Temperature Controllers

Model TEC-4100 1/4 DIN

Model TEC-4100 1/4 DIN Temperature Controller

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

Design Features

- *1/4 DIN size – 96 mm × 96 mm*
- *Fuzzy Logic PID heat and cool control*
- *PID Control – Auto-tuning on cold or warm start*
- *Short panel depth – only 2" (53 mm) required*
- *Universal programmable sensor input*
- *Highly versatile – 6 types of inputs available*
- *Output 2 can be used for cooling function*
- *Universal input power— 90-250 VAC or 11-26 VAC/VDC*
- *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 0.55" (14 mm) red LED process display and 0.40" (10 mm) green LED setpoint display*
- *High performance at a low price*
- *Agency Approvals:*

Ordering Code:

TEC-4100- [1] [2] [3] [4] [5] [6] [7]

Power Input *BOX 1*
4 = 90-250 VAC
5 = 11-26 VAC / VDC
9 = Other

Signal Input — Universal, can be programmed in the field for item 5 or 6 *BOX 2*
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

NEMA 4X / IP65 *BOX 7*
0 = No
1 = Yes

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.**

Temperature Controllers

Model TEC-4100 Specifications (1/4 DIN)

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: ±.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: T/C: 0.2μV/ohm
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 (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

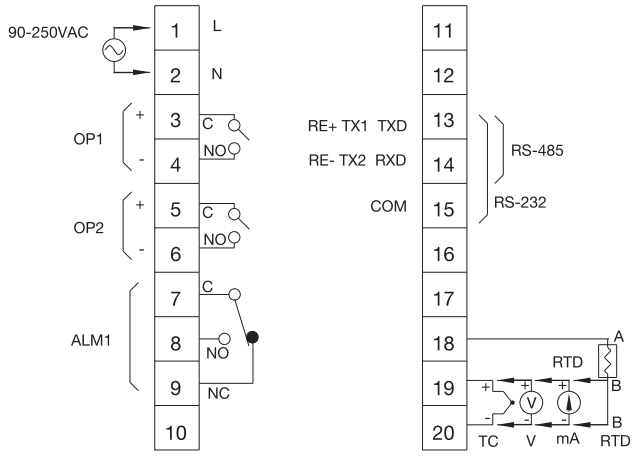
Output 1 / Output 2
Relay Rating: 240 VAC, 2 Amp
Pulsed Voltage: Source voltage 5V, Current limiting resistance 66Ω

Linear Output — Characteristics

Type Tolerance	Zero Tolerance	Span Capacity	Load
4-20 mA	3.6-4.0 mA	20-21 mA	500Ω max
0-20 mA	0 mA	20-21 mA	500Ω max
0-5 VDC	0 VDC	5-5.25 VDC	10 KΩ min
1-5 VDC	0.9-1.0 VDC	5-5.25 VDC	10 KΩ min
0-10 VDC	0 VDC	10-10.5 VDC	10 KΩ min

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



Alarm 1 — Programmable
Alarm 1 Relay: Form A, (NO)
Maximum rating: 240 VAC, 2 Amp
Alarm Functions: Dwell timer
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 **Baud Rate**: 0.3 - 38.4 Kbits/sec
Data Bits: 7 or 8 bits **Parity Bit**: None, Even or Odd
Stop Bit: 1 or 2 bits **Communication Buffer**: 160 bytes

User Interface
Dual 4-digit LED Display: 0.55" (14 mm) Red Process
0.40" (10 mm) Green Setpoint
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
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)
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: 3-3/4 × 3-3/4 × 2-9/16" (96 × 96 × 65 mm) H×W×D
Depth behind panel: 2" (53 mm)
Panel Cutout: 3-5/8" × 3-5/8" (92 × 92 mm) H×W
Weight: 0.55 lb. (250 grams)

