

Temperature Controls Power Supplies

CONTROLS

BEHIND PANEL

CONTROLLERS

THROUGH PANEL, 1/32 DIN

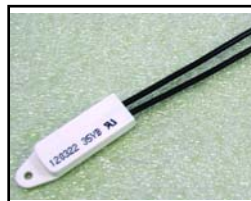
TC-3400 page 134
PID Controller



SWITCHES

TEMPERATURE SWITCHES AND RELAYS

TC-1F page 138
For cool and heat/cool
air conditioners
single set point
120/240 VAC; 12/24/48 VDC



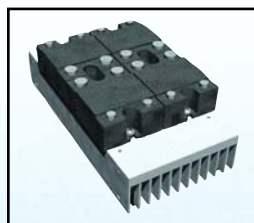
TC-3F page 138
For heat/cool air conditioners
two preset setting 35C and 15C
120/240 VAC; 12/24 VDC



ACCESSORIES

TC ACCESSORIES, POWER SUPPLIES

Relay Packs page 139
Single, Dual and Quad relay
packs for cool only, heat/cool
and reverse polarity
applications



Sensors page 140
Thermocouples, RTD's and
probes



TC-4600 page 132
PWM Controller



TC-3500 page 136
PID Controller



TC-6F page 138

For cool only air conditioners
three preset setting 35C, 25C
& continuous
120/240 VAC, 12/24/48 VDC

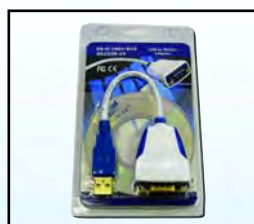


TC-7F page 138

For Heat/cool air conditioners
two preset setting 35C, 10C
& 20C heat exchanger mode
24 VDC

Comms page 140

RS-232 board, USB-RS232
converter, comms cable



Power Supplies

page 141

Switching power supplies



TC-4600 Temperature Controller

PWM Temperature Control
RS-232 Comms.

Pulse Width Modulating Temperature Controller

OVERVIEW

The TC-4600 is a bi-directional (heat/cool), H-bridge controller designed to control thermoelectric cooling/heating units with the option to set as unidirectional. The controller accepts an input voltage of 12-36VDC. The output voltage can range from 0 to 36VDC if a split supply is used. The load circuit is pulse width modulated at 2.7KHz and delivers a load of 0.1 to 25 Amps. Temperature resolution for this controller is 0.01°C, providing exceptional control stability in a well designed thermal system.

The H-bridge configuration allows for a seamless transition between heating and cooling. Using a PC with an RS232 interface, the controller can be set for any of the following control configurations: On/Off control, differential temperature control, manual control or any combination of PID control. The user friendly software requires no programming experience to set up the controller. The RS232 interface has 1500 VAC isolation from all the electronic circuitry minimizing the interference from noise or errant signals. Once the controller is set up, the computer may be disconnected and the controller becomes a stand alone unit. If the computer is left connected, it can be used for data acquisition in a half duplex mode.

The temperature may also be set through the optional display or through a remote potentiometer. The PC software also provides for several alarm types and the controller has 3 outputs for alarms with a 5VDC output rated for 25mA of current. In the set up menu the alarm function may be set as no alarm, tracking alarm, fixed value alarm or computer controlled alarm. The menu also offers selections for latching and for maintaining or cutting the power during an alarm. The alarm sensor may be the control temperature sensor or a secondary sensor.



FEATURES

- Full H-Bridge Control
- Fully PC Programmable
- P,I,D or On/Off Control
- PC Configurable Alarm Circuit
- 0-36VDC Output Using Split Power Supply
- RS232 Communication Port
- RoHS Compliant
- Set Temperature range of -40°C to 250°C dependent on sensor selection

ACCESSORIES

- Model TC-4600D Display: 4 Digit temperature readout for displaying set temperature or actual temperature with capability to adjust the set temperature.
- HS optional Heat Sink: Recommended for applications using 15A of load or greater.
- Thermistor-K: 2000 Ω +/- 2% at 25 °C, best for (-20 °C to 30 °C) range
- Thermistor-Z: 10000 Ω +/- 2% at 25 °C, best for (0 °C to 50 °C) range

