

Digital Temperature Controller (48 x 96 mm)

# E5EC-QX4ABM-008



Image

Digital Temperature Controller, 48 x 96 mm, Voltage output (for driving SSR), Auxiliary output: 4, Power supply voltage: 100 to 240 VAC, Universal inputs, HB alarm and HS alarm: 1, RS-485, 2 event inputs, Push-In Plus terminal block model

Shape	DIN 48 x 96
Terminal type	Push-In Plus Terminal Block
Input type	Thermocouple/Platinum resistance thermometer/Infrared Thermosensor/Analog input
Control output 1	Voltage output (for driving SSR)
Control output 2	None
Number of total auxiliary output	4 point
Power supply voltage	100 to 240 VAC (50/60 Hz)
Number of event input	2 point
Heater burnout /SSR failure detector	1 point
Communications method	RS-485 (two-wire, half duplex)

Ratings / Performance

As of August 19, 2024

### Ratings

Shape	DIN 48 x 96	
Fixed/Programmable	Fixed	
Power supply voltage	100 to 240 VAC (50/60 Hz)	
Allowable voltage variable range	85 to 110% of the power supply voltage	
Power consumption	8.3 VA max. (at 100 to 240 VAC)	
Input	Number of input points	1 point
	Temperature input	Thermocouple: K, J, T, E, L, U, N, R, S, B, C/W, PLII Platinum resistance thermometer: Pt100, JPt100 Infrared Thermosensor: 10 to 70 °C, 60 to 120 °C, 115 to 165 °C, 140 to 260 °C
	Analog input	4 to 20 mA, 0 to 20 mA, 1 to 5 V, 0 to 5 V, 0 to 10 V
	Input impedance	Current input: 150 Ω max., voltage input: 1 MΩ min. (Applicable when connecting 1:1 to ES2-HB-N/THB-N.)
Control method	ON/OFF or 2-PID control with auto-tuning	
Control output	Number of total control output	1 point
	Control output 1	Voltage output (for driving SSR)
	Control output 2	None
	Voltage output (for driving SSR)	1 point 12 VDC±20%, Maximum load current: 40 mA, PNP, with short-circuit protection