Approval Standards
Safety Standard: UL61010C-1
CSA C22.2 No. 24-93
EN61010-1 (IEC1010-1)
Protective Class: IP 50 front panel standard, all indoor use.
NEMA 4X/IP65 front panel if specified.
IP 20 housing and terminals with protective cover.
EMC: EN61326

Stock and Common Part Numbers
(Power Input: 90-250 VAC, no data com, no NEMA 4X)

Part Number	Input	Out 1	Out 2	Alarm
TEC56001	tc	relay	none	relay
TEC56002	tc	relay	none	none
TEC56003	tc	4-20 mA	none	none
TEC56004	tc	dc pulse	none	none
TEC56005	RTD	relay	none	none
TEC56006	RTD	DC pulse	none	none
TEC56007	RTD	DC pulse	relay	none
TEC56008	RTD	DC pulse	none	relay

Temperature Controllers

Model TEC-7100 3/16 DIN

Model TEC-7100 3/16 DIN Temperature Controller

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

Design Features

- *3/16 DIN size – 72 mm × 72 mm*
- *Fuzzy Logic PID heat and cool control*
- *PID Control – Auto-tuning on cold or warm start*
- *Short panel depth – only 2-9/16" (65 mm) required*
- *Universal programmable sensor input*
- *Highly versatile – 6 types of inputs available*
- *Output 2 can be used for cooling function*
- *Universal input power – 90-250 VAC or 11-26 VAC/VDC*
- *Optional NEMA 4X/IP65 front panel*
- *Bumpless transfer to manual mode during sensor failure*
- *Wide variety of alarm mode selections*
- *Optional 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 low price*
- *Agency Approvals:*

Ordering Code:

Power Input *BOX 1*
4 = 90-250 VAC
5 = 11-26 VAC / VDC
9 = Other

TEC-7100- [1] [2] [3] [4] [5] [6] [7]

Signal Input— Universal, can be programmed in the field for item 5 or 6 *BOX 2*
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
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

NEMA 4X / IP65 *BOX 7*
0 = No
1 = Yes

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.**

Temperature Controllers

Model TEC-7100 Specifications (3/16 DIN)

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: ±.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: T/C: 0.2μV/ohm
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 (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

Output 1 / Output 2

Relay Rating: 240 VAC, 2 Amp

Pulsed Voltage: Source voltage 5V, Current limiting resistance 66Ω

Linear Output — Characteristics

Type Tolerance	Zero Tolerance	Span Capacity	Load
4-20 mA	3.6-4.0 mA	20-21 mA	500Ω max
0-20 mA	0 mA	20-21 mA	500Ω max
0-5 VDC	0 VDC	5-5.25 VDC	10 KΩ min
1-5 VDC	0.9-1.0 VDC	5-5.25 VDC	10 KΩ min
0-10 VDC	0 VDC	10-10.5 VDC	10 KΩ min

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

Approval Standards

Safety Standard: UL61010C-1
CSA C22.2 No. 24-93
EN61010-1 (IEC1010-1)

Protective Class: IP65 front panel with additional option
IP 50 front panel without additional option, all indoor use
IP 20 housing and terminals with protective cover

EMC: EN61326

Stock and Common Part Numbers

(Power Input: 90-250 VAC, no data com, no NEMA 4X)

Part Number	Signal Input	Out 1	Out 2	Alarm
TEC42001	tc	relay	none	none
TEC42002	tc	relay	relay	relay
TEC42003	tc	4-20 mA	none	none
TEC42004	tc	DC pulse	none	none
TEC42005	RTD	relay	none	none
TEC42006	RTD	DC pulse	none	none
TEC42007	RTD	DC pulse	relay	none
TEC42008	RTD	DC pulse	relay	relay

Alarm 1 — Programmable

Alarm 1 Relay: Form A, (NO)

Alarm 1 Relay: Form A, (NC), Maximum rating: 240 VAC, 2 Amp

Alarm Functions: Dwell timer
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-485 (up to 247 units)