SPECIFICATIONS

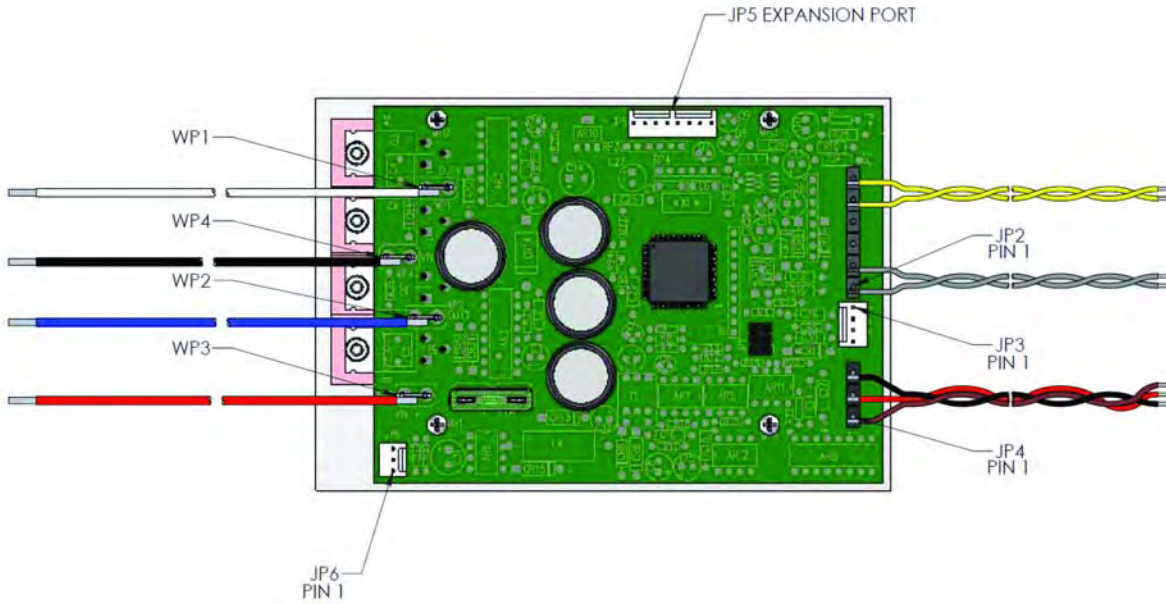
- Input Voltage: 12VDC to 36VDC
- Output Voltage: 0 to 36VDC with split supply
- Load Current: 0.1A to 25A
- Bandwidth: 0.1°C to 50°C
- Integral: 0 to 10 repeats per minute
- Derivative: 0 to 10 minutes
- PWM Base Frequency: 2.7 KHz
- Ambient Temperature range: -20°C to 70°C
- Power Dissipation: <10 Watts
- Process Control Rate: 90 times per second
- Output Power Resolution: $\pm 0.2\%$

PART NUMBER AND ORDERING

MODEL NUMBER	PART NUMBER	COMMS	OPERATING VOLTAGE VDC	SWITCHING VOLTAGE VDC	MAX. SWITCHING CURRENT AMPS.	HEAT SINK	SENSOR	SENSOR RANGE (°C)	DISPLAY
TC-4600	46-44O-41-000	RS-232	12-36	0-36	15*	none	Thermistor-K	-20 to 30	none
TC-4600	46-44O-41-001	RS-232	12-36	0-36	15*	none	Thermistor-K	-20 to 30	included
TC-4600	46-44O-51-000	RS-232	12-36	0-36	15*	none	Thermistor-Z	0 to 50	none
TC-4600	46-44O-51-001	RS-232	12-36	0-36	15*	none	Thermistor-Z	0 to 50	included
TC-4600	46-44P-41-000	RS-232	12-36	0-36	25	included	Thermistor-K	-20 to 30	none
TC-4600	46-44P-41-001	RS-232	12-36	0-36	25	included	Thermistor-K	-20 to 30	included
TC-4600	46-44P-51-000	RS-232	12-36	0-36	25	included	Thermistor-Z	0 to 50	none
TC-4600	46-44P-51-001	RS-232	12-36	0-36	25	included	Thermistor-Z	0 to 50	included

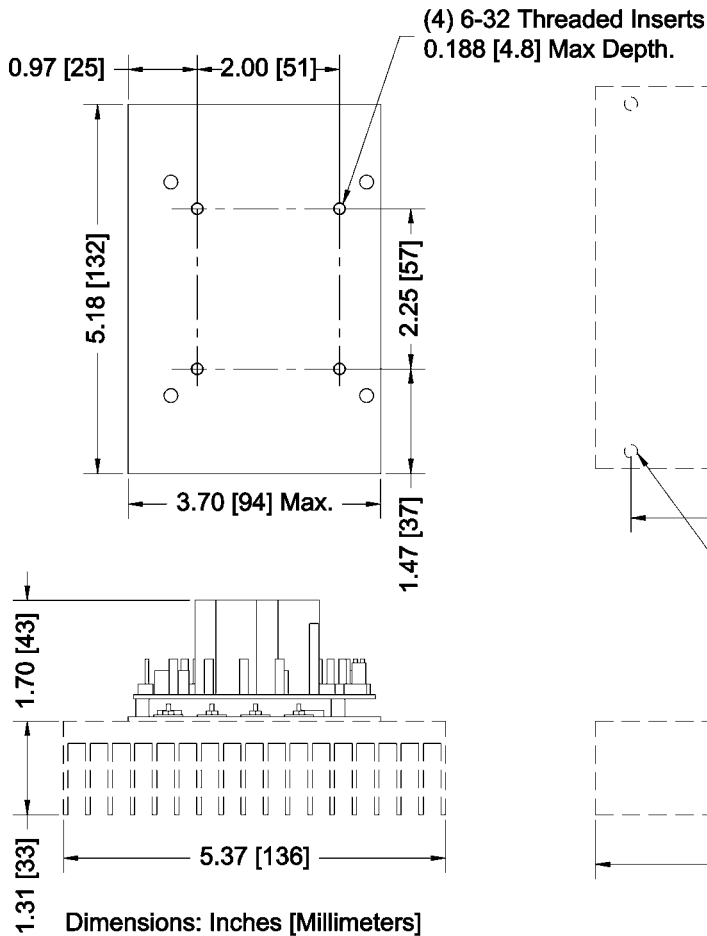
* Can switch up to 25 AMPS if used with heat sink