		circuit
<b>Auxiliary output</b>	<b>Number of total auxiliary output</b>	4 point
	<b>Relay output</b>	SPST-NO, 250 VAC, 2 A (resistive load), electrical life: 100,000 operations (minimum applicable load: 5 V, 10 mA)
<b>Event input</b>		2 point Contact input: ON: 1 kΩ max., OFF: 100 kΩ min. No-contact input: ON: Residual voltage 1.5 V max., OFF: Leakage current 0.1 mA max. Current flow: Approx. 7 mA per point
<b>Setting method</b>		Digital setting using front panel keys
<b>Indication method</b>		11-segment digital display and individual indicators
<b>Multi SP functions</b>		Up to eight set points (SP0 to SP7) can be saved and selected using the event inputs, key operations, or serial communications.
<b>Sampling period</b>		50 ms
<b>Hysteresis</b>		Temperature input: 0.1 to 999.9 °C or °F (in units of 0.1 °C or °F) Analog input: 0.01 to 99.99% FS (in units of 0.01% FS)
<b>Proportional band</b>		Temperature input: 0.1 to 999.9 °C or °F (in units of 0.1 °C or °F) Analog input: 0.1% to 999.9% FS (in units of 0.1% FS)
<b>Integral time</b>		0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s)
<b>Derivative time</b>		0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s)
<b>for cooling</b>	<b>Proportional band (P)</b>	Temperature input: 0.1 to 999.9 °C or °F (in units of 0.1 °C or °F) Analog input: 0.1% to 999.9% FS (in units of 0.1% FS)
	<b>Integral time (I)</b>	0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s)
	<b>Derivative time (D)</b>	0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s)
<b>Control period</b>		0.1 s, 0.2 s, 0.5 s, 1 to 99 s (in units of 1 s)
<b>Manual reset value</b>		0.0 to 100.0% (in units of 0.1%)
<b>Insulation resistance</b>		20 MΩ min. (at 500 VDC)
<b>Dielectric strength</b>		3,000 VAC 50/60 Hz 1 min (Between current-carrying terminals of different polarity)
<b>Vibration resistance</b>		Destruction: 10 to 55 Hz, 20 m/s <sup>2</sup> for 2 h each in X, Y, and Z directions Malfunction: 10 to 55 Hz, 20 m/s <sup>2</sup> for 10 min each in X, Y, and Z directions
<b>Shock resistance</b>		Destruction: 300 m/s <sup>2</sup> , 3 times each in X, Y, and Z directions Malfunction: 100 m/s <sup>2</sup> , 3 times each in X, Y, and Z directions
<b>Ambient temperature (Operating)</b>		-10 to 55 °C (with no freezing or condensation) For 3-year warranty with standard mounting: -10 to 50 °C (with no freezing or condensation)
<b>Ambient temperature (Storage)</b>		-25 to 65 °C (with no freezing or condensation)
<b>Ambient humidity (Operating)</b>		25 to 85 %
<b>Altitude</b>		2000 m max.
<b>Degree of protection</b>		Front panel: IP66, Rear case: IP20, Terminal section: IP00
<b>Memory protection</b>		Non-volatile memory (number of writes: 1,000,000)
<b>Case color</b>		Black
<b>Terminal type</b>		Push-In Plus Terminal Block
<b>Accessories</b>		Mounting adapter, Waterproof packing, Front Port Cover
<b>Weight</b>		Main Unit: Approx. 210 g Adapter: Approx. 4 g x 2
<b>Sold separately</b>		USB Serial Conversion Cable: E58-CIFQ2 Communications Conversion Cable: E58-CIFQ2-E Waterproof packing: Y92S-P9 Waterproof Cover: Y92A-49N

Front Port Cover: Y92S-P7  
 Adapter: Y92F-51  
 CX-Thermo Support Software: EST2-2C-MV4  
 Current Transformer (CT): E54-CT1/E54-CT1L/E54-CT3/E54-CT3L

