

# 1600

## Model 1604 1/16 DIN Temperature Controller



- SMART Self-Tuning with Fuzzy Logic
- Heat/Cool Control
- Heater Break Alarm Option with Indication of Load Current
- Universal Inputs: RTD, TC, Voltage and Current
- Three Outputs
- Soft-Start Power Limiting on Power Up
- Two Independent Setpoints Switched by Dry Contact Input
- RS485 Digital Communications with ChromaSoft® Capability
- Three Year Warranty



# Chromalox®

Telephone: 615-793-3900 • FAX: 615-793-3563

### Description

The fully field configurable Chromalox® model 1604 1/16 DIN controller combines advanced hardware design and sophisticated electronic control technology into a compact, reliable 1/16 DIN package.

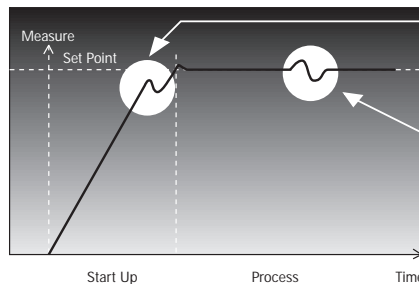
### Easy to Install and Operate

The 1604 plug-in design requires only panel cutout, instrument mounting, setpoint and alarm setpoint adjustment to set up.

### SMART Self-Tuning

The model 1604 meets the application needs of operators with or without skills in temperature processes and PID control. Simply enable the SMART function and the controller self-adjusts automatically and rapidly to all process changes - load changes, setpoint changes and more. Sophisticated control features include:

- Start-up and continuous in-process tuning
- Continuous self-tuning without artificial upset
- Proprietary control algorithm using fuzzy logic/artificial intelligence concepts
- Proven maximum suppression of overshoot



### Special Control Features

- Heat/Cool Control Features Selection of Cooling Medium and Overlap
- Heater Breakdown (HB) Alarm / Current Transformer Input
- Auto/Manual Control
- ChromaSoft® Remote Operator Interface Software Compatibility
- Soft Start - Timed Output Power Limit on Start-Up
- Control Output "Turn Off" via Pushbuttons
- Programmable Ramp on Setpoint Changes

### Applications

- Packaging and packing equipment
- Extrusion lines, coextrusion lines, plastic films and injection presses
- Fermentation equipment, reactors for chemical and pharmaceutical industries
- Food industries
- Environmental chambers and refrigeration

### During Start-Up

the SMART self-tuning function calculates the control parameters to optimize the rise to setpoint.

### During Process

SMART updates the control parameters as needed to respond to setpoint changes or a load change.



# 1604 Temperature Controller

## ISO 9001 Certified Quality Construction and Reliability

Manufactured with SMT (Surface Mount Technology) and verified with long burn-in times and temperature cycling, the 1604 is guaranteed for reliability and long service life.

### NEMA 4X Hosedown Front Faceplate

Front Faceplate

### Lower Display (4 Orange 7-Segment LEDs)

(4 Orange 7-Segment LEDs)

For setpoint value. During configuration, shows the code of the selected parameter.

### Output 1, 2, 3

Indicate load output ON and Heater Breakdown

### MAN - Red LED

Indicates manual control is active

### Digital Communications

RS485 communications available and can be operated using *ChromaSoft*® Remote Operator Interface Software, and can be networked with other Chromalox controllers via RS-485 digital communications (optional).

### Heater Breakdown Current Monitoring

Indicates heater failure(s).

### Upper Display (4 Green 7-Segment LEDs)

(4 Green 7-Segment LEDs)

For process temperature. During configuration, shows the programmed value of selected parameter.

### Indicators - Red LEDs

- SMRT** SMART tuning is active
- REM** Digital Communications is active
- SP2** Setpoint #2 is active and displayed in lower display



### Large Target Pushbuttons Simplify Operator Adjustments



Toggles between Auto and Manual control modes.



Decrease/Increase Parameter Values



Scrolls parameter display forward and stores previous parameter value.