Protocol: Modbus Protocol – RTU mode

Address: 1-247 **Baud Rate**: 0.3 - 38.4 Kbits/sec
Data Bits: 7 or 8 bits **Parity Bit**: None, Even or Odd
Stop Bit: 1 or 2 bits **Communication Buffer**: 160 bytes

User Interface

Dual 4-digit LED Display: 0.40" (10 mm) Red Process Display
0.31" (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

On-Off: 0.1 - 100.0°F hysteresis control (P band = 0)

P or PD: 0 - 90.0% 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)

Storage Temperature: -40 to 140°F (-40 to 60°C)

Humidity: 0 to 90% RH, non-condensing

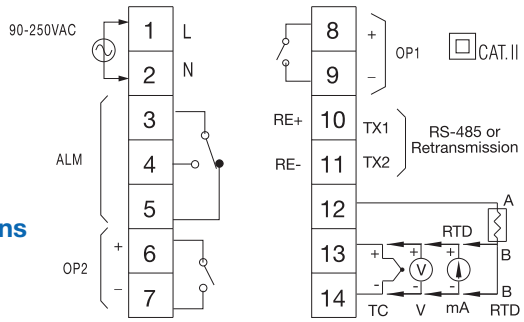
Dielectric Strength: 2000 VAC, 50/60 Hz for 1 minute

Dimensions: 2-27/32 × 2-27/32 × 3" (72 × 72 × 78 mm) H×W×D
Depth behind panel: 2-9/16" (65 mm)

Panel Cutout: 2-11/16" × 2-11/16" (68 × 68 mm) H×W

Weight: 0.44 lb. (200 grams)

Rear Terminal Connections



Temperature Controllers

Model TEC-920 1/16 DIN

Model TEC-920 1/16 DIN Temperature Controller

Single Display, Configurable for 2 Programmable Outputs!

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 3-3/8" (86 mm) required*
- *Universal programmable sensor input*
- *Highly versatile – 6 types of inputs 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 with 18 bit analog to digital converter*
- *Bumpless transfer to manual mode during sensor failure*
- *Wide variety of alarm mode selections*
- *Optional RS-485 communications interface*
- *Bright 0.40" (10 mm) LED display*
- *High performance at a very low price*
- *Agency Approvals:*

Ordering Code: TEC-920- [1] [2] [3] [4]

Power Input BOX 1
4 = 90-250 VAC
5 = 11-26 VAC / VDC
9 = Other

Signal Input— Universal, can be programmed in the field for item 5 or 6 BOX 2
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 / Alarm 1 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 = RS-485 Data Interface
8 = Isolated 20V @ 25 mA DC, Output Power Supply
A = 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)
B = Other

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.**

Temperature Controllers

Model TEC-920 Specifications (1/16 DIN)

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: ±.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: T/C: 0.2μV/ohm
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 (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

Output 1 / Output 2

Relay Rating: 240 VAC, 2 Amp

Pulsed Voltage: Source voltage 5V, Current limiting resistance 66Ω

Linear Output — Characteristics

Type	Zero Tolerance	Span Capacity	Load
4-20 mA	3.6-4.0 mA	20-21 mA	500Ω max
0-20 mA	0 mA	20-21 mA	500Ω max
0-5 VDC	0 VDC	5-5.25 VDC	10 KΩ min
1-5 VDC	0.9-1.0 VDC	5-5.25 VDC	10 KΩ min
0-10 VDC	0 VDC	10-10.5 VDC	10 KΩ min

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

Output 2 / Alarm 1 — Programmable

Alarm 1 Relay: Form A, (NO)
Maximum rating: 240 VAC, 2 Amp

Alarm Functions: Dwell timer
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

Interface: RS-485 (up to 247 units)

Protocol: Modbus Protocol – RTU mode

Address: 1-247 **Baud Rate**: 0.3 - 38.4 Kbits/sec
Data Bits: 7 or 8 bits **Parity Bit**: None, Even or Odd
Stop Bit: 1 or 2 bits **Communication Buffer**: 160 bytes

