Model TEC-2500 1/32 DIN Temperature Controller

**Design Features**
- 1/32 DIN size – 24 mm x 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
- Heater Break Alarm using 0-50 Amp current transformer
- Output 2 can be programmed as output or alarm
- NEMA 4X / IP65 gasketed front panel
- Alarm 1 – programmable 5 VDC logic output
- Universal input power, 90-264 VAC or 11-26 VAC/VDC
- Bumpless transfer to manual mode during sensor failure
- Power limiter output
- Wide variety of alarm mode selections
- RS-485 and RS-232 data communications interface
- Bright 0.40” (10 mm) LED display
- Fast input sample rate (5 samples/second)
- Automatic programming
- Differential control
- “Soft-Start” ramp and dwell timer
- Analog input for remote setpoint and current transformer
- Event input for changing functions and setpoint
- Hardware lockout plus remote lockout protection
- Loop break alarm
- Analog retransmission
- DC power supply outputs
- High performance at a low price

**Configurable for 4 Programmable Outputs!**

**Hardware Code:** TEC-2500-

### Power Input
**BOX 1**
- **4** = 90-264 VAC
- **5** = 11-26 VAC / VDC
- **9** = Other

### Signal Input
- **1** = Input 1 – Universal input (factory default = tc type J)
- Thermocouple: J, K, T, E, B, R, S, N, L
- RTD: PT100 DIN, PT100 JIS
- Current: 4-20 mA, 0-20 mA
- Voltage: VDC, 0-1, 0-5, 1-5, 0-10
- **Input 2** – not available if RS-232 is specified
- CT: 0 - 50A AC current Transformer (factory default)
- Voltage Input: 0-1V, 0-5V, 1-5V, 0-10V
- **9** = Other

### 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 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

### Alarm 1
**BOX 5**
- **1** = 5 VDC Logic Output
- **9** = Other

### Communications
**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

### Units — °F or °C
**BOX 7**
- **1** = °F on faceplate
- **2** = °C on faceplate
- **3** = None (process units)

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**Transformer for Heater Break Alarm**
- (0-50 Amp current)
- **Part Number:** TEC99999
- Specifications on page 13-43

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**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: 90-264 VAC, 47-63 Hz, 15 VA, 7W maximum
- Optional: 11-26 VAC / VDC, 15 VA, 7W maximum

Signal Input
- Input 1
  - 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
    - 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 (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

- Input 2
  - Resolution: 18 bits
  - Sampling Rate: 1.66 times per second
  - Sensor Break Response Time: 0.5 second
  - Types: Current Transducer: 0 to 50 Amp
    - mA: -3 to 27 mA
    - V: -1.3 to 11.5 VDC
  - Event Input Functions: Select 2nd setpoint and/or PID, disable output 1 and/or output 2, remote lockout, reset alarm 1 and/or alarm 2

Output 1 or Output 2 / Alarm 2
- Relay Rating: 240 VAC, 2 Amp
- Pulsed Voltage: Source voltage 5V,
  - Current limiting resistance 66Ω
- Linear Output — Characteristics

<table>
<thead>
<tr>
<th>Type</th>
<th>Tolerance</th>
<th>Zero</th>
<th>Span</th>
<th>Capacity</th>
<th>Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-20 mA</td>
<td>3.6-4.0 mA</td>
<td>20-21 mA</td>
<td>500Ω max</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-20 mA</td>
<td>0 mA</td>
<td>20-21 mA</td>
<td>500Ω max</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5 VDC</td>
<td>0 VDC</td>
<td>5-5.25 VDC</td>
<td>10 KΩ min</td>
<td></td>
<td></td>
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<tr>
<td>1-5 VDC</td>
<td>0-9.1-10 VDC</td>
<td>5-5.25 VDC</td>
<td>10 KΩ min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-10 VDC</td>
<td>0 VDC</td>
<td>10-10.5 VDC</td>
<td>10 KΩ min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>15 bit analog to digital converter</td>
<td></td>
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</tr>
</tbody>
</table>

- 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

- TEC020007 tc 4-20 mA none °F
- TEC020008 tc 4-20 mA relay °F
- TEC020009 tc 4-20 mA relay °C
- TEC020001 tc relay none °C
- TEC020002 tc relay none °F
- TEC020003 tc relay none °C
- TEC020004 tc relay none °F
- TEC020005 tc relay none °C
- TEC020006 tc relay none °F
- TEC020007 tc relay none °C
- TEC020008 tc relay none °F

- Alarm 1 / Alarm 2
  - Alarm 1: 5 VDC logic output
  - Alarm 2 Relay: Form A, (NO) 
  - Maximum rating: 240 VAC, 2 Amp

- Alarm Functions:
  - Dwell timer
  - Deviation Band High / Low Alarm
  - Loop Break Alarm
  - PV2 High / Low Alarm
  - Sensor Break Alarm

- Alarm Mode: Normal, Latching, Hold, Latching / Hold
  - Dwell Time: 0 - 6553.5 minutes

Data Communications
- Interface: RS-232 (1 unit), RS-485 (up to 247 units)
  - Protocol: Modbus Protocol – RTU mode

User Interface
- Single 4-digit LED Displays: 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 controller, cooling P band 1-255% of PB
  - On-Off: 0.1 - 100.0°F hysteresis control (P band = 0)
  - P or PD: 0 - 100.0% offset adjustment
  - PID: Fuzzy logic modified
    - Proportional band: 0.1 - 900°F (500°C)
    - Integral: 0 - 1000 seconds
    - Derivative: 0 - 360 seconds
  - Cycle Time: 0.1 - 100 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
  - Power Limit: 0 - 100% for output 1 and output 2

Remote Setpoint: Programmable range for voltage or current input

Digital Filter: Time constant: settable from 0.2 to 60 seconds

Analog Retransmission
- Analog Retransmission Functions: PV1, PV2, PV1-PV2, PV2-PV1, setpoint, MV1, MV2, PV-SV deviation value
  - Output Signal: 4-20 / 0-20 mA, 0-1, 0-5, 0-10 VDC

Accuracy: ±0.05% of span, ±0.0025%/°C

Environmental and Physical
- Operating Temperature: 14 to 122°F (-10 to 50°C)
- Storage Temperature: -40 to 140°F (-40 to 60°C)
- Humidity: 0 to 90% RH, non-condensing
- Dielectric Strength: 2000 VAC, 50/60 Hz for 1 minute
- Dimensions: 1-3/4 × 2 × 4-3/8” (26.5 × 50 × 110.5 mm) HxWxD
- Panel Cutout: 7/8 × 1-25/32” (22 × 45 mm) HxW
- Weight: 0.26 lb. (120 grams)

Approval Standards
- Safety Standard: UL 3121-1, CSA C22.2 No. 24-93
  - EN61010-1 (IEC1010-1)
- EMC: EN61325

- Protective Class: Front Panel: NEMA 4X / IP65
  - Housing and Terminals: IP 20

Stock and Common Part Numbers
(Power Input: 90-264 VAC, w/ alarm 1, no data com)