WIRING

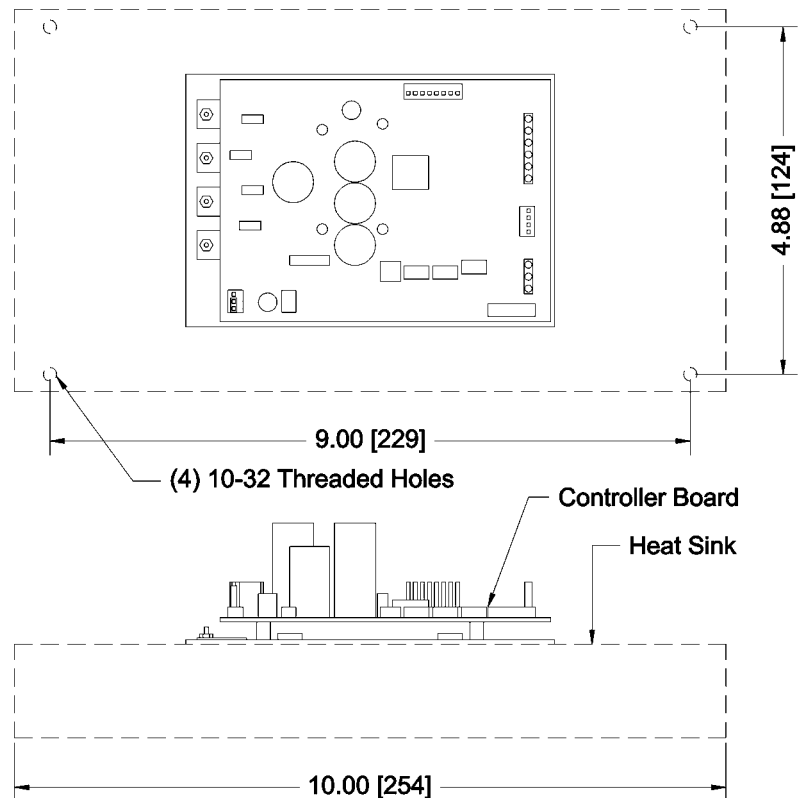


DIMENSIONS

Mounting Without Heat Sink



Mounting With Heat Sink



TC-3400 Temperature Controller

PID Temperature Control

OVERVIEW

The TC-3400 temperature controller series simplifies your temperature control requirements.

The controller options reduce system complexity and the cost of control loop ownership. The TC-3400 is a high performance PID temperature controller in space-saving, panel-mount 1/32 DIN size EIA 485 communications and standard NEMA-4X IP66 sealing make the TC-3400 versatile and suitable for wide range of environments.

FEATURES

Advanced PID Control Algorithm

- Offers TRU-Tune™ + adaptive control to provide tighter control for demanding applications
- Provides auto-tune for fast, efficient start up

Configuration

- Systems come preconfigured for PID cooling application
- "Canned" configuration for different applications available

Parameter Save and Restore Memory

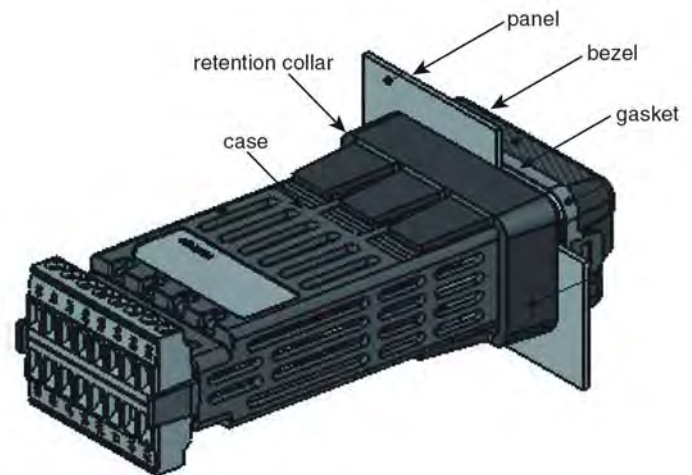
- Reduce service requirement and down time

Heat-Cool Operation

- Provides application flexibility with accurate temperature and process control

P3T Armor Sealing System

- NEMA-4X and IP66 offers water and dust resistance that can be cleaned and washed down
- Backed up by UL 50 independent certification to NEMA-4X specification



SPECIFICATIONS

Line Voltage/Power:

- 85 to 264V~(ac), 47 to 63Hz
- 12 to 40Vdc OR 20 to 28V~(ac), +10/-15 percent; 50/60Hz, ± 5 percent
- 10VA maximum power consumption
- Data retention upon power failure via nonvolatile memory
- Compliant with SEMI F47-0200, Figure R1-1 voltage sag requirements @ 24V~(ac) or higher

Environment:

- -18 to 65°C (0-149°F) operating temperature
- -40 to 85°C (-40-185°F) storage temperature
- 0 to 90 percent RH, non-condensing

Accuracy:

- Calibration accuracy and sensor conformity ± 0.1 percent of span, $\pm 1^\circ\text{C}$ @ the calibrated ambient temperature and rated line voltage
- Types R, S B; 0.2 percent

- Type T below -50°C ; 0.2 percent
- Calibration ambient temperature @ $25^\circ\text{C} \pm 3^\circ\text{C}$ ($77^\circ\text{F} \pm 5^\circ\text{F}$)
- Accuracy span 540°C (1000°F) minimum
- Temperature stability $\pm 0.1^\circ\text{C}/^\circ\text{C}$ ($\pm 0.1^\circ\text{F}/^\circ\text{F}$) rise in ambient maximum

Agency Approvals:

- UL®/EN 61010 Listed
- UL® 1604 Class 1 div. 2
- UL® 50, NEMA 4X, EN 60529 IP66
- CSA 610110 CE
- RoHS, W.E.E.E.

