TEC-805
1/8 DIN Solid State Temperature Controller
Relay Output–Solid State Output–For Heating
The TEC-805 is designed to fit panel cutouts that are 1.781" (45mm) x 3.625" (92mm). 3" minimum depth is required to provide clearance for rear terminal connections.

**Input**
- Thermocouple (T/C): Type K, J. See Control label.
- RTD: 3-wire PT100 DIN or JIS
- Cold junction compensation: Automatic
- Input break protection: Built-in, upscale on open sensor and output off
- Input impedance: 10M ohm
- Common mode rejection (CMR): CMRR 120dB, min.
- Normal mode rejection (NMR): NMRR 60dB, min. (60Hz)

**Control Output**
- Relay—heating: SPDT relay, 5 amps max resistive load at 120V, 240VAC, or 24VDC
  - Optional:
    - 20VDC: For output to solid state relay
    - 4–20mA: For output to SCR
- Relay—alarm: SPST relay, 2 amps max resistive load at 120V or 240VAC

**Control Modes**
- On-Off: Differential 0.5% of full-scale range
- Proportional: Proportional Band fixed at 2.5% of range. Proportional Cycle time 20 seconds for relay controls, 1 second for SSR controls

**Indication**
- Output: Red LED lit, heater on/LED not lit, heater off.

**Set Point**
- Resolution: ±1 Least significant digit
- Accuracy: ±1% of span
- Repeatability: ±1 significant digit
- Manual Reset: Adjustable up to 2.6% of span

**Power**
- Rating: 90–264VAC, 50/60Hz.
- Consumption: Less than 3VA.

**Environmental and Physical**
- Operating Temperature: 32–122°F (0–50°C)
- Humidity: 0–90% RH (non-condensing)
- Insulation: 20M ohm min. (500VDC)
- Breakdown: 2000VAC, 50/60Hz, 1 minute
- Vibration: 10–55Hz, amplitude 1.0mm
- Shock: 660ft/s² (20g)
- Weight: 8oz. (227g)

**Dimensions**
- Height: 3.75" (96mm) x Width: 1.875" (48mm) x Depth: 3.125" (80mm)
- Depth behind panel: 2.559" (65mm)
- Panel cutout: 1.871" x 3.625" (46mm x 92mm)
- DIN case: Plastic full plug-in construction with screw terminals on rear and adjustable brackets for panel mounting.
Mounting
When mounting one of these instruments, make sure the control and
the ambient temperature remain within the 10–125°F range. The
control may be mounted in any position. Once the control has been
inserted into the panel, use the two mounting brackets provided with
the unit to secure it. Use light to moderate pressure.

Manual Reset Adjustment
The reset adjustment is located on the front of the control. Approximately half an hour after adjusting the set point, when the
process stabilizes, it may become necessary to adjust “reset” as well.
Start with the reset adjustment pointing to zero. If the temperature
indication stabilizes above the set point, adjust the reset to the
“minus” side; if the temperature stabilizes below the set point, adjust
to the “plus” side. Continue making adjustments until the temperature
indication stabilizes at the set point. Make sure to allow 15 minutes
between adjustments for stabilization.

Wiring
All wiring should conform to local and national codes.

When wiring the thermocouple, make sure that the thermocouple and
extension wire conform to the thermocouple type specified by the
instrument. The thermocouple and the extension wires must have the
same polarity and be the same alloy. For accurate measurements, the
total lead resistance should not exceed 100 ohms.

To assure effective lead resistance compensation when wiring three
wire RTDs (Resistance Temperature Detectors), make sure that all of
the leads that connect to the controller are the same gauge and
composition. Connect the two common wires of the three wire RTD to
terminals 17 and 18. When using a two wire RTD, install a jumper
between terminals 17 and 18.

WARNINGS
1. Dangerous voltages may be present in these
instruments. Before installation or troubleshooting,
switch off and isolate power to all equipment. If a unit
is suspected of being faulty, it should be disconnected
and removed to a properly equipped workshop for
testing and repair. Component replacement and
internal adjustments should be performed by qualified
maintenance personnel only.