# 1604 Temperature Controller

## Specifications

<b>Control Modes</b> .....	Field Selectable	On/Off PID SMART
	Manual	Bumpless, Balanceless transfer with Proportional Control
<b>Control Adjustments</b> .....	Control Set Point	Instrument sensor range
	Deadband	0.1 to 10.0% of sensor input range
	Proportional Band	0.1% to 100.0% of span
	Automatic Reset	20 seconds to 20 minutes
	Integral Pre-Load	Programmable
	Rate	0 to 10.00 minutes
	Output Cycle Time	1 to 200 seconds
<b>Heat/Cool Parameters</b> .....	Relative Gain	0.20 to 1.00, select air, oil or water
	Overlap	-20% to 50% of Proportional Band
<b>Outputs</b>		
Output #1 .....	One (1) Heat or Cool Output	
	Relay	Normally open SPDT contact rated 3.0 Amps at 250 Vac (resistive load)
	SSR Drive	Transistor output of 24 Vdc max at 1 mA, 14Vdc +/- 20% at 20 mA. Maximum load 700 Ohms protected against accidental short circuit
Output #2 .....	One (1) Cool or Alarm Output	
	Relay	Normally open SPST contact rated 2.0 Amps at 250 Vac (resistive load)
Output #3 (option) .....	Alarm Output	One (1) SPST relay 2 Amps at 250 Vac (resistive load)
<b>Alarm Features</b>		
Functions .....	Field Selectable	Process Alarm Deviation Alarm Band Alarm Heater Breakdown Alarm
Types .....	Field Selectable	High / Low for Process Alarm Outside / Inside for Band Alarm Inhibit on Start-up and Setpoint changes Latching / Non-latching (Manual / Automatic Reset) Normally Energized / Normally De-Energized
Alarm Deadband .....	0.1 to 10.0% of instrument sensor range	
<b>Digital Communications (option)</b>	RS485 multi-drop, Isolated, CPIO, ASCII Line Mode, Modbus and J-BUS protocol selection	
<b>Instrument Power</b> .....	100 to 240 Vac, +10%, -15%, 50 to 60 Hz, 24 Vac or Vdc	5 VA nominal power consumption
<b>Operating Environment</b> .....	30 to 120°F (0 to 50°C) ambient temperature with relative humidity from 20% to 85% non-condensing	
<b>Physical Specifications</b> .....	1/16 DIN, 1.9 x 1.9 inches (48mm x 48mm), 4.8 inches deep (122mm) Panel cutout 1.77 x 1.77 inches (45mm x 45mm), 0.7 lbs. (300 grams)	

# 1604 Temperature Controller

## Specifications (Cont.)

### Input Specifications

Sensor Type		Range*		Accuracy
		°F	°C	
Thermocouple**	J	-150 to 1830	-100 to 1000	0.2% of Sensor Span
		-	-100.0 to 400.0	0.2% of Sensor Span
	K	-150 to 2500	-100 to 1370	0.2% of Sensor Span
			-100.0 to 400.0	0.2% of Sensor Span
	L	0 to 1650	0 to 900	0.2% of Sensor Span
			0 to 400.0	0.2% of Sensor Span
	N	-150 to 2550	-100 to 1400	0.2% of Sensor Span
R	0 to 3200	0 to 1760	0.2% of Sensor Span	
S	0 to 3200	0 to 1760	0.2% of Sensor Span	
T	-330 to 750	-199.9 to 400.0	0.2% of Sensor Span	
RTD		-330 to 1470	-200 to 800	0.2% of Sensor Span
		-199.9 to 400.0	-199.9 to 400.0	0.2% of Sensor Span
Current	0-20 mA or 4-20 mA, dc		} Range and decimal points programmable, -1999 to 4000	
Voltage	0-5, 1-5, 0-10 or 2-10 Vdc, 0-60 or 12-60 mVdc			

