Model TEC-9300 1/16 DIN Temperature Controller

Design Features
- 1/16 DIN size – 48 mm × 48 mm
- Fuzzy Logic PID heat and cool control
- PID Control – Auto-tuning on cold or warm start
- Short panel depth – only 3” (75 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 NO or NC relay
- 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) red LED process display, 0.31” (8 mm) green LED setpoint 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
- Tempco’s most highly featured 1/16 DIN control

Hardware Code: TEC-9300-

Power Input BOX 1
4 = 90-264 VAC
5 = 11-26 VAC / VDC
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
0 = None
1 = Relay: 2A / 240 VAC (NO)
2 = Pulse DC for SSR drive: 5 VDC (30 mA max)
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

Power Input BOX 1
4 = 90-264 VAC
5 = 11-26 VAC / VDC
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

Transformer for Heater Break Alarm
(0-50 Amp current)
Part Number: TEC99999
Specifications on page 13-47

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.
**Model TEC-9500 Specifications (1/16 DIN)**

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

**Signal Input**

<table>
<thead>
<tr>
<th>Input</th>
<th>Resolution</th>
<th>Sampling Rate</th>
<th>Accuracy</th>
<th>Maximum Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18 bits</td>
<td>5 samples / second</td>
<td>±24% of span typical</td>
<td>-2 VDC minimum, 12 VDC maximum (1 minute for mA input)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Temperature Effect: ±1.5 μV / °C for all inputs except mA input ±3.0 μV / °C for mA input</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sensor Lead Resistance: T/C: 0.2μV/ohm 3-wire RTD: 2.6°C/ohm of resistance difference of two leads</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Burn-out Current: 200mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Common Mode Rejection Ratio (CMRR): 120 dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Normal Mode Rejection Ratio (NMRR): 55 dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sensor Break Detection: Sensor open for TC, RTD and mA 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</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sensor Break Response Time: Within 4 seconds for TC, RTD and mA inputs; 0.1 second for 4-20 mA and 1-5 V inputs</td>
</tr>
</tbody>
</table>

**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

**Input 3**
- 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
- Logic Low: -10V min., 0.8V max.
- Logic High: 2V min., 10V max.
- External Pull-Down Resistance: 400KΩ max
- External Pull-Up Resistance: 1.5MΩ min

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

**Output 1**
- Linear Output — Characteristics

<table>
<thead>
<tr>
<th>Type Tolerance</th>
<th>Zero Tolerance</th>
<th>Span 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>
</tr>
<tr>
<td>0-20 mA</td>
<td>0 mA</td>
<td>20-21 mA</td>
<td>500Ω max</td>
</tr>
<tr>
<td>0-5 VDC</td>
<td>0 VDC</td>
<td>5-5.25 VDC</td>
<td>10 KΩ min</td>
</tr>
<tr>
<td>1-5 VDC</td>
<td>0.9-1.0 VDC</td>
<td>5.25 VDC</td>
<td>10 KΩ min</td>
</tr>
<tr>
<td>0-10 VDC</td>
<td>0 VDC</td>
<td>10-10.5 VDC</td>
<td>10 KΩ min</td>
</tr>
<tr>
<td>0-20 VDC</td>
<td>0 VDC</td>
<td>20-21 VDC</td>
<td>500Ω max</td>
</tr>
</tbody>
</table>

**Resolution**: 15 bit analog to digital converter

**Isolation Breakdown Voltage**: 1000 VAC

**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

**Dwell Timer**: 0 - 6553.5 minutes

**Alarm 1 / Alarm 2**

<table>
<thead>
<tr>
<th>Alarm 1 Relay</th>
<th>Form A, (NO)</th>
<th>Maximum rating: 240 VAC, 2 Amp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm 1 Relay</td>
<td>Form A, (NC)</td>
<td>Maximum rating: 240 VAC, 2 Amp</td>
</tr>
</tbody>
</table>

**Alarm Functions**
- Dwell timer
- PV1-PV2 High / Low Alarm
- Deviation Band High / Low Alarm
- Loop Break Alarm
- PV2 High / Low Alarm
- Sensor Break Alarm

**Alarm Mode**: Normal, Latching, Hold, Latching / Hold

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

**User Interface**
- Dual 4-digit LED Display: 0.40" (10 mm) Red Process Display
- Keypad: 3 keys 0.31" (8 mm) Green Setpoint Display
- 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 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, 1-5, 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: 2 x 2 x 3-1/2" (51 x 51 x 89 mm) HxWxD
- Depth behind panel: 3" (75 mm)
- Panel Cutout: 1-25/32 x 1-25/32" (45 x 45 mm) HxW
- Weight: 0.33 lb. (150 grams)

**Approval Standards**
- Safety Standard: UL3121-1 and CSA: C22.2 No. 24-93
- EN61010-1 (IEC1010-1)
- Protective Class: Front panel: NEMA 4X / IP65
- Housing and Terminals: IP 20
- EMC: EN61325

**Stock and Common Part Numbers**
- (Power Input: 90-264 VAC, no data com)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Signal Input</th>
<th>Out 1</th>
<th>Out 2 / Alarm 2</th>
<th>Alarm 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEC13001</td>
<td>tc-J</td>
<td>relay</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>TEC13002</td>
<td>tc-J</td>
<td>relay</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>TEC13003</td>
<td>tc-J</td>
<td>4-20 mA</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>TEC13004</td>
<td>tc-J</td>
<td>4-20 mA</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>TEC13005</td>
<td>tc-J</td>
<td>DC pulse</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>TEC13006</td>
<td>tc-J</td>
<td>DC pulse</td>
<td>none</td>
<td>none</td>
</tr>
</tbody>
</table>