Model TEC-220 1/32 DIN Temperature Controller

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

Power Input
- BOX 1
  4 = 90-250 VAC
  5 = 11-26 VAC / VDC
  9 = Other

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

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
  8 = Isolated 20V @ 25 mA DC, Output Power Supply
  A = Isolated 12V @ 40 mA DC, Output Power Supply
  C = Pulse DC for SSR drive: 14 VDC (40 mA max)
  B = 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
  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.
**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: ±24% of span typical  
Maximum Rating: -2 VDC minimum, 12 VDC maximum (1 minute for mA input)  
Temperature Effect: ±1.5 μV / °C for all inputs except mA input ±3.0 μV / °C for mA input  
Sensor Lead Resistance Effect: T/C: 0.2μV/ohm  
3-wire RTD: 2.6°C/ohm of resistance difference of two leads  
Burn-out Current: 200mA  
Common Mode Rejection Ratio (CMRR): 120 dB  
Normal Mode Rejection Ratio (NMRM): 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 66Ω

**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°F hysteresis control (P band = 0)  
P or PD: 0 - 100.0% offset adjustment  
PID: Fuzzy logic modified  
Proportional band: 0.1 - 900°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°F/min or 0 - 900°F/hr ramp rate

**Environmental and Physical**

Operating Temperature: 14 to 122°F (-10 to 50°C)  
Storage Temperature: -40 to 140°F (-10 to 60°C)  
Humidity: 0 to 90% RH, non-condensing  
Dielectric Strength: 2000 VAC, 50/60 Hz for 1 minute  
Dimensions: 7/8 × 2 × 4-3/8" (26.5 × 50 × 110.5 mm) H × W × D  
Ramp-down mode: 1-3/64" (9 mm)  
Power: 11-26 VAC / VDC, 10 VA, 5W maximum  
Weight: 0.26 lb. (120 grams)

**Approval Standards**

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

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Signal Input</th>
<th>Out 1</th>
<th>Out 2 / Alarm 1</th>
<th>°F/°C</th>
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<tbody>
<tr>
<td>TEC03001</td>
<td>tc</td>
<td>relay</td>
<td>none</td>
<td>°F</td>
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<td>°F</td>
</tr>
<tr>
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<td>4-20 mA</td>
<td>relay</td>
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<td>°F</td>
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<tr>
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<td>DC pulse</td>
<td>relay</td>
<td>none</td>
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<td>RTD</td>
<td>relay</td>
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</table>

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