\*Field Programmable for °C or °F

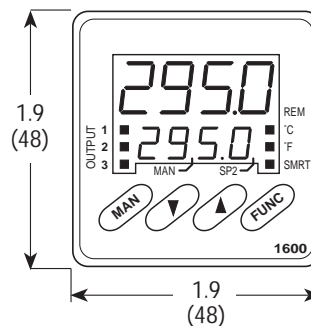
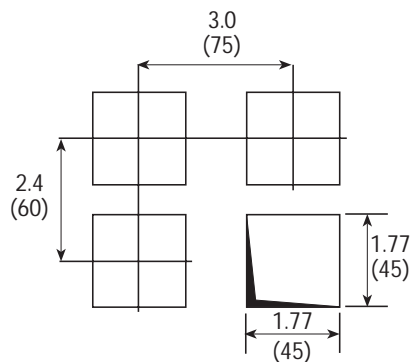
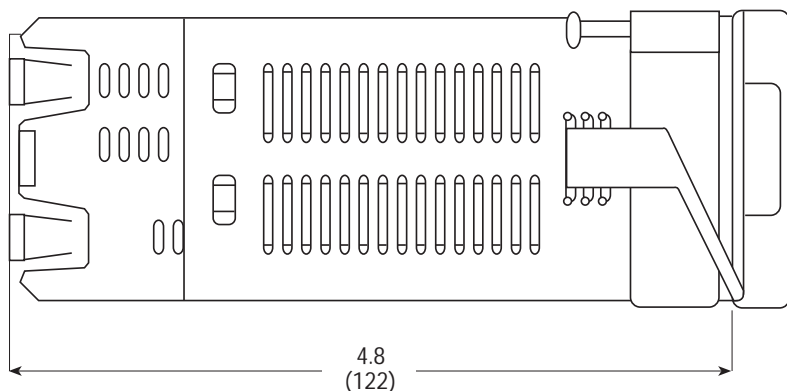
\*\*Units with digital communications 1604-xx3xx and 1604 xx4xx do not have negative ranges

Line Impedance ..... 100 Ohms maximum for thermocouple input. Less than 4 Ohms per wire for RTD input

Input Sampling ..... 500 milliseconds typical for TC/RTD input  
250 milliseconds typical for Linear input

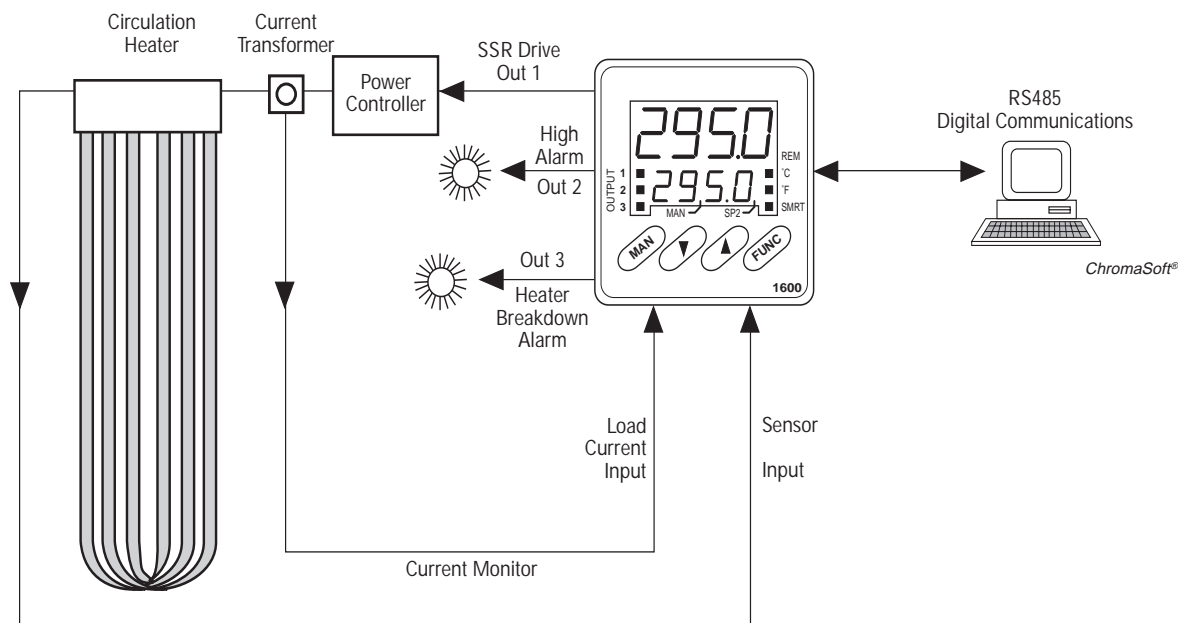
## Dimensions

Dimensions in inches (mm in parenthesis)