## Accuracy

<b>Indication accuracy</b>	<p>Thermocouple: (<math>\pm 0.3\%</math> of indicated value or <math>\pm 1\text{ }^{\circ}\text{C}</math>, whichever is greater) <math>\pm 1</math> digit max.          Platinum resistance thermometer: (<math>\pm 0.2\%</math> of indicated value or <math>\pm 0.8\text{ }^{\circ}\text{C}</math>, whichever is greater) <math>\pm 1</math> digit max.          Analog input: <math>\pm 0.2\%</math> FS <math>\pm 1</math> digit max.          (The indication accuracy of K thermocouples in the <math>-200</math> to <math>1300\text{ }^{\circ}\text{C}</math> range, T and N thermocouples at a temperature of <math>-100\text{ }^{\circ}\text{C}</math> max., and U and L thermocouples at any temperatures is <math>\pm 2\text{ }^{\circ}\text{C}</math> <math>\pm 1</math> digit max. B thermocouple at a temperature of <math>400\text{ }^{\circ}\text{C}</math> max. is not specified. B thermocouples in the <math>400</math> to <math>800\text{ }^{\circ}\text{C}</math> range is <math>\pm 3\text{ }^{\circ}\text{C}</math> max. R and S thermocouples at a temperature of <math>200\text{ }^{\circ}\text{C}</math> max. is <math>\pm 3\text{ }^{\circ}\text{C}</math> <math>\pm 1</math> digit max. C/W thermocouples is (<math>\pm 0.3\%</math> PV or <math>\pm 3\text{ }^{\circ}\text{C}</math>, whichever is greater) <math>\pm 1</math> digit max. PL II thermocouples is (<math>\pm 0.3\%</math> PV or <math>\pm 2\text{ }^{\circ}\text{C}</math>, whichever is greater) <math>\pm 1</math> digit max.)</p>
<b>Influence of temperature/voltage</b>	<p>Thermocouple: R, S, B, C/W, and PLII: (<math>\pm 1\%</math> of indicated value or <math>\pm 10\text{ }^{\circ}\text{C}</math>, whichever is greater) <math>\pm 1</math> digit max.          Others: (<math>\pm 1\%</math> of indicated value or <math>\pm 4\text{ }^{\circ}\text{C}</math>, whichever is greater) <math>\pm 1</math> digit max.. However K thermocouple at <math>-100\text{ }^{\circ}\text{C}</math> max.: <math>\pm 10\text{ }^{\circ}\text{C}</math> max.          Platinum resistance thermometer: (<math>\pm 1\%</math> of indication value or <math>\pm 2\text{ }^{\circ}\text{C}</math>, whichever is greater) <math>\pm 1</math> digit max.          Analog input: <math>\pm 1\%</math> FS <math>\pm 1</math> digit max.          CT input: <math>\pm 5\%</math> FS <math>\pm 1</math> digit max.          Ambient temperature: <math>-10</math> to <math>23</math> to <math>55\text{ }^{\circ}\text{C}</math>, Voltage range: <math>-15</math> to <math>10\%</math> of rated voltage</p>
<b>Influence of EMS.</b>	<p>Thermocouple: R, S, B, C/W, and PLII: (<math>\pm 1\%</math> of indicated value or <math>\pm 10\text{ }^{\circ}\text{C}</math>, whichever is greater) <math>\pm 1</math> digit max.          Others: (<math>\pm 1\%</math> of indicated value or <math>\pm 4\text{ }^{\circ}\text{C}</math>, whichever is greater) <math>\pm 1</math> digit max.. However K thermocouple at <math>-100\text{ }^{\circ}\text{C}</math> max.: <math>\pm 10\text{ }^{\circ}\text{C}</math> max.          Platinum resistance thermometer: (<math>\pm 1\%</math> of indication value or <math>\pm 2\text{ }^{\circ}\text{C}</math>, whichever is greater) <math>\pm 1</math> digit max.          Analog input: <math>\pm 1\%</math> FS <math>\pm 1</math> digit max.</p>
<b>Influence of signal source resistance</b>	<p>Thermocouple: <math>0.1\text{ }^{\circ}\text{C}/\Omega</math> max. (<math>100\ \Omega</math> max.)          Platinum resistance thermometer: <math>0.1\text{ }^{\circ}\text{C}/\Omega</math> max. (<math>10\ \Omega</math> max.)</p>

## Communication characteristics

<b>Transmission path connection</b>	Multidrop (RS-485)
<b>Communications method</b>	RS-485 (two-wire, half duplex)
<b>Synchronization method</b>	Start-stop synchronization
<b>Protocol</b>	CompoWay/F, Modbus
<b>Communication speed</b>	9600, 19200, 38400, 57600 bps
<b>Transmission code</b>	ASCII
<b>Data bit length</b>	7 or 8 bits
<b>Stop bit length</b>	1 or 2 bits
<b>Error detection</b>	Vertical parity (none, even, odd) Block check character (BCC) with CompoWay/F CRC-16 Modbus
<b>Flow control</b>	None
<b>Interface</b>	RS-485
<b>Retry function</b>	None
<b>Communications buffer</b>	217 bytes
<b>Communications response send delay</b>	0 to 99 ms (Default: 20 ms)

## Communication function

<b>Programless communications function</b>	You can use the memory in the PLC to read and write E5□C parameters, start and stop operation, etc. The E5□C automatically performs communications with PLCs. No communications programming is required. Number of connected Digital Temperature Controllers: 32 max. (Up to 16 for the FX Series)
<b>Component communications</b>	When Digital Temperature Controllers are connected, set points and RUN/STOP commands can be sent from the Digital Temperature Controller that is set as the master to the Digital Temperature Controllers that are set as slaves. Slope and offsets can be set for the set point. Number of connected Digital Temperature Controllers: 32 max. (including master)
<b>Copying</b>	When Digital Temperature Controllers are connected, the parameters can be copied from the Digital Temperature Controller that is set as the master to the Digital Temperature Controllers that are set as slaves.

