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# 7

SECTION

## RADIANT PROCESS HEATERS



## Pictorial Index Infrared Heaters

### **Ceramic Infrared E-Mitters® Hi-Tech Radiant Heater Technology**

(pages 7-4 through 7-21)



- \* **Metamorphing Color Change provides a visible indication of operation**
- \* **Highest Radiant Efficiency— 96%**
- \* **Ultimate Zoning Flexibility**
- \* **Watt Density up to 40 watts/sq. inch**
- \* **Heat-up, Cool-down Time— 1.5 to 5.5 minutes**
- \* **Infrared Wavelength Range from 2.0 to 10µm**

**Ceramic Infrared Heaters** are composed of a resistance wire embedded in a glazed ceramic body. The elements are generally shaped either concave or flat, although other shapes are manufactured. Thermocouples (type J or K) can be embedded in the heater with the junction in the radiant face of the heater for precise temperature control. Reflectors and housings are available.

### **Quartz Tubular Elements**

(pages 7-28 and 7-29)



- \* **Good Radiant Efficiency— up to 79%**
- \* **Very Rapid Heat-up, Cool-down Time— 30 to 60 seconds**
- \* **Watt Density up to 40 watts/sq. inch**
- \* **Infrared Wavelength Range from 2.5 to 6µm**

**Tubular Quartz Heaters** consist of a helically wound resistance coil housed in a pure vitreous silica fused quartz tube. The quartz tubing is terminated with specially designed ceramic insulating caps that allow the quartz tubing to breathe. Optimum design provides a clear red color on the translucent quartz tube when operating at full voltage, providing a wavelength peak of 2.5 to 3.0µm.

### **Infrared Radiant Panel Heaters**

(pages 7-22 through 7-27)



- \* **High Radiant Efficiency— up to 89%**
- \* **Good Zoning Flexibility**
- \* **Watt Density up to 60 watts/sq. inch**
- \* **Heat-up, Cool-down Time— 7 minutes**
- \* **Infrared Wavelength Range from 2.5 to 6µm**

**Panel Heaters** have a helically wound resistance coil under an emitter surface. The emitter surface can be hard ceramic, tempered glass, or fused translucent quartz. The emitter face is backed by a ceramic refractory board, which directs the radiant energy forward. Separate metal reflectors are not required. Type J or K thermocouples can be mounted internally near the face for precise temperature control.

### **Metal Sheathed Tubular Radiant Heaters**

(pages 7-30 through 7-34)



- \* **Radiant Efficiency— 50%**
- \* **Low-Cost, Rugged Construction**
- \* **Rapid Heat-up— 1.5 minutes**
- \* **Extremely Long Operating Life**
- \* **Infrared Wavelength Range from 3.0 to 6µm**
- \* **Good Contamination Resistance**

**Metal Sheathed Tubular Radiant Heaters** consist of a tubular heating element mounted in a reflective housing. The tubular element consists of a helical resistance wire inside a metal tube filled with magnesium oxide as an insulator and heat conductor. The assemblies are available in lengths from 24 to 86 inches with single, dual or U-Bend elements in various watt densities and voltages.



## Introduction to Infrared Radiation Heating Systems

### Tempco's Radiant Heaters

fall into the medium wavelength range of electromagnetic infrared radiation. Infrared energy is commonly used to heat plastics, remove moisture, cure painted finishes, or heat food products. This is because plastics, organic substances and water absorb infrared energy more efficiently than other materials in industrial applications.

For more technical and application information, refer to pages 7-17 through 7-21 in this section

### A Straightforward Approach to Infrared Radiant Heating Technology

Radiant heating is regarded by many as a black magic technology that is complicated and difficult to work with. While radiation theory can be complicated, it is far easier to apply when given the appropriate heating devices and guidance on which device best suits your application.

In this section, Tempco will present an overview of our product offerings, their capabilities, and relevant technical data that will aid you in selecting the heating system that best serves your requirements.

No matter what the application needs, Tempco has the right product to satisfy your requirements.

### The Basics

The three main modes of heat transfer are:

**Conduction** When two bodies of different temperature are brought in contact with each other, heat energy flows from the hotter to the colder body.

**Convection** Heat energy is transferred from a higher temperature region in a gas or liquid to a lower temperature region as a result of movement of masses within the fluid or gas.

**Radiation** Infrared radiant energy is transported throughout space by electromagnetic waves without the need of a conductive media. Consequently, heat can be delivered in concentrated areas at very fast rates. Electromagnetic radiation can be further broken down into four basic categories:

1. Ultraviolet
2. Infrared — (Short /Medium /Long Wavelength)
3. Microwave
4. Radio Frequency/Induction



Contact **TEMPCO'S** experienced, knowledgeable staff of sales engineers for help with your applications.

