power lines, and 1 shield line)						
Communications distar	nce	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	Э	DeviceNet power supply: 11 to 25 VDC						
Current consumption		50 mA max. (24 VDC)						
Maximum number of nodes that can be con- nected		64 (includes Configurator when used)						
Maximum number of sl nected	aves that can be con-	63						
Error control		CRC error detec	tion					
Power supply		Power supplied from DeviceNet communications connector.						

# **Wiring Terminals**

# E5AR Standard Controller Connections

#### E5AR-Q4B



#### E5AR-Q43B-FLK



V Voltage) PT

(Resistance thermor nt) (V

тс К

#### E5AR-C4B



#### E5AR-C43B-FLK



#### E5AR-Q43DB-FLK



(Resis

#### E5AR-QC43DB-FLK



#### E5AR-C43DB-FLK



#### E5AR-Q43DW-FLK (2-loop Control)



#### E5AR-C43DW-FLK (2-loop Control)



#### E5AR-QQ43DW-FLK (2-loop Control)

E5AR-A4W-500		E5AR-A4W-500
24 VAC/DC 100-240 VAC		Auxiliary outputs
		B (Relay outputs)
		П СОМ
	ABCDE	개월 🚬 🗌
Input power supply depend		ר אין (2) ארי אין SUB1
on the model.		
100 to 240 VAC		U ~ ~ 3062
or 24 VAC/DC (no polarity)	3	(4) сом
	4	
E53-ARQC3		5- 20B3
B(+) <del>→</del> (1)		G SUB4
RS-485	6	
		E03-ARB4
	4	EV3 ~~ 2
12 V 40 mA or	5	FV4-9 0+3
	6 /	
4-20 mA DC 500 O max F		EV5 -<
0-20 mA DC 500 Q max		
(Switch using output type setting.)		
(	' // //	COM <u>6</u>
E53-ARQC	) (E5AR-A4W-500	, j
	1	
	월 111 - 6 1	
00174	2)     🖆 🗁	
Voltage output	이    Input 2 🔆	
12 V 40 mA	<u>عالماً الجنو</u>	
OUT2	4)    <sup>+</sup> → <sup>∨</sup>	
Voltago output 12 V +	월 111 : 6 : -	
40 mA or	50     _++;+	× (5)
Current output	6)    Input 1 🕂	
4-20 mA DC, 500 Q max.		
0-20 mA, DC 500 Q max	GI I V	
	(Current) (Maltern	
(Switch using output type sett	(Current) (Voltage (Current) (Voltage	e) (Thermocouple)

#### E5AR-CC43DWW-FLK (4-loop Control)



#### E5AR-PR4DF



#### E5AR-QQ43DWW-FLK (4-loop Control)



#### E5AR-PRQ43DF-FLK



# ■ E5AR DeviceNet-compatible Controller Connections

#### E5AR-Q4B-DRT





#### E5AR-QC4B-DRT



#### E5AR-QQ4W-DRT (2-loop Control)



#### E5AR-PR4F-DRT



#### E5AR-CC4WW-DRT (4-loop Control)



#### E5AR-PRQ4F-DRT



# Dimensions

Note: All units are in millimeters unless otherwise indicated.



### Rubber Packing (Sold Separately)

#### Y92S-P4 (for E5AR)



If the rubber packing is lost or damaged, it can be ordered using the following model number: Y92S-P4.

(Depending on the operating environment, deterioration, contraction, or hardening of the rubber packing may occur and so, in order to ensure the level of waterproofing specified in NEMA4, periodic replacement is recommended.)

Note: Rubber packing is provided with the Controller.

### Terminal Cover (Sold Separately)

#### E53-COV14 (for E5AR)



# Unit Label Sheet (Sold Separately)

# Y92S-L1

				◄—11.8—►	
UNIT LABE	L			· ·	
mV	V	mA	А	kW	
mm	cm	m	km	g	
kg	m³	l	°C	°F	
K	%RH	%	l/s	ℓ/min	
ℓ/h	m³/s	m³/min	m³/h	kg/h	
rpm	ppm	pН	kPa	mmHg	
mmH <sub>2</sub> O	mH2O	bar	Torr	mmAq	
kgf/cm <sup>2</sup>	g/cm <sup>2</sup>	kg/cm <sup>2</sup>	kgf/cm <sup>2</sup> G	kgf/cm <sup>2</sup> G	
TAG No.	TAC	i No.			

