Temperature Controllers

Model TEC-9100 1/16 DIN Temperature Controller

Configurable for 4 Programmable Outputs and optional NEMA 4X/IP65 Front Panel!

Design Features
- 1/16 DIN size – 48 mm × 48 mm
- Fuzzy Logic PID Autotune heat & cool control
- Short panel depth – only 4-1/8" (105 mm) required
- Universal input, field configurable (Type J/T/C default, PT100, mA, V) with high accuracy 18-bit D-A
- Highly versatile – 6 types of output available
- Output 2 can be programmed as output or alarm
- Universal input power – 90-250 VAC or 11-26 VAC/VDC
- Highly accurate universal input
- Optional NEMA 4X/IP65 front panel
- Bumpless transfer to manual mode during sensor failure
- Wide variety of alarm mode selections
- Optional RS-232 or RS-485 communications interface
- Bright 0.40" (10 mm) red LED process display 0.31" (8 mm) green LED setpoint display
- High performance at a very low price

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

Hardware Code: TEC-9100-

Signal Input— Universal, can be programmed 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 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 BOX 5
0 = None
1 = Relay: 2A / 240 VAC, SPDT
9 = Other

Communication 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

Case Options BOX 7
0 = Panel mount standard
1 = Panel mount with NEMA 4X/IP65 front panel
2 = DIN rail mount adapter

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.

Agency Approvals: RoHS

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**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: ±2.4% 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

**Output 1 / Output 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>Zero Tolerance</th>
<th>Span Tolerance</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
- 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: ±0.01% of span/°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

- RS-232: TXD, RXD, COM
- RS-485: TX1, TX2

**Output 2 / Alarm 1 — Programmable**
- Alarm 1 Relay: Form A, (NO)
- Maximum rating: 240 VAC, 2 Amp
- Alarm Functions:
  - 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
- Data Bits: 7 or 8 bits
- Stop Bit: 1 or 2 bits
- Communication Buffer: 160 bytes

**User Interface**
- Dual 4-digit LED Display: 0.40" (10 mm) Red Process Display
- 0.51" (8 mm) Green Setpoint Display
- Keypad: 4 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)
- Humidity: 0 to 90% RH, non-condensing
- Dielectric Strength: 2000 VAC, 50/60 Hz for 1 minute
- Dimensions: 1-7/8" × 1-7/8" × 4-9/16" (48 × 48 × 116 mm) H×W×D
- Panel Cutout: 1-25/32" × 1-25/32" (45 × 45 mm) H×W
- Weight: 0.33 lb. (150 grams)

**Approval Standards**
- Safety: UL61010-1, CSA C22.2 No. 24-93
- EMC: EN61326
- Protective Class: Front Panel: IP50, optional NEMA 4X/IP65
- Housing and Terminals: IP 20

**Stock and Common Part Numbers**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Signal Input</th>
<th>Output 1</th>
<th>Output 2</th>
<th>Alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEC14001</td>
<td>tc</td>
<td>relay</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>TEC14002</td>
<td>tc</td>
<td>relay</td>
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<td>none</td>
</tr>
<tr>
<td>TEC14003</td>
<td>tc</td>
<td>relay</td>
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<td>none</td>
</tr>
<tr>
<td>TEC14004</td>
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<td>4-20 mA</td>
<td>relay</td>
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</tr>
<tr>
<td>TEC14005</td>
<td>RTD</td>
<td>relay</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>TEC14006</td>
<td>RTD</td>
<td>relay</td>
<td>none</td>
<td>none</td>
</tr>
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<td>TEC14007</td>
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<td>DC pulse</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>TEC14008</td>
<td>RTD</td>
<td>DC pulse</td>
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<td>none</td>
</tr>
</tbody>
</table>

**Model TEC-9100 Specifications (1/16 DIN)**

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