### Ideal for Many Diverse Applications

Infrared Radiant Heaters provide many application solutions where conventional conductive and convective heat sources are not practical. IR heaters have the capability to perform in a multitude of diverse commercial and industrial applications where heating, drying, curing, or cooking is involved.

*Radiant Infrared energy is commonly used in...*

#### Plastics and Rubber

- *Plastifying of plastic sheets and rolls for thermoforming and vacuum forming*
- *Preheating or vulcanizing rubber sheets*
- *Heating glass fiber reinforced plastic during production*
- *Curing plastisols*
- *Laminating and plastic welding*

#### Paper/Pulp

- *Drying of paper pulp*
- *Quick drying of gummed, sized, or lacquered paper*
- *Drying of unprocessed and printed wallpaper*
- *Heating papier-mâché before pressing*
- *Adhesive activation*

#### Textiles

- *Setting Nylon® and Perlon® threads*
- *Gelling PVC paste coatings on fabrics*
- *Drying washed, dyed, and finished textile fabrics*
- *Heat set synthetic fabrics*

#### Food

- *Baking and browning small bakery products*
- *Keeping food warm*
- *Heating processed cheeses*
- *Packaging food products*

#### Miscellaneous Processes

- *Drying and curing of paint and powder coatings*
- *Drying raw tobacco*
- *Evaporation of water and solvents*
- *Manufacturing shrink packaging equipment*
- *Ink drying*

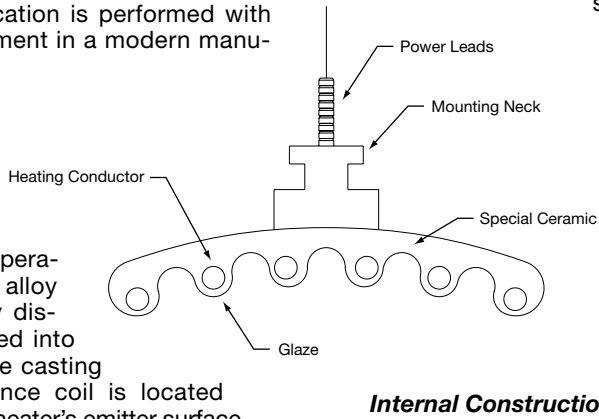


## Ceramic Infrared E-Mitters® Hi-Tech Radiant Heater Technology

Tempco's Ceramic Infrared Heaters are designed and manufactured in accordance with the highest global quality standards. The heaters are designed with computer generated specifications, and all fabrication is performed with state of the art equipment in a modern manufacturing facility.

### The Basic Ceramic Infrared Heater Design

consists of a high temperature nickel-chromium alloy resistance coil evenly distributed and embedded into the ceramic during the casting process. This resistance coil is located extremely close to the heater's emitter surface to maximize radiation properties and deliver 96% thermal efficiency. The Tempco family of Ceramic Infrared E-Mitters® yields a range of infrared wavelengths from 2 to 10 µm.



Internal Construction

### Precise Temperature and Process Control

In certain applications process control is extremely critical and is tightly regulated by temperature profile in a heating system or element array. In these cases the system can easily be designed with a very finite zone control to precisely regulate the application process.

This is achieved by controlling each zone in the system with a ceramic heater with an internal type K or J thermocouple which is wired in parallel with the other heaters within the zone. This finite zone control allows a precise temperature profile of the system; higher temperature zones at the perimeter and cooler temperatures in the inner zones. This Isothermal Heating System ensures uniform heat radiation to the process.

### Metamorphing Color Change Indicates Heater Operation

Because identifying burned out heaters in a radiation panel is a common problem, Tempco has developed E-Mitters®, a line of ceramic heaters that change color when the element is energized. In a cold state the element is a coral color, and changes to grey when the heater is energized. White, black and color changing yellow/orange are also available.

With this feature the operator can determine exactly which elements are functioning and which have failed. Fast visual identification of failed heaters in a radiation panel can eliminate wasted material and facilitate quick, easy replacement.

— E-Mitters® DELIVER THAT ADVANTAGE! —



CRB Series — Cold



CRB Series — Hot

### Contamination Resistant

To protect against contamination and adverse atmospheric conditions that can lead to premature oxidation or corrosion of the resistance coil, the ceramic body is coated with a layer of surface glaze. Tempco's surface glaze is specially formulated to expand and contract at the same rate as the ceramic body to avoid craze cracking of the glaze layer, a condition which can occur on ceramic infrared heaters, exposing the surface to contaminants.