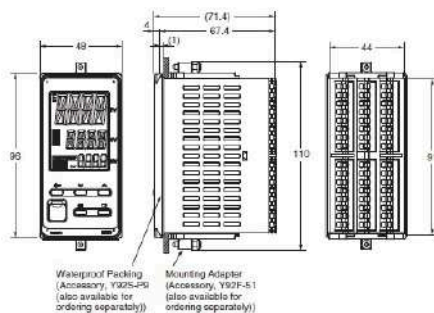
## Heater burnout /SSR failure detector

<b>CT input (for heater current detection)</b>	1 point
<b>Max. heater current</b>	Single-phase 50 A AC
<b>Input current indication accuracy</b>	±5% FS ±1 digit max.
<b>Heater burnout alarm setting range</b>	0.1 to 49.9 A (in units of 0.1 A) Minimum detection ON time: 100 ms (The value is 30 ms for a control period of 0.1 s or 0.2 s)
<b>SSR failure detector alarm setting range</b>	0.1 to 49.9 A (in units of 0.1 A) Minimum detection OFF time: 100 ms (The value is 35 ms for a control period of 0.1 s or 0.2 s)

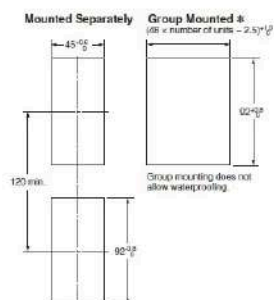
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## Dimensions

As of August 19, 2024



- Setup Tool ports are provided as standard feature. Use these ports to connect a computer to the Digital Temperature Controller. The E58-CIFQ2 USB-Serial Conversion Cable is required to connect to the port on the top panel. The E58-CIFQ2 USB-Serial Conversion Cable and E58-CIFQ2-E Communications Conversion Cable are required to connect to the port on the front panel. (You cannot leave either port connected constantly during operation.)



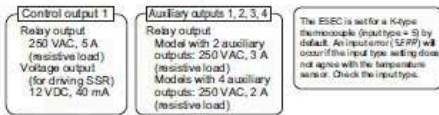
- Recommended panel thickness is 1 to 8 mm.
- Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers.)
- To mount the Controller so that it is waterproof, insert the waterproof packing onto the Controller.
- When two or more Controllers are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature specified in the specifications.

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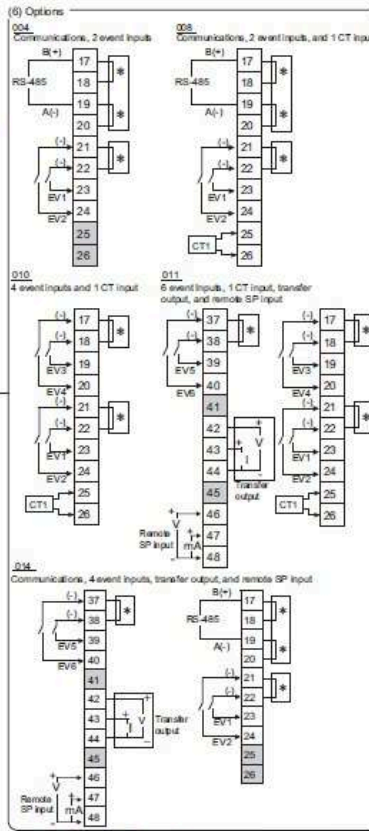
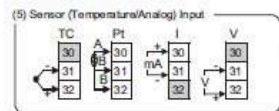
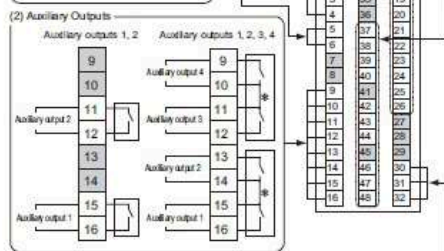
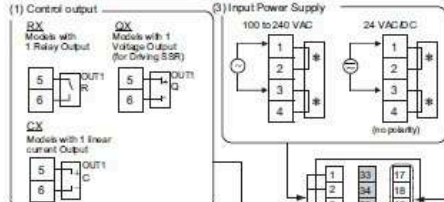
E5EC-B (Push-In Plus Terminal Blocks)

