# 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
- PID Control – Auto-tuning on cold or warm start
- 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-<box>1 2 3 4 5 6</box>

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

### Signal Input — Universal, can be programmed in the field BOX 2
- 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 – CT: 0 - 50A AC current Transformer (factory default)
  - Linear Input: 0-1V, 0-5V, 1-5V, 0-10V, 0-20mA, 4-20mA
- Input 3 – Event Input, not available if RS-232 is specified
- 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
- 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

### 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 = Relay: 2A / 240 VAC (NC)
- 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

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

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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 ±3.0 µV / °C for mA input
- Sensor Lead Resistance Effect: 3-wire RTD: 2.6°C/ohm of resistance difference of two leads
- Burn-out Current: 200nA
- Common Mode Rejection Ratio (CMRR): 120 dB
- Normal Mode Rejection Ratio (NMR): 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
- Current: 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

Linear Output — Characteristics
<table>
<thead>
<tr>
<th>Type</th>
<th>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>5-5.25 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>
</tbody>
</table>

Resolution: 15 bit analog to digital converter

Isolation Breakdown Voltage: 1000 VAC

Solid State Relay (Tric) Output
- Rating: 1A / 240 VAC
- Inrush Current: 20A for 1 cycle
- Min. Load Current: 50 mA rms
- Max. Off-state Leakage: 3 mA rns
- Max. On-state Voltage: 1.5 VAC rns
- Insulation Resistance: 1000 Megohms minimum at 500 VDC
- Dielectric Strength: 2500 VAC for 1 minute

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
- 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

Alarm 1 / Alarm 2
- Alarm 1 Relay: Form A, (NO) Maximum rating: 240 VAC, 2 Amp
- Alarm 1 Relay: Form A, (NC) Maximum rating: 240 VAC, 2 Amp
- 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
- Dwell Timer: 0 - 6553.5 minutes

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

Analogue 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

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- Operating Temperature: 14 to 122°F (-10 to 50°C)
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- 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>relay</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>TEC13004</td>
<td>tc-J</td>
<td>relay</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>

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