

# Temperature Controllers



Model TEC-9100 1/16 DIN

## Model TEC-9100 1/16 DIN Temperature Controller



**Configurable for 4  
Programmable Outputs  
and optional NEMA  
4X/IP65 Front Panel!**

Agency Approvals: RoHS



### Design Features

- \* 1/16 DIN size – 48 mm × 48 mm
- \* Fuzzy Logic PID Autotune heat & cool control
- \* Short panel depth – only 4-1/8" (105 mm) required
- \* Universal input, field configurable (Type J T/C default, PT100, mA, V) with high accuracy 18-bit D-A
- \* Highly versatile – 6 types of output available
- \* Output 2 can be programmed as output or alarm
- \* Universal input power – 90-250 VAC or 11-26 VAC/VDC
- \* Highly accurate universal input
- \* Optional NEMA 4X/IP65 front panel
- \* Bumpless transfer to manual mode during sensor failure
- \* Wide variety of alarm mode selections
- \* Optional RS-232 or RS-485 communications interface
- \* Bright 0.40" (10 mm) red LED process display 0.31" (8 mm) green LED setpoint display
- \* High performance at a very low price

### Power Input BOX 1

- 4 = 90-264 VAC
- 5 = 11-26 VAC / VDC
- 9 = Other

Hardware Code: TEC-9100-



A Part Number based on the hardware code and any software pre-programming will be issued at time of order.

**Standard lead time is stock to 2 weeks.**

### Signal Input— Universal, can be programmed in the field for item 5 or 6 BOX 2

- 5 = Thermocouple: \*J, K, T, E, B, R, S, N, L 0-60mV
- 6 = RTD: \*PT100 DIN, PT100 JIS
- 7 = 0-1 VDC
- 8 = \*0-5, 1-5 VDC
- A = 0-10 VDC
- B = \*4-20, 0-20 mA
- 9 = Other \* indicates default value

### Alarm BOX 5

- 0 = None
- 1 = Relay: 2A / 240 VAC, SPDT
- 9 = Other

### Communication BOX 6

- 0 = None
- 1 = RS-485 Interface
- 2 = RS-232 Interface
- 3 = Retransmission 4-20 mA (default), 0-20 mA
- 4 = Retransmission 1-5 VDC (default), 0-5 VDC
- 5 = Retransmission 0-10 VDC
- 9 = Other

### Case Options BOX 7

- 0 = Panel mount standard
- 1 = Panel mount with NEMA 4X/IP65 front panel
- 2 = DIN rail mount adapter

### Output 1 BOX 3

- 1 = Relay: 2A / 240 VAC
- 2 = Pulse dc for SSR drive: 5 VDC (30 mA max)
- 3 = Isolated, 4-20 mA (default), 0-20 mA
- 4 = Isolated, VDC, 1-5 (default), 0-5, 0-1
- 5 = Isolated, VDC, 0-10
- 6 = Triac-SSR output 1A / 240 VAC
- C = Pulse DC for SSR drive: 14 VDC (40 mA max)
- 9 = Other

### Output 2 BOX 4

- 0 = None
- 1 = Relay: 2A / 240 VAC
- 2 = Pulse DC for SSR drive: 5 VDC (30 mA max)
- 3 = Isolated, 4-20 mA (default), 0-20 mA
- 4 = Isolated VDC, 1-5 (default), 0-5, 0-1
- 5 = Isolated VDC, 0-10
- 6 = Triac-SSR output 1A / 240 VAC
- 7 = Isolated 20V @ 25 mA DC, Output Power Supply
- 8 = Isolated 12V @ 40 mA DC, Output Power Supply
- 9 = Isolated 5V @ 80 mA DC, Output Power Supply
- C = Pulse DC for SSR drive: 14 VDC (40 mA max)
- A = Other



**Note:** Detailed information on features common to digital microprocessor-based TEC temperature controls and the complete Table of Input Range and Accuracy can be found on page 13-46.