# Digital Controllers

E5ER Digital Controllers offer high speed, high precision, and multiple I/O and use a 5digit, 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.
- Multipoint control, cascade control, and proportional control are possible with a single Controller.
- When using models with communications functions, initial settings can be downloaded and settings can be masked using Support Software (Thermo Tools).
- 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 any special programming.



# **Model Number Structure**

# Model Number Legend

- 1. Constant values/Program
- None: Constant values 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
  - Q: Pulse voltage and pulse voltage/current outputs
  - C: Current and current outputs

### 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: Multi-input and 2 event inputs
  - F: Multi-input and FB (Potentiometer input)
  - W: Multi-input and multi-input
- 9. Input 2
- Blank:None
  - W: Multi-input and multi-input
- 10.Communications Method
- Blank:None
- FLK: RS-485 (CompoWay F/MODBUS)
- DRT: DeviceNet

Temperature controllers

# ■ Digital Controllers

### **Standard Controllers**

Size	Control type	Control mode	Outputs (control/	Optic	onal func	Model	
			transfer)	Auxiliary outputs (SUB)	Event inputs	Serial commu- nica- tions	
48 × 96 mm	Basic control (1 loop)	Single-loop standard control Single-loop heating and cooling control	2 points: Pulse volt- age and Pulse volt- age/current	4	2	No	E5ER-Q4B
			2 points: Current and Current				E5ER-C4B
			2 points: Pulse volt- age and Pulse volt- age/current			RS-485	E5ER-Q43B-FLK (See note 2.)
			2 points: Current and Current				E5ER-C43B-FLK (See note 2.)
			2 points: Pulse volt- age and Pulse volt- age/current	2 (See note 3.)	6		E5ER-QT3DB-FLK (See note 2.)
			2 points: Current and Current				E5EAR-CT3DB- FLK (See note 2.)
			4 points: Pulse volt- age and Pulse volt- age/current and Current (2 points)	4	2		E5ER-QC43B-FLK
	2-loop control	2-loop standard control Single-loop heating and cooling control Single-loop cascade control	2 points: Pulse volt- age and Pulse volt- age/current	2 (See note 3.)	4	RS-485	E5ER-QT3DW-FLK
		Single-loop control with remote SP Single-loop proportional control	2 points: Current and Current				E5ER-CT3DW-FLK
	Position-pro- portional con- trol	Single-loop position-proportional control	Relay output (1 open, 1 closed)	2 (See note 3.)	4	No	E5ER-PRTDF
	(1 loop)		Relay output (1 open, 1 closed) and Current (transfer) output (1 point)	4	No	RS-485	E5ER-PRQ43F-FLK

Note 1: Specify the power supply specifications when ordering. Model numbers for 100 to 240 VAC are different from those for 24 VAC/VDC.

2: These models are for 100 to 240 VAC only.

3: The auxiliary outputs are transistor outputs.

### **DeviceNet-compatible Controllers**

Size	Control	Control mode	Outputs (control/	Opti	onal fund	ctions	Model
	type		transfer)	Auxiliary outputs (SUB)	Event inputs	DeviceNet communi- cations	
48 × 96 mm	Basic control (1 loop)	trol Single-loop standard control Single-loop heating and cooling control	2 points: Pulse voltage Pulse voltage/current	2 (See note 2.)	2	Yes	E5ER-QTB-DRT
			2 points: Current Current				E5ER-CTB-DRT
	2-loop con- trol	n- Single-loop standard control Single-loop heating and cooling control Single-loop cascade control Single-loop standard control with remote SP Single-loop proportional control	2 points: Pulse voltage Pulse voltage/current	2 (See note 2.)	None	Yes	E5ER-QTW-DRT
			2 points: Current Current				E5ER-CTW-DRT
	Position-pro- portional control (1 loop)	Single-loop position-proportional control	Relay output (1 open, 1 closed)	2 (See note 2.)	None	Yes	E5ER-PRTF-DRT

Note 1: Specify the power supply specifications when ordering. Model numbers for 100 to 240 VAC are different from those for 24 VAC/VDC.

2: The auxiliary outputs are transistor outputs.