Controller:

- Auto-tune with TRU-TUNE™ + adaptive control algorithm
- Control sampling rates: input 10Hz, outputs 10Hz

Wiring Termination:

- Input, power and controller output terminals are touch safe removable 12 to 22 AWG

Universal Input:

- Thermocouple, grounded or ungrounded sensors
- $>20\text{M}\Omega$ input impedance
- $3\mu\text{A}$ open sensor detection
- Maximum of 200Ω source resistance
- RTD 2- or 3-wire, platinum, 100Ω and 1000Ω @ 0°C calibration to DIN curve ($0.00385\Omega / \Omega/^\circ\text{C}$)

Serial Communications:

- Isolated communications
- EIA 485, Modbus® RTU

TC-3400

PART NUMBER AND ORDERING

34	-	X	X	X	-	X	X	-	X	X	X
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Input voltage

0: Universal AC - 85 to 264Vac, 47 to 63 Hz
 4: 12/24Vdc - 12 to 40Vdc, 20 to 28Vac

Functions

2: Heat/Cool -No relay
 3: Cooling with relay (package defined below)
 4: Heating/Cooling with relays (package defined below)

Switching Volts & Amps

A: None, drive signal only - no relays
 B: Cool only, VAC switching, 120/240Vac, 10 Amps
 C: Cool Only, VDC switching, 0-100 VDC, 12 Amps
 D: Cool Only, VDC switching, 0-100 VDC, 20 Amps
 E: Cool Only, VDC switching, 0-100 VDC, 40 Amps
 F: Heat/Cool, VDC switching, 0-100 VDC, 12 Amps
 G: Heat/Cool, VDC switching, 0-100 VDC, 20 Amps
 H: Heat/Cool, VDC switching, 0-100 VDC, 40 Amps
 I: Heat/Cool, Heat: 120/240 VAC, 10 amps Cool: VDC switching, 0-100 VDC, 12 Amps
 J: Heat/Cool, Heat: 120/240 VAC, 10 amps Cool: VDC switching, 0-100 VDC, 20 Amps
 K: Heat/Cool, Heat: 120/240 VAC, 10 amps Cool: VDC switching, 0-100 VDC, 40 Amps
 L: Heat/Cool, Heat: 0-100 VDC, 12 Amps Cool: VAC switching, 120/240 VAC, 10 amps
 M: Heat/Cool, Heat: 0-100 VDC, 20 Amps Cool: VAC switching, 120/240 VAC, 10 amps
 N: Heat/Cool, Heat: 0-100 VDC, 40 Amps Cool: VAC switching, 120/240 VAC, 10 amps
 O: Heat/Cool, Reverse Polarity, 0-100 VDC, 12 Amps
 P: Heat/Cool, Reverse Polarity, 0-100 VDC, 20 Amps
 Q: Heat/Cool, Reverse Polarity, 0-100 VDC, 40 Amps
 R: Heat/Cool, VAC switching, 120/240 VAC, 10 amps

Sensor

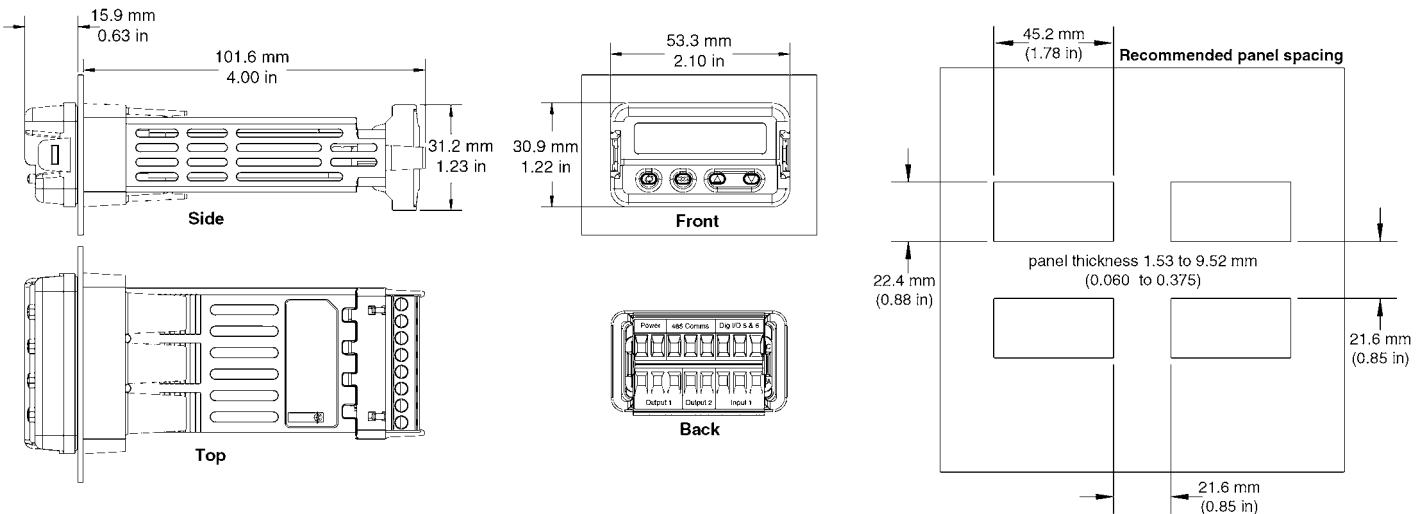
0: None
 1: 3- Wire RTD - RTD-Probe
 2: T type thermocouple (ring mount)

