



### Model TEC-220 1/32 DIN Temperature Controller



**Configurable for 3 Programmable Outputs!**

Agency Approvals:



#### Design Features

- \* 1/32 DIN size – 24 mm × 48 mm
- \* Fuzzy Logic PID heat and cool control
- \* PID Control – Auto-tuning on cold or warm start
- \* Short panel depth – only 3-7/8" (98 mm) required
- \* Universal programmable sensor input
- \* Highly versatile – 6 types of inputs available
- \* Output 2 can be programmed as output or alarm
- \* NEMA 4X / IP65 gasketed front panel
- \* Universal input power, 90-250 VAC or 11-26 VAC/VDC
- \* Highly accurate universal input with 18 bit analog to digital converter
- \* Bumpless transfer to manual mode during sensor failure
- \* Wide variety of alarm mode selections
- \* RS-485 and RS-232 data communications interface optional
- \* Bright 0.40" (10 mm) LED display
- \* High performance at a very low price

**Hardware Code:** TEC-220-



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.**

#### Power Input BOX 1

- 4** = 90-250 VAC
- 5** = 11-26 VAC / VDC
- 9** = Other

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

- 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

#### 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 / Alarm 1 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
- 8** = Isolated 20V @ 25 mA DC, Output Power Supply
- A** = 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)
- B** = Other

#### Communications BOX 5

- 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

#### Units – °F or °C BOX 6

- 1** = °F on faceplate
- 2** = °C on faceplate
- 3** = None (process units)



**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.

**WARNING:** Cancer and Reproductive Harm - [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



### 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:**  $\pm 1.5 \mu V / ^\circ C$  for all inputs except mA input  $\pm 3.0 \mu V / ^\circ C$  for mA input

**Sensor Lead Resistance Effect:** T/C:  $0.2 \mu V / \text{ohm}$   
 3-wire RTD:  $2.6^\circ C / \text{ohm}$  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/ $^\circ C$

### Solid State Relay (Triac) Output

**Rating:** 1A / 240 VAC

**Inrush Current:** 20A for 1 cycle

**Min. Load Current:** 50 mA rms

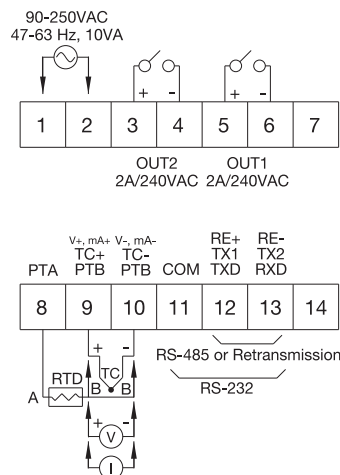
**Max. Off-state Leakage:** 3 mA rms

**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

**Single 4-digit LED Display:** 0.4" / 10 mm

**Keypad:** 3 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 $^\circ F$  hysteresis control (P band = 0)

**P or PD:** 0 - 100.0% offset adjustment

**PID:** Fuzzy logic modified

**Proportional band:** 0.1 - 900 $^\circ F$

**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 $^\circ F$ /min or 0 - 900 $^\circ F$ /hr ramp rate

### Environmental and Physical

**Operating Temperature:** 14 to 122 $^\circ F$  (-10 to 50 $^\circ C$ )

**Storage Temperature:** -40 to 140 $^\circ F$  (-40 to 60 $^\circ C$ )

**Humidity:** 0 to 90% RH, non-condensing

**Dielectric Strength:** 2000 VAC, 50/60 Hz for 1 minute

**Dimensions:** 1-3/64  $\times$  2  $\times$  4-3/8" (26.5  $\times$  50  $\times$  110.5 mm) H $\times$ W $\times$ D  
 Depth behind panel: 3-7/8" (98 mm)

**Panel Cutout:** 7/8  $\times$  1-25/32" (22  $\times$  45 mm) H $\times$ W

**Weight:** 0.26 lb. (120 grams)

### Approval Standards

**Safety:** UL61010C-1, CSA C22.2 No. 24-93

EN61010-1 (IEC1010-1)

**Protective Class:** Front Panel: NEMA 4X / IP65

Housing and Terminals: IP 20

**EMC:** EN61326

### Stock and Common Part Numbers

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

Part Number	Signal Input	Out 1	Out 2 / Alarm 1	$^\circ F / ^\circ C$
TEC03001	tc	relay	none	$^\circ F$
TEC03002	tc	relay	relay	$^\circ F$
TEC03003	tc	4-20 mA	none	$^\circ F$
TEC03004	tc	DC pulse	none	$^\circ F$
TEC03005	RTD	relay	none	$^\circ F$
TEC03006	RTD	DC pulse	none	$^\circ F$
TEC03007	tc	relay	none	$^\circ C$
TEC03008	tc	4-20 mA	none	$^\circ C$
TEC03009	RTD	relay	none	$^\circ C$