2. To minimize the risk of fire or shock hazards, avoid
exposing these instruments to rain or excessive
moisture.

3. Do not use these instruments in areas that are prone to
hazardous conditions such as excessive shock,
vibration, dirt, moisture, corrosive gases, or oil. The
ambient temperature of the areas should not exceed
the maximum rating specified.
Wiring Precautions:
- Before wiring, verify the correct model number and options on the label. Switch off the power while checking.
- Care must be taken to ensure that the maximum voltage rating specified on the label is not exceeded.
- It is recommended that the power for these units be protected by fuses or circuit breakers rated at the minimum value possible.
- All units should be installed in a suitable enclosure to prevent live parts from being accessible to human hands and metal tools. Metal enclosures and/or subpanels should be grounded in accordance with national and local codes.
- All wiring must conform to appropriate standards of good practice and local codes and regulations. Wiring must be suitable for the voltage, current, and temperature rating of the system.
- Beware not to over-tighten the terminal screws. The torque should not exceed 1 N-m (8.9 lb-in or 10 KgF-cm).
- Unused control terminals should not be used as jumper points as they may be internally connected, causing damage to the unit.
- Verify that the ratings of the output devices and the inputs as specified are not exceeded.
- Except for thermocouple wiring, all wiring should use stranded copper conductor with a maximum gage of 14 AWG.
- Electrical power in industrial environments contains a certain amount of noise in the form of transient voltage and spikes. This electrical noise can adversely affect the operation of microprocessor-based controls. For this reason the use of shielded thermocouple extension wire which connects the sensor to the controller is strongly recommended. This wire is a twisted-pair construction with foil wrap and drain wire. The drain wire is to be attached to ground in the control panel only.

General Operation
Adjust the digital set point to the temperature desired. The “OUT” lamp will glow red, indicating that the control is calling for heat, and the relay is closed. As the process temperature approaches the set point, the control will begin to cycle the heaters on and off. When the heater load is turned off, the “OUT” lamp will not be lit. The actual process temperature measured by the sensor is indicated on the digital LED display.

Calibration Instructions
Calibration is performed using the four potentiometers located on the bottom of the left-hand circuit board. Open the control by unlatching the clamps on the top and bottom of the front of the control. Allow the control to warm up for at least half an hour before checking the calibration. The functions of the potentiometers is as follows:
- VR1 Low scale calibration
- VR2 Low scale switching point
- VR3 High scale switching point
- VR4 High scale calibration

You must set the “reset” adjustment to zero before calibration. VR1 and VR4 affect each other, so you should calibrate low scale and high scale at least three times each.

Alarm Operation (Optional)
The TEC-805 has the option of coming equipped with a form-A relay that can be used as a deviation alarm. It is called a deviation alarm because the alarm set point maintains the same deviation from the control set point, so if the control set point is changed, the alarm set point will change with it. The relay is rated for a maximum load of 2 amps, 240 volts. On units that have been ordered with the alarm option, there will be an alarm set point adjustment on the front of the control. The alarm can be adjusted from 0–10% of the range of the control from the set point, in either direction. If the alarm adjustment is set to the positive side, it will act as a deviation high alarm, if it is set to the negative side, it will act as a deviation low alarm. If it is set at 0, the alarm will energize at the control set point.

WARNING:
Failure of the thermocouple-RTD sensor, heater output relay, temperature control, or other devices can result in severe damage to a product while in process, melting of the heater, or a damaging fire. An over-temperature protection device must be included in your process that will remove all power from the heater circuit if any of the above failures occur. It is recommended that this device be classified as a safety control. Failure to install such a device where a potential hazard exists could result in damage to equipment and property, and injury to personnel.

Troubleshooting
Common causes of failures:
- Line wires improperly connected
- Incorrect voltage between line terminals
- No voltage between line terminals
- Connections to terminals are loose, open, or missing
- Short across terminals
- Shorted thermocouple leads
- Thermocouple is open at tip
- Thermocouple lead is broken
- Open or shorted heater circuit
- Open coil in external contactor
- Burned out contactor
- Burned out line fuses
- Defective line switches
- Defective circuit breakers.

If the control still does not function after these points have been checked, the instrument should be returned to Tempco for inspection. Make sure to use adequate packing materials to prevent damage during shipment.

Note that no products returned can be accepted without a completed Return Material Authorization (RMA) form.
### Function of Solder Gaps J1–J11