### **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 E5ER	E5ER-K

### Terminal Cover (Sold Separately)

Descriptions	Model
Terminal Cover for E5ER	E53-COV15

Temperature controllers
## **Specifications**

## Ratings

Item Supply voltage (See note 1.)		100 to 240 VAC, 50/60 Hz	24 VAC, 50/60 Hz; 24 VDC			
Operating voltag	e range	85% to 110% of rated supply voltage	•			
Power consumpt	tion	17 VA max. (with maximum load)	11 VA/7 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 Q for current input approx, 1 MQ for voltage input)				
Control output	Voltage (pulse) output	12 VDC, 40 mA max. with short-circuit protection c (E5AR-QQ WW-:: 21 mA max.)	ircuit			
	Current output	0 to 20 mA DC, 4 to 20 mA DC; load: 500 $\Omega$ max. ( (Resolution: Approx. 54,000 for 0 to 20 mA DC; Ap	(including transfer output) prox. 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) <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 in	put	100 Ω to 2.5 kΩ				
Event input	Contact	Input ON: 1 k $\Omega$ max.; OFF: 100 k $\Omega$ 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	t	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 No. 1 display: 9.5 mm; No. 2 display: 7.2 mm; No. 3 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 operatir	ng 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.



## ■ Input Ranges

The E5ER has multi-inputs. The default setting is 2 (K-type thermocouple, -200.0 to 1300.0°C or -300.0 to 2300.0°F).

### Platinum Resistance Thermometer Input

Input		Pt100		
Range	°C	–200.0 to 850.0	-150.0 to 150.0	
	°F	–300.0 to 1500.0	–199.99 to 300.0	
Setting		0	1	
Minimum settir	ng unit (SP and alarm)	0.1	0.01	
Input type setti	ng switch	Set to TC.PT.	TC.PT	

## Thermocouple Input

Input		K	ζ.	J		Т	E	L	U	Ν	R	S	В	W
Range	°C	–200.0 to 1300.0	–20.0 to 500.0	-100.0 to 850.0	–20.0 to 400.0	-200.0 to 400.0	0.0 to 600.0	–100.0 to 850.0	-200.0 to 400.0	–200.0 to 1300.0	0.0 to 1700.0	0.0 to 1700.0	100.0 to 1800.0	0.0 to 2300.0
	°F	–300.0 to 2300.0	0.0 to 900.0	-100.0 to 1500.0	0.0 to 750.0	-300.0 to 700.0	0.0 to 1100.0	–100.0 to 1500.0	-300.0 to 700.0	-300.0 to 2300.0	0.0 to 3000.0	0.0 to 3000.0	300.0 to 3200.0	0.0 to 4100.0
Setting		2	3	4	5	6	7	8	9	10	11	12	13	14
Minimu ting uni and ala	m set- it (SP rm)	0.1												
Input ty setting	vpe switch	Set to TC.	PT.											

## Current/Voltage Input

Input	Current		Voltage		
Range	4 to 20 mA	0 to 20 mA	1 to 5 V	0 to 5 V	0 to 10 V
Setting	15	16	17	18	19
Input type setting switch	Set to ANALOG.	TC.PT trypt ANALOG			

## ■ 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)					
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 <sup>2</sup> for 10 min each in X, Y, and Z directions					
Shock resistance	100 m/s <sup>2</sup> , 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	E5AR: Controller only: Approx. 450 g; Mounting bracket: Approx. 60 g; Terminal cover: Approx. 30 g E5ER: Controller only: Approx. 330 g; Mounting bracket: Approx. 60 g; Terminal cover: Approx. 16 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	UL3121-1, CSA C22.2 No. 1010-1 EN61010-1 (IEC61010-1): Pollution degree 2/overvoltage category 2					
EMC	EMI: EN61326 Radiated Interference Electromagnetic Field Strength: EN55011 Group 1 Class A Noise Terminal Voltage: EN55011 Group 1 Class A EMS: EN61326 ESD Immunity: EN61000-4-2: 4 kV contact discharge (level 2) 8 kV air 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) 2 kV power line (level 3) 2 kV output line (relay output) (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 ine 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: EN61000-4-1: 05 cvcle. 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.