# 1604 Temperature Controller

## Applications



## Features

### Two Independent (Run-Idle) Setpoints

Dry contact input can be connected to toggle between setpoint #1 and setpoint #2.

- LEDs give visual indication of active setpoint
- Programmable ramp up/ramp down between two setpoints protects against overshoot/undershoot

### Independent Programmable Ramp on Setpoint Change

Prevents overshoot/undershoot of process temperature when setpoint is changed.

- Independently programmed Ramp Up/Ramp Down 1-100° per minute
- Operates on any Setpoint Change (Manual or Run-Idle)

### Output Disable Function

Simple front panel operation to turn off control output.

- Applications where it is desirable to disconnect load power during set-up
- Applications that require temperature monitoring only, no control needed

### Heater Breakdown Alarm/Current Monitoring

Alarm is activated when load current reaches excessively low values, indicating an open load, disconnected wire or welded contact.

- Prevents damage to sensitive processes and equipment
- Displays load current without separate ammeter

### Programmable Advanced Alarm Functions for Each Alarm

- Selectable High, Low, Band or Deviation alarm modes, Deadband, Alarm Inhibit, normally energized or de-energized, and latching or non-latching

### Soft Start on Power-Up

Allows you to program a "warm up period" to protect process and avoid thermal shock on startup.

- Limits control output power 0 to 100% below a threshold setpoint, from 1 to 100 minutes or infinitely

### Control Output Maximum Rate of Change

Slows the output signal response, selectable from 1% to 10% per second, when process demands change significantly, avoiding overshoot and undershoot.

## Ordering Information

### Model 1/16 DIN Temperature Controller

1604 SMART Self-Tuning, 2 Outputs (Heat/Cool or Control/Alarm), Dual 4-Digit Display of Process and Setpoint, Field Selectable Universal Thermocouple, RTD, Voltage or Current Inputs, Auto-Manual Control, Programmable Alarms, 0.1 Degree Display Resolution, IEC 801-4 Noise Immunity, Optional Heater Break Alarm/Current Transformer Input, NEMA 4X Splashproof Faceplate, Optional RS485 Digital Communications, Compatible with *ChromaSoft*® Remote Operator Interface Software.

#### Code Output 1 - Heat or Cool

1 Relay, 3 Amps at 240 Vac  
6 SSR Drive, 14 Vdc at 20 mA

#### Code Output 2 - Cool or Alarm

1 Relay, 2 Amps at 240 Vac

#### Code Options

0 None  
1 Output #3, 2 Amps at 250 Vac (Resistive Load)  
2\* Heater Breakdown Input and Output #3  
3 RS485 Digital Communications and Output #3  
4\* RS485 Digital Communications, Heater Breakdown Input and Output #3

#### Code Power Supply

3 100/240 Vac  
5 24 Vac/dc

#### Code

0 Add to complete model number

1604 - 1 1 0 3 0 **Typical Model Number**

## Accessories

\*Controllers with the Heater Breakdown option, models 1604-xx2xx and 1604-xx4xx require a Current Transformer. Specify one of the four Current Transformers listed below when ordering a controller with the Heater Breakdown option.

	Part No.	PCN
Current Transformer, for 0.0 to 10.0 Amp Load Current	0149-01340	306480
Current Transformer, for 0-25 Amp Load Current	0149-01341	306350
Current Transformer, for 0-50 Amp Load Current	0149-01342	306368
Current Transformer, for 0-100 Amp Load Current	0149-01343	306376
<i>ChromaSoft</i> ® Remote Operator Interface Software	SOFT-12000	-
1/4 DIN to 1/16 DIN Adapter Plate	0006-12137	306923