### Power Input

**Standard:** 90-250 VAC, 47-63 Hz, 10 VA, 5W maximum  
**Optional:** 11-26 VAC / VDC, 10 VA, 5W maximum

### Signal Input

**Resolution:** 18 bits    **Sampling Rate:** 5 samples / second  
**Accuracy:**  $\pm 0.24\%$  of span typical  
**Maximum Rating:** -2 VDC minimum, 12 VDC maximum (1 minute for mA input)  
**Temperature Effect:**  $\pm 1.5 \mu\text{V} / ^\circ\text{C}$  for all inputs except mA input  $\pm 3.0 \mu\text{V} / ^\circ\text{C}$  for mA input  
**Sensor Lead Resistance Effect:** T/C:  $0.2 \mu\text{V}/\text{ohm}$   
 3-wire RTD:  $2.6^\circ\text{C}/\text{ohm}$  of resistance difference of two leads  
**Burn-out Current:** 200nA  
**Common Mode Rejection Ratio (CMRR):** 120 dB  
**Normal Mode Rejection Ratio (NMRR):** 55 dB  
**Sensor Break Detection:** Sensor open for TC, RTD and mV inputs; sensor short for RTD input; below 1 mA for 4-20 mA input; below 0.25V for 1-5V input; unavailable for other inputs  
**Sensor Break Response Time:** Within 4 seconds for TC, RTD and mV inputs; 0.1 second for 4-20 mA and 1-5 V inputs

### Output 1 / Output 2

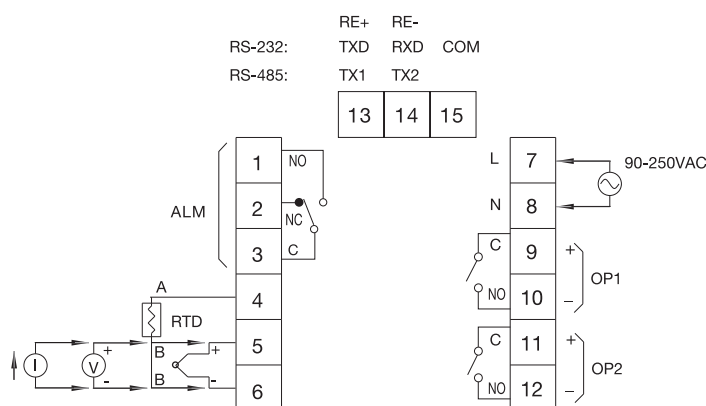
**Relay Rating:** 240 VAC, 2 Amp  
**Pulsed Voltage:** Source voltage 5V, Current limiting resistance 66 $\Omega$

#### Linear Output — Characteristics

Type	Zero	Span	Load
Tolerance	Tolerance	Capacity	
4-20 mA	3.6-4.0 mA	20-21 mA	500 $\Omega$ max
0-20 mA	0 mA	20-21 mA	500 $\Omega$ max
0-5 VDC	0 VDC	5-5.25 VDC	10 K $\Omega$ min
1-5 VDC	0.9-1.0 VDC	5-5.25 VDC	10 K $\Omega$ min
0-10 VDC	0 VDC	10-10.5 VDC	10 K $\Omega$ min

**Resolution:** 15 bit analog to digital converter  
**Output Regulation:** 0.02% for full load change  
**Output Settling Time:** 0.1 sec. (stable to 99.9%)  
**Isolation Breakdown Voltage:** 1000 VAC  
**Temperature Effect:**  $\pm 0.01\%$  of span/ $^\circ\text{C}$   
**Solid State Relay (Triac) Output**  
**Rating:** 1A / 240 VAC  
**Inrush Current:** 20A for 1 cycle  
**Min. Load Current:** 50 mA rms  
**Max. Off-state Leakage:** 3 mA rms  
**Max. On-state Voltage:** 1.5 VAC rms  
**Insulation Resistance:** 1000 Megohms minimum at 500 VDC  
**Dielectric Strength:** 2500 VAC for 1 minute