## Communications Specifications

### **RS-485 Serial Communications**

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 (CompoWay/F), RTU Remote Terminal Unit (MODBUS)
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) Start-stop synchronization data format
Flow control	None
Interface	RS-485
Retry function	None

## **DeviceNet**

lte	em	Specifications					
Communications proto	col	Conforms to DeviceNet					
Communications func-	Remote I/O communi-	<ul> <li>Master-slave connections (polling, bit-strobe, COS, or cyclic)</li> </ul>					
ions cations • Conform to DeviceNet specifications.							
	I/O allocations	Can allocate a	ny I/O data from the Configura	itor.			
		<ul> <li>Can allocate a ler variable are</li> </ul>	ny data, such as parameters s a.	specific to the Devicenet	, and the Digital Control-		
		<ul> <li>Up to 2 blocks</li> </ul>	for the IN Area, up to a total o	f 100 words.			
		<ul> <li>One block for t Bits).</li> </ul>	he OUT Area, up to 100 word	s (first word is always all	ocated to Output Enable		
	Message communica-	• Explicit messa	ge communications				
	tions	<ul> <li>CompoWay/F sage format).</li> </ul>	communications commands c	an be sent (commands	are sent in explicit mes-		
Connection format		Combination of r	multidrop and T-branch conne	ctions (for trunk and drop	o lines)		
Baud rate		DeviceNet: 500, 250, or 125 kbps, or automatic detection of master baud rate					
Communications media	à	Special 5-wire cable (2 signal lines, 2 power lines, and 1 shield line)					
Communications distar	nce	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	Э	DeviceNet power supply: 11 to 25 VDC					
Current consumption		50 mA max. (24 VDC)					
Maximum number of nodes that can be con- nected		64 (includes Configurator when used)					
Maximum number of slaves that can be con- nected		63					
Error control		CRC error detection					
Power supply		Power supplied from DeviceNet communications connector.					

## **Wiring Terminals**

## E5ER Standard Controller Connections





#### E5ER-Q43B-FLK



#### E53-ARR4 Auxiliary outputs (Relay outputs) E5ER-AB-500 24 VAC/DC 100-240 VAC A 1 В ÷₫ 0 2 COM € 3 0 SUB1 0 4 3 SUB2 Input power supply depends on the model 100 to 240 VAC or 24 VAC/DC (no polarity) 5 4 COM 6 (5) SUB3 .... 1 6 SUB4 2 3 4 5 6 CDE E5ER-AB-500 E53-ARCC Event inputs 1 2 OUT2 EV2 2 ر ه Current output 4-20 mA DC, 500 Ω max. 0-20 mA DC, 500 Ω max. 3 CON 3 4

(Switching by output type setting) +± 5 -= 6 OUT1 Current output Ţ. 4-20 mA DC, 500 Ω max. 0-20 mA DC, 500 Ω max. PT V (oltage) тс Е ent) (\ (Th (Switch using output type setting.) (Res

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#### E5ER-C43B-FLK

E5ER-C4B



#### E5ER-QT3DB-FLK



#### E5ER-QC43B-FLK



#### E5ER-CT3DB-FLK



#### E5ER-QT3DW-FLK (2-loop Control)



#### E5ER-PRTDF



#### E5ER-CT3DW-FLK (2-loop Control)



#### E5ER-PRQ43F-FLK



## ■ E5ER DeviceNet-compatible Controller Connections

#### E5ER-QTB-DRT



#### E5ER-QTW-DRT (2-loop Control)



#### E5ER-CTB-DRT



#### E5ER-CTW-DRT (2-loop Control)



#### E5ER-PRTF-DRT



# Or

Note: All units are in millimeters unless otherwise indicated.



## Rubber Packing (Sold Separately)

#### Y92S-P5 (for E5ER)

If the rubber packing is lost or damaged, it can be ordered using the following model number: Y92S-P5.

(Depending on the operating environment, deterioration, contraction, or hardening of the rubber packing may occur and so, in order to ensure the level of waterproofing specified in NEMA4, periodic replacement is recommended.)

Note:Rubber packing is provided with the Controller.

### Terminal Cover (Sold Separately)

#### E53-COV15 (for E5ER)







### Unit Label Sheet (Sold Separately)

#### Y92S-L1

-			
V	mA	A	kW
cm	m	km	g
m <sup>3</sup>	l	°C	۴
%RH	%	l/s	ℓ/min
m³/s	m³/min	m³/h	kg/h
ppm	рΗ	kPa	mmHg
mH₂O	bar	Torr	mmAq
g/cm <sup>2</sup>	kg/cm <sup>2</sup>	kgf/cm <sup>2</sup> G	kgf/cm <sup>2</sup> G
	V cm %RH m³/s ppm mH2O g/cm <sup>2</sup>	V         mA           cm         m           m³         l           %RH         %           m³/s         m³/min           ppm         pH           mH₂O         bar           g/cm²         kg/cm²	V         mA         A           cm         m         km           m³         l         °C           %RH         %         l/s           m³/s         m³/min         m³/h           ppm         pH         kPa           mH₂O         bar         Torr           g/cm²         kg/cm²         kg/cm²G

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.