E5EC-□□□□ B M - □□□□  
(1) (2) (3) (4) (5) (6)

Terminal type



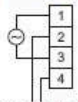
The E5EC is set for a K-type thermocouple (input type = S) by default. An input error (SEPP) will occur if the input type setting does not agree with the temperature sensor. Check the input type.



Use no-voltage inputs for the event inputs. The polarity for non-contact inputs is given in parentheses.

- The application of the terminals depends on the model.
- Do not wire the terminals that are shown with a gray background.
- When complying with EMC standards, the cable that connects the sensor must be 30 m or less. If the cable length exceeds 30 m, compliance with EMC standards will not be possible.
- Refer to *Wiring Precautions for E5EC-B (Controllers with Push-In Plus Terminal Blocks)* on page 126 for wire specifications and wiring methods.
- Common terminals are indicated with asterisks (\*). You can use the input power supply and communications common terminals for crossover wiring. Do not exceed the maximum number of temperature Controllers given below if you use crossover wiring for the input power supply.  
100 to 240 VAC Controllers: 16 max.  
24 VAC/VDC Controllers: 8 max.

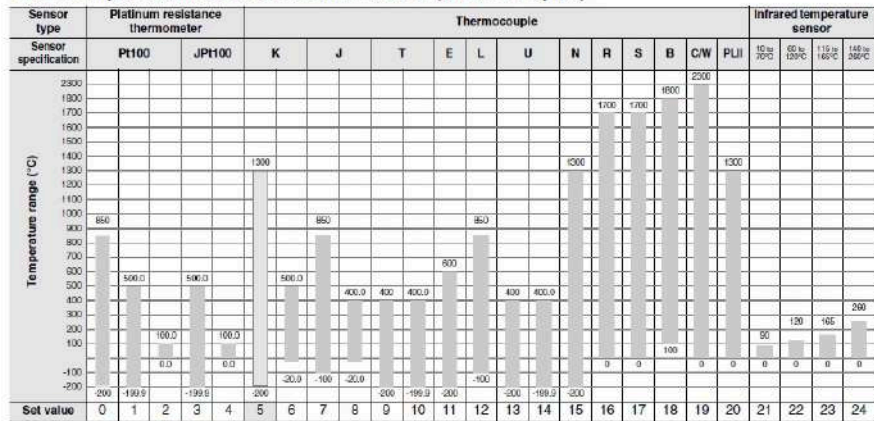
Wiring Example:



To another E5EC

- Due to UL Listing requirements, use the E54-CT1L or E54-CT3L Current transformer with the factory wiring (internal wiring). Use a UL category XDBA or XDBA7 current transformer that is UL Listed for field wiring (external wiring) and not the factory wiring (internal wiring).

**Thermocouple/Platinum Resistance Thermometer (Universal inputs)**



The applicable standards for the input types are as follows:  
 K, J, T, E, N, R, S, B: JIS C 1602-2015, IEC 60584-1  
 L: Fe-CuNi, DIN 43710-1985  
 U: Cu-CuNi, DIN 43710-1985  
 C/W: W5Re/W2Re, JIS C 1602-2015, ASTM E988-1900  
 JPH100: JIS C 1604-1969, JIS C 1606-1989  
 PH100: JIS C 1604-1997, IEC 60751  
 PL I: According to Platinum II electromotive force charts from BASF (previously Engelhard)

**Analog Input**

Input type	Current		Voltage		
Input specification	4 to 20 mA	0 to 20 mA	1 to 5 V	0 to 5 V	0 to 10 V
Setting range	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				
Set value	25	26	27	28	29

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