### Rear Terminal Connections



### Output 2 / Alarm 1 — Programmable

**Alarm 1 Relay:** Form A, (NO)  
 Maximum rating: 240 VAC, 2 Amp  
**Alarm Functions:** Dwell timer  
 Deviation High / Low Alarm  
 Deviation Band High / Low Alarm  
 Process High / Low Alarm  
 Sensor Break Alarm  
**Alarm Mode:** Normal, Latching, Hold, Latching / Hold  
**Dwell Timer:** 0 - 4553.6 minutes

### Data Communications

**Interface:** RS-232 (1 unit), RS-485 (up to 247 units)  
**Protocol:** Modbus Protocol – RTU mode  
**Address:** 1-247    **Baud Rate:** 0.3 - 38.4 Kbits/sec  
**Data Bits:** 7 or 8 bits    **Parity Bit:** None, Even or Odd  
**Stop Bit:** 1 or 2 bits    **Communication Buffer:** 160 bytes

### User Interface

**Dual 4-digit LED Display:** 0.40" (10 mm) Red Process Display  
 0.31" (8 mm) Green Setpoint Display

**Keypad:** 4 keys

**Programming Port:** For automatic setup, calibration and testing

### Control Mode

**Output 1:** Reverse (heating) or direct (cooling) action  
**Output 2:** PID cooling control, cooling P band 50-300% of PB, dead band -36.0 to 36.0% of PB  
**On-Off:** 0.1 - 90.0 $^\circ\text{F}$  hysteresis control (P band = 0)  
**P or PD:** 0 - 100.0% offset adjustment  
**PID:** Fuzzy logic modified  
**Proportional band:** 0.1 - 900 $^\circ\text{F}$   
**Integral time:** 0 - 1000 seconds  
**Derivative time:** 0 - 360 seconds  
**Cycle Time:** 0.1 - 90 seconds  
**Manual Control:** Heat (MV1) and Cool (MV2)  
**Auto-tuning:** Cold start and warm start  
**Failure Mode:** Auto-transfer to manual mode with sensor break or A-D converter damage  
**Ramping Control:** 0 - 900 $^\circ\text{F}/\text{min}$  or 0 - 900 $^\circ\text{F}/\text{hr}$  ramp rate

### Environmental and Physical

**Operating Temperature:** 14 to 122 $^\circ\text{F}$  (-10 to 50 $^\circ\text{C}$ )  
**Humidity:** 0 to 90% RH, non-condensing  
**Dielectric Strength:** 2000 VAC, 50/60 Hz for 1 minute  
**Dimensions:** 1-7/8  $\times$  1-7/8  $\times$  4-9/16" (48  $\times$  48  $\times$  116 mm) H $\times$ W $\times$ D  
 Depth behind panel: 4-1/8" (105 mm)  
**Panel Cutout:** 1-25/32  $\times$  1-25/32" (45  $\times$  45 mm) H $\times$ W  
**Weight:** 0.33 lb. (150 grams)

### Approval Standards

**Safety:** UL61010C-1, CSA C22.2 No. 24-93  
 EN61010-1 (IEC1010-1)  
**EMC:** EN61326  
**Protective Class:** Front Panel: IP50, optional NEMA 4X/IP65  
 Housing and Terminals: IP 20

### Stock and Common Part Numbers

(Power Input: 90-250 VAC, no data com, no NEMA 4X)

Part Number	Signal Input	Output 1	Output 2	Alarm
TEC14001	tc	relay	relay	none
TEC14002	tc	relay	none	none
TEC14003	tc	relay	none	relay
TEC14004	tc	4-20 mA	none	none
TEC14005	RTD	relay	none	none
TEC14006	RTD	relay	none	relay
TEC14007	RTD	DC pulse	none	none
TEC14008	RTD	DC pulse	none	relay