User Interface

Single 4-digit LED Displays: 0.4" / 10 mm **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)

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: 1-7/8 × 1-7/8 × 3-3/4" (48 × 48 × 94 mm) H×W×D
Depth behind panel: 3-3/8" (86 mm)

Panel Cutout: 1-25/32 × 1-25/32" (45 × 45 mm) H×W

Weight: 0.31 lb. (140 grams)

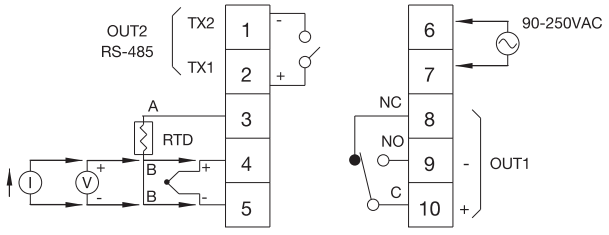
Approval Standards

Safety: UL61010C-1, CSA C22.2 No. 24-93
EN61010-1 (IEC1010-1)

EMC: EN61326

Protective Class: Front Panel: IP30
Housing and Terminals: IP 20

Rear Terminal Connections



Stock and Common Part Numbers

(Power Input: 90-250 VAC)

Part Number	Signal Input	Out 1	Out 2/ Alarm1
TEC15001	tc	relay	none
TEC15002	tc	relay	relay
TEC15003	tc	4-20 mA	none
TEC15004	tc	DC pulse	none
TEC15005	RTD	relay	none
TEC15006	RTD	DC pulse	none
TEC15007	RTD	DC pulse	relay

Temperature Controllers

Model TEC-9300 1/16 DIN

Model TEC-9300 1/16 DIN Temperature Controller

Configurable with 4 Programmable Outputs and Standard NEMA 4X/IP65 Front Panel!

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*

Ordering Code:

TEC-9300- 1 2 3 4 5 6

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
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 = 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

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

Agency Approvals: **RoHS**

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.**

Temperature Controllers

Model TEC-9300 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
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: T/C: 0.2μV/ohm
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 (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

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

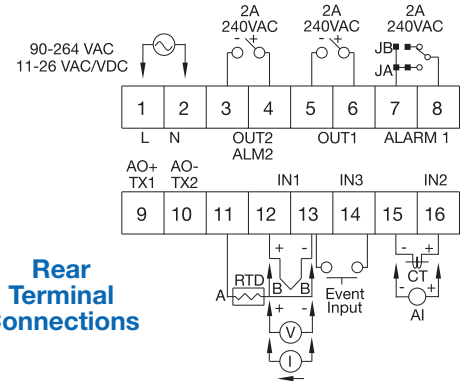
Linear Output — Characteristics

Type Tolerance	Zero Tolerance	Span Capacity	Load
4-20 mA	3.6-4.0 mA	20-21 mA	500Ω max
0-20 mA	0 mA	20-21 mA	500Ω max
0-5 VDC	0 VDC	5-5.25 VDC	10 KΩ min
1-5 VDC	0.9-1.0 VDC	5-5.25 VDC	10 KΩ min
0-10 VDC	0 VDC	10-10.5 VDC	10 KΩ min

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



Rear Terminal Connections

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

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 × 2 × 3-1/2" (51 × 51 × 89 mm) H×W×D
Depth behind panel: 3" (75 mm)

Panel Cutout: 1-25/32 × 1-25/32" (45 × 45 mm) H×W

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)

Part Number	Signal Input	Out 1	Out 2/ Alarm 2	Alarm 1
TEC13001	tc-J	relay	none	none
TEC13002	tc-J	relay	relay	none
TEC13003	tc-J	4-20 mA	none	none
TEC13004	tc-J	4-20 mA	relay	none
TEC13005	tc-J	DC pulse	none	none
TEC13006	tc-J	DC pulse	relay	none