Communications

0: Basic communications used with standard **EZ Zone Configurator** allows the user to configure all the set up parameters including the ability to change set point, monitor the process temperature and initiate an Auto Tune
 1: RS-232 complete communication for use with standard EZ Zone Configurator and optional **SpecView** or third party software, includes RS-232/RS-485 adapter
 2: RS-485 complete communication for use with standard EZ Zone Configurator and optional **SpecView** or third party software

Options

DIMENSIONS AND CUTOUT



TC-3500 Temperature Controller

PID Temperature Control

OVERVIEW

The TC-3500 temperature controller series simplifies your temperature control requirements.

This controller reduces system complexity and set up cost. The TC-3500 is a high performance PID temperature controller in space-saving, panel-mount size. RS485 with MODBUS-RTU (JBUS) protocol and IP 65 mounted in panel with gasket suitable for wide range of environments.

For use with reverse polarity AHP-300FFHC, AHP-300XEHC, AHP-300XHC (page 38), AHP-150FFHC, AHP-150XEHC (page 40) air conditioners and AHP-300CPHC, AHP-150CPHC (page 78) cold plates.



SPECIFICATIONS

Mechanical Data:

- Housing Self-extinguishing plastic, UL 94 V0
- Dimensions 35x78 mm - depth 75,5 mm
- Weight 130 g approx
- Connections 2,5 mm² screw terminal block
- Mounting Flush in panel in 29x71 mm hole
- Front panel protection IP 65 mounted in panel with gasket

Electrical Data:

- Power supply 12...24 VDC +/- 10
- Power consumption 4 VA approx.

Input Sensor:

- PTC Thermistor (included)

Functional Data:

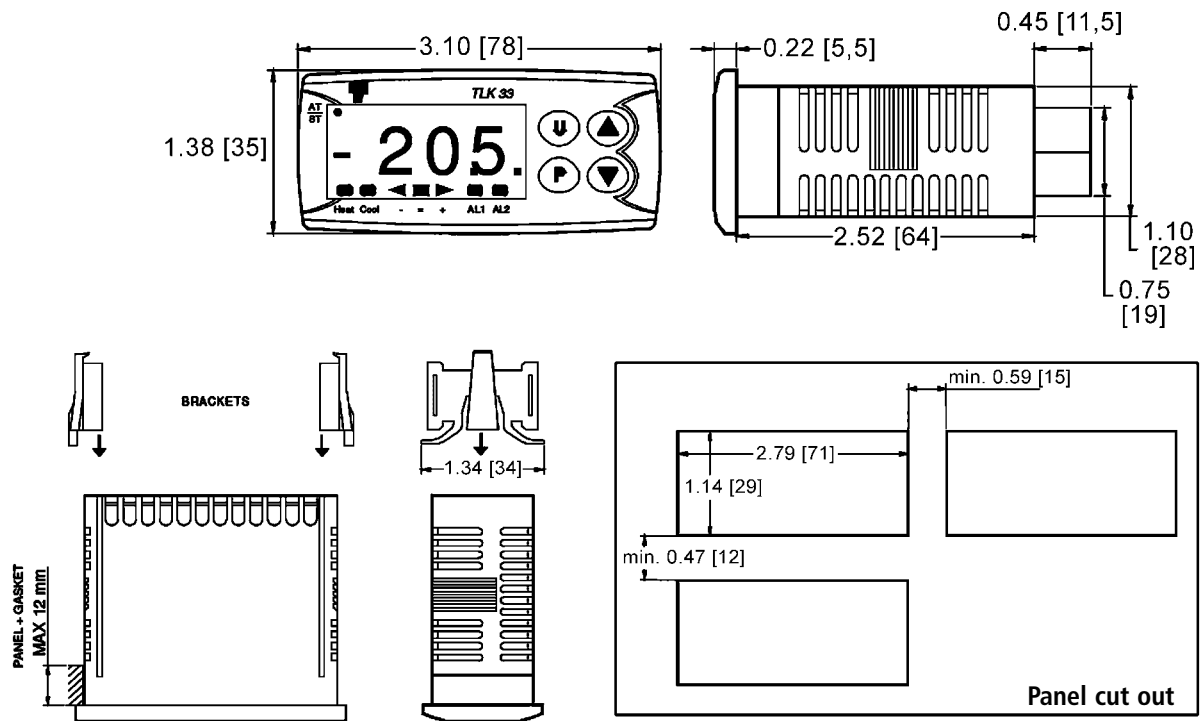
- Control PID double action
- PID functions AUTO TUNING FAST, SELF TUNING, FUZZY OVERSHOOT CONTROL

- Multi Set Point Up to 4 programmable Set Points
- Overall accuracy +/-0,5% full scale (TC S : +/- 1% fs)
- Unit of measurement °C / °F, programmable
- Max. cold junction compensation drift 0,1°C/°C with operating temperature 0...50°C after warm-up time of 20 min.
- Sampling rate 8 sample per second
- Serial communication RS485 with MODBUS-RTU (JBUS) protocol
- Communication rate 1200...38400 baud, programmable
- Display 4 red digit h=12 mm
- Parameters access Protected by password
- Operating temperature 0...50°C
- Operating humidity 30...95 RH% without condensation