# CX-Thermo Support Software Ver. 3.0 EST2-2C-MV3

Monitoring/Setting Support Software for E5CN-, E5EN-, E5AN, E5ZN-, E5 $\square$ R, and EJ1series Temperature Controllers Enabling Faster Parameter Setup, Device Adjustment, and Maintenance

- Enables creating, editing, and batch-downloading parameters from a personal computer, reducing the work required to set parameters.
- Supports Online Monitoring: Monitor data for up to 31 Temperature Controllers at the same time. Up to 64 EJ1 Temperature Controllers can be connected. (The Temperature Controllers must be from the same series.)
- Supports parameter masks for hiding unused parameters (E5 N, E5 R and E5ZN).
- Starting CX-Programmer at the same time and using in combination enables sharing of the folders used by CX-Programmer.
- Searches automatically for models by unit number only and is equipped with an autopilot function for connecting to the trend monitor.

## **Ordering Information**

## ■ List of Models

Name	Model
CX-Thermo Support Software	EST2-2C-MV3

Note: The old models of E5DN Temperature Controller are not supported.

## Specifications

Basic function	s	Creating, changing, and saving parameters Monitor function Parameter mask (unused parameters are not displayed) function (E5□N, E5□R and E5ZN) Parameter mask settings can be written (personal computer to E5□N) only. Parameter mask settings cannot be read (E5□N to personal computer).
Compatible devices	Temperature Controllers	E5⊡N, EJ1 (Models without communications functions can also be connected if the E58-CIFQ1 Cable is used, although 1:N connections are not possible). E5ZN, E5AR and E5ER (except E5AR and E5ER models for DeviceNet communications)
Personal	CPU	300 MHz min.
computer	OS	Windows 2000 or XP (Japanese or English versions)
requirements	Memory	128 MB min.
	Harddisk	650 MB min. available space
	CD-ROM	One CD-ROM drive
	Monitor	SVGA (800 $\times$ 600). Recommended: XGA (1024 $\times$ 768), high color (16 bits) min.
	Communications ports	<ul> <li>RS-232C port, COM1 to COM8</li> <li>USB port can be used if the E58-CIFQ1 is used (E5 \Box N and EJ1 only).</li> <li>USB port can be used if the K3SC is used. (Connection to E5 \Box N, E5 \Box N, or E5 \Box R is supported only for models with communications.)</li> </ul>

**Note:** "E5 N" indicates the upgraded versions of the E5CN, E5AN, and E5EN.





ermoMini Parameter Copying Software is provided free-of-charge.	
Compatible Temperature Controllers:	
<ul> <li>E5CN (new models) only (not supported for EJ1, E5EN, or E5AN)</li> </ul>	
Functions:	
<ul> <li>Uploading all parameters from the E5CN to the personal computer</li> </ul>	
<ul> <li>Downloading all parameters from the personal computer to the E5CN</li> </ul>	
<ul> <li>Saving uploaded data to the personal computer and outputting data as CSV files</li> </ul>	
Note: Changing parameter settings and monitoring is not supported.	
ntact your OMRON representative for details.	

Note: The product names in this catalog are trademarks or registered trademarks of the respective companies.

The application examples provided in this catalog are for reference only. Check functions and safety of the equipment before use.
 Never use the products for any application requiring special safety requirements, such as nuclear energy control systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, or other application involving serious risk to life or property, without ensuring that the system as a whole has been designed to address the risks, and that the OMRON products are properly rated and installed for the intended use within the overall equipment or system.

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Cat. No. H131-E2-03

1

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# PROFIBUS-DP Gateway to Host Link / Compoway-F PRT1-SCU11

### **Omron's intelligent PROFIBUS gateway**

- Supports all Compoway-F-equipped products (temperature controllers, digital panel meters, etc.).
- Can be used in Host Link mode for connecting MCW151-E.
- Enhanced for use with E5AK/E5EK temperature controllers and OYMC Varispeed F7 inverters.
- Cost-effectively integrates existing instruments into a PROFIBUS network.
- Requires no complex protocol conversion writing.
- Has function blocks for drag-and-drop configuration.
- Connects up to 15 instruments to a single PROFIBUS point.