<table>
<thead>
<tr>
<th>Location</th>
<th>Short</th>
<th>Open</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1</td>
<td>x</td>
<td></td>
<td>T/C type J or K</td>
</tr>
<tr>
<td>“</td>
<td>x</td>
<td></td>
<td>PT100 ohms DIN or JIS</td>
</tr>
<tr>
<td>J2</td>
<td>x</td>
<td></td>
<td>Reverse control</td>
</tr>
<tr>
<td>“</td>
<td>x</td>
<td></td>
<td>Direct control</td>
</tr>
<tr>
<td>J3</td>
<td>x</td>
<td></td>
<td>100°C span</td>
</tr>
<tr>
<td>J4</td>
<td>x</td>
<td></td>
<td>200°C span</td>
</tr>
<tr>
<td>J5</td>
<td>x</td>
<td></td>
<td>300°C span</td>
</tr>
<tr>
<td>J6</td>
<td>x</td>
<td></td>
<td>400°C span</td>
</tr>
<tr>
<td>J7</td>
<td>x</td>
<td></td>
<td>460°C span</td>
</tr>
<tr>
<td>J8</td>
<td>x</td>
<td></td>
<td>600°C span</td>
</tr>
<tr>
<td>J9</td>
<td>x</td>
<td></td>
<td>800°C span</td>
</tr>
<tr>
<td>J10</td>
<td>x</td>
<td></td>
<td>1200°C span</td>
</tr>
<tr>
<td>J11</td>
<td>x</td>
<td></td>
<td>ON-OFF control</td>
</tr>
<tr>
<td>“</td>
<td>x</td>
<td></td>
<td>Time proportional control</td>
</tr>
</tbody>
</table>

### Function of Solder Gaps J12–J13

<table>
<thead>
<tr>
<th>J12</th>
<th>J13</th>
<th>Cycle time</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short</td>
<td>Short</td>
<td>20 sec.</td>
<td>Relay output</td>
</tr>
<tr>
<td>Open</td>
<td>Short</td>
<td>1 sec.</td>
<td>SSR drive</td>
</tr>
<tr>
<td>Open</td>
<td>Open</td>
<td>0.02 sec.</td>
<td>Linear current or voltage output</td>
</tr>
</tbody>
</table>

### Function of Solder Gaps J14–J15

<table>
<thead>
<tr>
<th>J14</th>
<th>J15</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short</td>
<td>Open</td>
<td>Positive setting</td>
</tr>
<tr>
<td>Open</td>
<td>Open</td>
<td>Positive and negative setting</td>
</tr>
<tr>
<td>Open</td>
<td>Short</td>
<td>Negative setting</td>
</tr>
</tbody>
</table>

### Ordering Code:

**TEC-805-**

- **Power Input** *BOX 1*
  - 4 = 90-264 VAC  50/60 Hz

- **Signal Input** *BOX 2*
  - 1 = Thermocouple: Type J
  - 2 = Thermocouple: Type K
  - 3 = RTD: 100 ohm PT, DIN 0.00385
  - 4 = RTD: 100 ohm PT, JIS 0.00392
  - 9 = Other

- **Range code** *BOX 3*
  - X = 0 to 499°F
  - V = 0 to 999°F
  - W = 0 to 1999°F
  - C = 0 to 299°C
  - E = 0 to 499°C
  - H = 0 to 999°C
  - Other ranges are available for large volume orders. Consult Tempco for more information.

- **Control Mode** *BOX 4*
  - 1 = On - Off (used for valves and solenoids)
  - 2 = Proportional (common for electric heaters)

- **Output 1** *BOX 5*
  - 1 = Relay: 5A / 240 VAC
  - 2 = Pulse dc for SSR drive: 20 VDC (20 mA max)
  - 3 = 4-20 mA, linear (max load 500 ohms)
  - 4 = 0-20 mA, linear (max load 500 ohms)
  - 5 = 0-10 VDC, linear (min. impedance 500K ohms)
  - 9 = Other

- **Output 2** *BOX 6*
  - 0 = Not Available

- **Alarm** *BOX 7*
  - 0 = None
  - 1 = Relay: 2A / 240 VAC
    - Deviation alarm

- **Communication** *BOX 8*
  - 0 = Not Available

### RETURNS

No product returns can be accepted without a completed Return Material Authorization (RMA) form.

### TECHNICAL SUPPORT

Technical questions and troubleshooting help is available from Tempco. When calling or writing please give as much background information on the application or process as possible.

**TEMPCO Electric Heater Corporation**

607 N. Central Avenue
Wood Dale, IL 60191-1452 USA

E-mail: techsupport@tempco.com

Phone: 630-350-2252   Toll Free: 800-323-6859

Web: Tempco.com

**Note:** Information in this manual was deemed correct at the time of printing. The policy of Tempco is one of continuous development and product improvement, and we reserve the right to modify specifications and designs without prior notice. Not responsible for typographical errors.
HEAT THINGS UP!
With Thousands of Design Variations
We Make Everything You Need.

Band Heaters  
Cast-In Heaters  
Radiant Heaters  
Flexible Heaters  
Process Heaters  
Temperature Control

Cartridge Heaters  
Coil & Cable Heaters  
Strip Heaters  
Tubular Heaters  
Instrumentation  
Temperature Sensors