PART NUMBER AND ORDERING

MODEL NUMBER	PART NUMBER	SWITCHING VOLTAGE VDC	SWITCHING CURRENT AMPS (MAX.)	COMMUNICATIONS
TC-3500	35-44S-30-000	12/24	7	None
TC-3500	35-44S-32-000	12/24	7	RS-485

DIMENSIONS AND CUTOUT



Dimensions: Inches [Millimeters]

Power Temperature Controllers

TC-1C AND TC-1H POWER TEMPERATURE SWITCHES

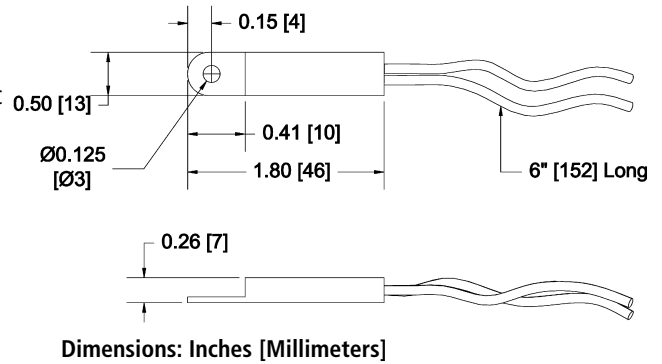
Models TC-1C and TC-1H power temperature controllers, with their small tolerance and reset differential, are the simplest and most cost effective way to control a cooling or heating device (VAC or VDC) without a need for a relay. For circuits that have higher current draw simply use them in conjunction with a solid state relay.

Part Numbers:

Mode	Part Number	Note
Cool	TC-1C-XX	switch closes on temperature rise
Heat	TC-1H-XX	switch closes on temperature drop

XX: Specify temperatures 20 °C, 25 °C, 30 °C, 35 °C for cool mode and 10°C, 15 °C for heat mode

Example: TC-1C-20 and TC-1H-10



TC-1 SPECIFICATION

VOLTAGE	CURRENT amps	SET POINT TOLERANCE °C	RESET DIFFERENTIAL °C
125 VAC	2	+/- 3	3 - 6
250 VAC	1.3	+/- 3	3 - 6
12 VDC	2	+/- 3	3 - 6
24 VDC	1.3	+/- 3	3 - 6

TC-6F COOL ONLY

Model TC-6F (Cool Only) thermostat is designed using two temperature power switches in conjunction with a solid state relay. A three position switch is provided to adjust temperature settings.

TC-6F SPECIFICATION

MODEL NUMBER	PART NUMBER	NOTES	TEMP @ T1 °C	TEMP @ T2 °C	T1-T2 (MAX) °C	RESET (TYP) °C	RESET °C	TEMP @ T3	OPERATING VOLTAGE	SWITCHING VOLTAGE	SWITCHING CURRENT
TC-6F	6F-00A-00-000	No Relay	35 +/- 5	25 +/- 5	10 +/- 3	6.5	3	Continuous On	NA	NA	NA
TC-6F-AC	6F-03T-00-000	VAC Version	35 +/- 5	25 +/- 5	10 +/- 3	6.5	3	Continuous On	85-250 VAC	24-280 VAC	10
TC-6F-DC	6F-43D-00-000	12/24 VDC	35 +/- 5	25 +/- 5	10 +/- 3	6.5	3	Continuous On	3.5-32 VDC	0-100 VDC	.02-20 ADC
TC-6F-DC	6F-33D-00-000	48 VDC	35 +/- 5	25 +/- 5	10 +/- 3	6.5	3	Continuous On	3.5-32 VDC	0-100 VDC	.02-20 ADC

TC-3F HEAT AND COOL

Model TC-3F (Heat/Cool) thermostat incorporates the same technology as the TC-6F. It contains a single setting each for both heating and cooling as referenced below:

TC-3F SPECIFICATION

MODEL NUMBER	PART NUMBER	NOTES	COOL TEMP. °C	HEAT TEMP. °C	RESET (MAX) °C	RESET (TYP) °C	OPERATING VOLTAGE	SWITCHING VOLTAGE	SWITCHING CURRENT
TC-3F-AC	3F-04R-00-000	VAC Version	35 +/- 5	15 +/- 5	6.5	3	85-250 VAC	24-280 VAC	10 AMPS
TC-3F-DC	3F-44G-00-000	12/24 VDC	35 +/- 5	15 +/- 5	6.5	3	3.5-32 VDC	0-100 VDC	.02 - 20 ADC
TC-3F-DC*	3F-44P-00-000	12/24 VDC	35 +/- 5	15 +/- 5	6.5	3	3.5-32 VDC	0-100 VDC	.02 - 20 ADC

* H-Bridge relays included

TC-7F HEAT AND COOL

Model TC-7F (Heat/Cool) thermostat incorporates the same technology as the TC-6F. It contains a single setting each for both heating and cooling and a heat exchanger mode:

TC-7F SPECIFICATION

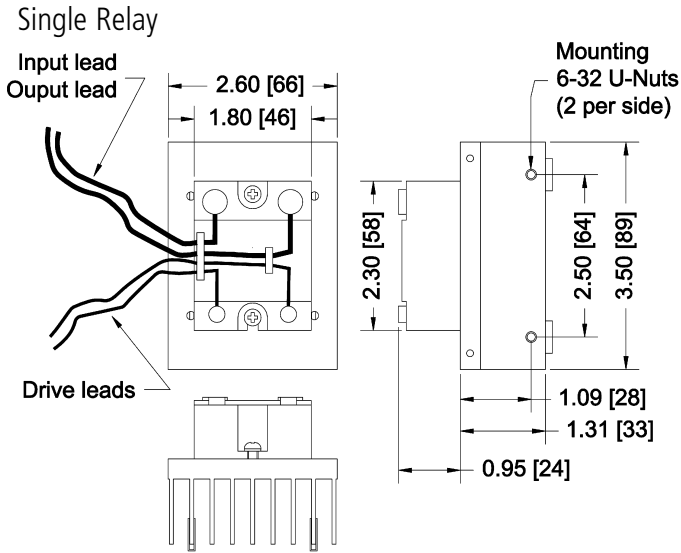
MODEL NUMBER	PART NUMBER	NOTES	HX TEMP. °C	COOL TEMP. °C	HEAT TEMP. °C	RESET (MAX) °C	RESET (TYP) °C	OPERATING VOLTAGE	SWITCHING VOLTAGE	SWITCHING CURRENT
TC-7F-DC	7F-24G-00-000	24 VDC	20 +/- 3	35 +/- 3	10 +/- 3	6.5	3	24 VDC	24 VDC	.02 - 20 ADC

* H-Bridge relays included

RELAYS

Relays
H-Bridges

SINGLE RELAY

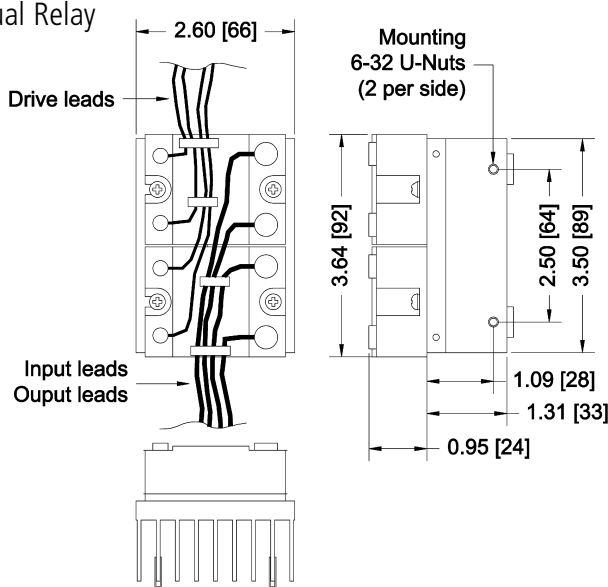


DESCRIPTION

PART

Cool only, DC Drive, VAC switching, 120/240 VAC, 10 AMPS	RELAY - B
Cool only, DC Drive, VDC switching, 0-100 VDC, 12 AMPS	RELAY - C
Cool only, DC Drive, VDC switching, 0-100 VDC, 20 AMPS	RELAY - D
Cool only, DC Drive, VDC switching, 0-100 VDC, 40 AMPS	RELAY - E
Cool only AC Drive, VAC switching, 0-100 VDC, 10 AMPS	RELAY - T

Dual Relay

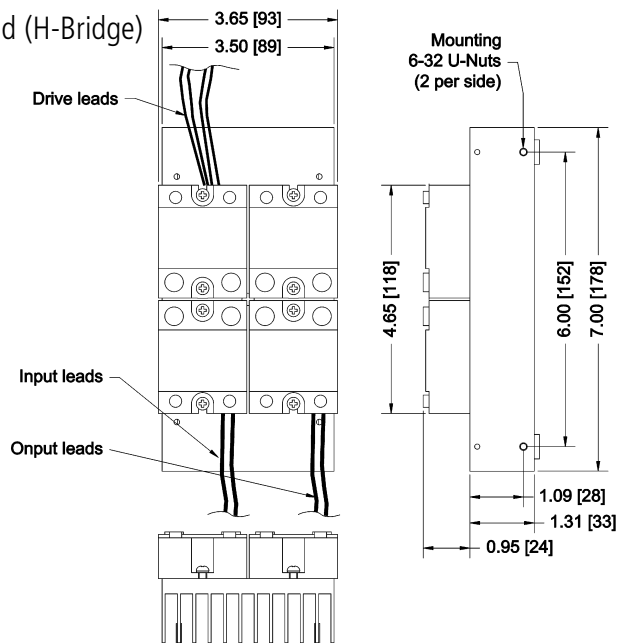


DESCRIPTION

PART

Heat/Cool, VDC switching, 0-100 VDC, 12 AMPS	RELAY - F
Heat/Cool, VDC switching, 0-100 VDC, 20 AMPS	RELAY - G
Heat/Cool, VDC switching, 0-100 VDC, 40 AMPS	RELAY - H
Heat/Cool, Heat: 120/240 VAC, 10 AMPS Cool: 0-100 VDC, 12 AMPS	RELAY - I
Heat/Cool, Heat: 120/240 VAC, 10 AMPS Cool: 0-100 VDC, 20 AMPS	RELAY - J
Heat/Cool, Heat: 120/240 VAC, 10 AMPS Cool: 0-100 VDC, 40 AMPS	RELAY - K
Heat/Cool, Heat: 0-100 VDC, 12 AMPS Cool: 120/240 VAC, 10 AMPS	RELAY - L
Heat/Cool, Heat: 0-100 VDC, 20 AMPS Cool: 120/240 VAC, 10 AMPS	RELAY - M
Heat/Cool, Heat: 0-100 VDC, 40 AMPS Cool: 120/240 VAC, 10 AMPS	RELAY - N
Heat/Cool, VAC switching, 120/240 VAC, 10 AMPS	RELAY - R