## **Model Number Structure**



#### PRT1-SCU11 1: 1: SCU: PRT1

- Version
- Wired
- SCU: Serial Communication Unit PRT1: PROFIBUS Remote Terminal

## Specifications

#### Unit Specifications

Ambient	Operating temperature: 0 to 55°C
temperatures	Storage temperature: -20 to 75°C
Ambient humidity	10 to 90% (non-condensing)
Conformance to EMC	EN61000-6-2: 2001
and safety standards	EN61000-6-4: 2001/CISPR11
	EN61131-2: 2003, IDT
Power supply	+24 VDC (+10% / -15%) Current consumption 85 mA (max), 75 mA typical at 24 Vdc
Weight	130 g
Communication	RS-485 based PROFIBUS DP
Interface	RS-422A / RS-485
	RS-232C Peripheral Port supporting connection to CX-Thermo and CX-Drive

#### **PROFIBUS** Cable

- Only use shielded twisted pair cable, line type A as specified by EN 50170 vol. 2 (e.g. Belden 3079A).
- The maximum cable length per bus segment (32 stations) depends on the selected communication speed

Baud rate (kbit/s)	Length/segment
9.6, 19.2, 45.45, 93.75	1200
187.5	1000
500	400
1500	200
3000, 6000, 12000	100

#### **PROFIBUS Communication Specifications**

Applicable standard	EN 50170 vol. 2 (PROFIBUS-DP)	
Туре	PROFIBUS-DP Slave	
Bus connector	9-pin sub-D female, RS-485	
Bus termination	NOT included	
Baud rates in kbit/s (auto-detect)	9.6, 19.2, 45.45, 93.75, 187.5, 500, 1500, 3000, 6000, 12000	
PROFIBUS address range	01-99	
Communication cable	Type A (EN 50170 vol. 2)	
Minimum slave interval	0.5 ms	
Input data	200 bytes maximum	
Output data	200 bytes maximum	
Supported DP functions	Data_Exchange	
(as responder)	Chk_Cfg / Set_Prm	
	Slave_Diag	
	Global_Control (SYNC/FREEZE/ CLEAR)	
	RD_Inp / RD_Outp / Get_Cfg	
GSD file	OC_0780.GSD	

#### RS-422A / RS-485 Protocol Specifications

Compoway-F devices	E5AN / E5CN / E5EN / E5GN
supported	E5ZN
	E5ER / E5AR
K-Format devices supported	E5AK / E5EK
Host Link devices supported	R88A-MCW151-E
Memobus devices supported	OYMC Varispeed F7 Inverter
Max. No of devices	15
Connection type	RS-422A (4-wire)
	RS-485 (2-wire)
Baud rates in kbit/s	9.6, 19.2, 34.8
Slave address range	1 ~ 15
supported	(Address and selected PROFIBUS I/O module must match)

#### **Peripheral Port**

- The Peripheral Port is intended to allow communication between Personal Computer based software (i.e. Thermotools) and temperature controllers.
- Use OMRON's CS1W-CN226 cable to setup the connection.

#### I/O Configuration Options

Туре		уре	Device	Description
ooway-F Fixed Comm.	ed nm.	Basic	E5_N / E5ZN / E5_R	1 word I/O per loop
		Extended	E5_N	2 word out / 6 word in
	έÖ		E5ZN	3 word out / 11 word in
	0		E5_R	5 word out / 21 word in
lmo	, READ	E5_N / E5ZN / E5_	5 word out / 4 word in	
Free	-ree	WRITE		7 word out / 2 word in
	щõ	OPERATE		3 word out / 2 word in
K-Format Free Fixed Comm Com	ed E	Basic	E5AK / E5EK	2 word out / 5 word in
	ĚÖ	Extended		4 word out / 5 word in
	Free Comm	Special Operation		3 word out / 3 word in
Host Link		(	R88A-MCW151-E	5, 10, 15 word I/O
Memob us		Fix	OYMC Varispeed F7	3 word out / 3 word in
		Free	Inverter	3 word out / 3 word in

Note: • Different protocols can not be intermixed on the same network.

- Total maximum I/O size: 100 words I/O.
- Fixed Communication Blocks are pre-defined I/O blocks designed for the listed devices. Free Communication Blocks require programming in the PROFIBUS master to assemble commands.
- Memobus Fixed I/O modules access pre-defined F7 registers, Free I/O module allows specification of F7 registers.



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Cat. No. P05-EN-02

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## Dimensions