Quad (H-Bridge)







DESCRIPTION

PART

Heat/Cool, reverse polarity, 0-100 VDC, 12 AMPS	RELAY - O
Heat/Cool, reverse polarity, 0-100 VDC, 20 AMPS	RELAY - P
Heat/Cool, reverse polarity, 0-100 VDC, 40 AMPS	RELAY - Q

Accessories

SENSORS, CABLES, ADAPTERS

<p>TTYPE-Ring Surface mounting "T" type thermocouple with connector</p>	
<p>RTD-Surface Surface mounting 3 wire RTD with connector</p>	
<p>RTD-Probe 6" long, 1/8 DIA, 3 wire RTD with connector</p>	
<p>Probe-1/4NPT RTD-Probe with male 1/4 NPT compression fitting</p>	
<p>Probe-3/8NPT RTD-Probe with male 3/8 NPT compression fitting</p>	
<p>Thermocouple Wire (specify length in feet) "T" type WIRE-T-XXX "J" type WIRE-J-XXX</p>	
<p>RTD Wire (specify length in feet) 3 conductor cable WIRE-RTD-XXX</p>	
<p>C-USB RS-232 to USB converter</p>	
<p>C-485/232 RS-485 to RS-232 and RS-232 to RS-485 converter</p>	
<p>C-RS232 RS-232 cable</p>	

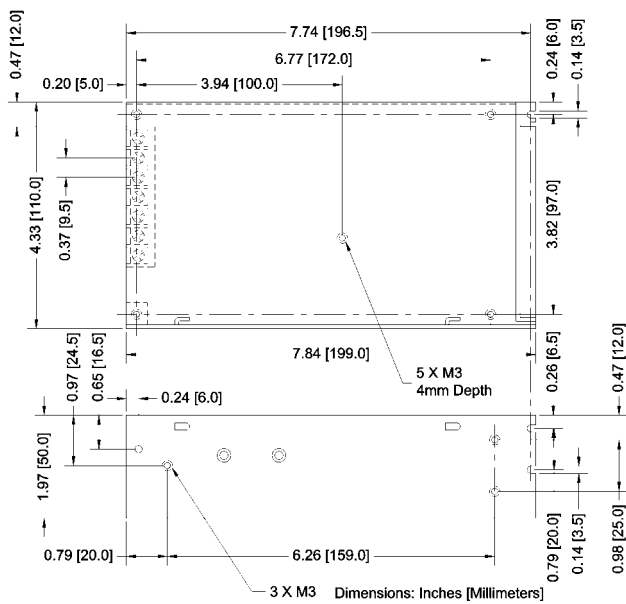
SPECIFICATION

MODEL	INPUT VOLTAGE VAC 47-63 HZ	OUTPUT VOLTAGE VDC	DC OUTPUT POWER WATTS	OUTPUT CURRENT AMPS.	WEIGHT LBS.	WORKING TEMPERATURE °C 20-90%RH	DIMENSIONS L X W X H INCHES
AS150F-12	88-132 OR 176-264*	12	150	12.5	1.76	-10 - 60	7.96X4.4X2
AS150F-24	88-132 OR 176-264*	24	150	6.5	1.76	-10 - 60	7.96X4.4X2
SP300-12	90-264	12	300	24	2.6	-10 - 50	8.6X4.6X2
SP300-24	90-264	24	300	12.5	2.6	-10 - 50	8.6X4.6X2
SP500-24	90-264	24	500	20.8	3.3	0 - 70	9.2X4.25X2.5
SP800-24	90-264	24	800	33	3.3	0 - 70	9.2X4.25X2.5

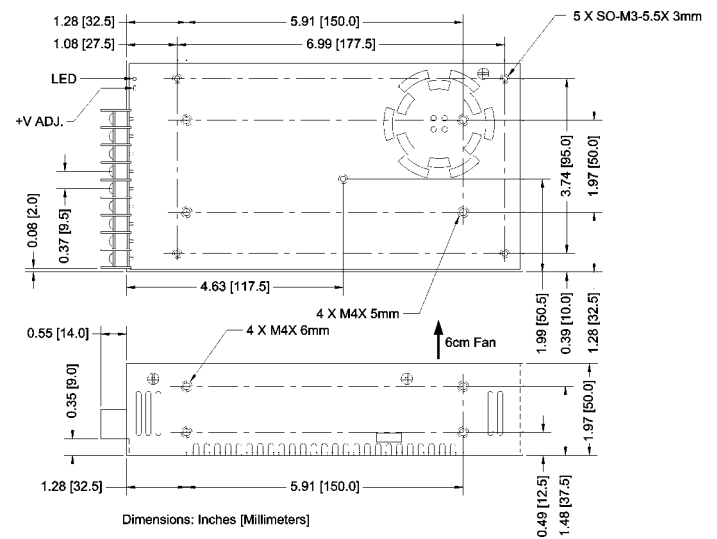
* Input voltage range is switch selectable.

DIMENSIONS

AS-150F



SP-300



SP-500, SP-800