**ORDER TODAY-  
RECEIVE TOMORROW!  
SHIPPED DIRECTLY FROM STOCK**

Tempco Ceramic Infrared Heaters are designed and manufactured to common industry standards and maintained in a large inventory for immediate delivery. The standard sizes are stocked in 220/240 volts with a large range of 100 to 1000 watts, in the standard color changing coral and white. To assure precise temperature control, the elements are available from stock with a standard type K thermocouple.

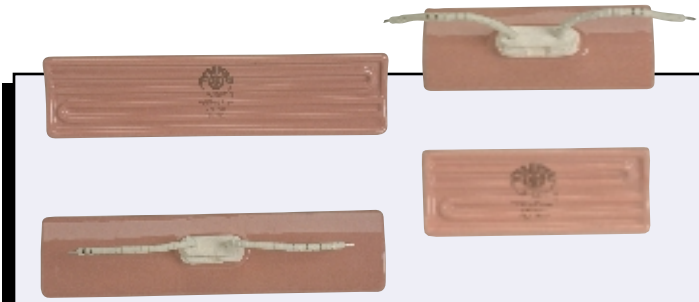
Tempco also maintains stock of E-Mitter® accessories such as reflectors, terminal blocks, high temperature hookup wire, and housings. This enables Original Equipment Manufacturers to design and build their own infrared heating systems, as well as facilitates immediate field retrofits or replacements by end users.



Contact Tempco's experienced, knowledgeable staff of sales engineers for technical assistance or product availability.



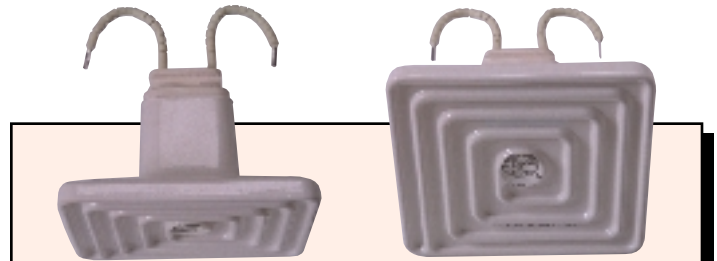
## Ceramic Infrared E-Mitters®



### CRB and CRC Series Concave

- Industry standard sizes:  
CRB Full Size — 60mm × 245mm (2.36" × 9.65")  
CRC Half Size — 60mm × 122mm (2.36" × 4.80")
- Standard wattages available:  
CRB — 250, 400, 650, & 1000  
CRC — 125, 200, 325, & 500
- Elements are available with a Type K thermocouple
- In Stock for immediate delivery in color changing coral and white @ 220/240V
- Housings, reflectors, and accessories are available from stock supply

• See pages 7-6 to 7-9



### CRD Series Flat, Long Support Shaft

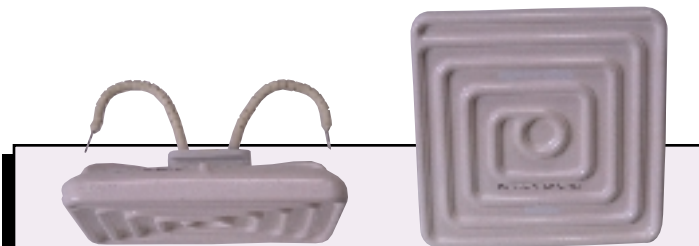
- Standard size:  
122 × 122 × 85mm (4.80" × 4.80" × 3.35")
- Standard wattages available: 250, 400, & 650 Watts
- The back of the element is insulated to cool the terminal area and direct heat output to the front surface.
- Heaters are available with optional type K thermocouple
- In Stock for immediate delivery in color changing coral and white @ 220/240V
- Custom radiant panel arrays made to customer specifications

• See pages 7-10 to 7-13

## Ceramic Infrared E-Mitters® Product Overview

Tempco offers high technology solutions to radiant heating applications with our line of Ceramic Infrared E-Mitters®. E-Mitters® are a unique ceramic infrared heating element that electromagnetically transmits extremely uniform radiant heat energy to its target application process.

- **E-Mitter** brand elements provide unbeatable performance and up to 10,000 hours of continuous operation.
- Tempco's Metamorphing Color Change E-Mitters® provide a **visible indication** when a particular heater has failed.



### CRH Series Flat, Short Support Shaft

- Standard sizes:  
122 × 122 × 36mm (4.80" × 4.80" × 1.42")  
60 × 245 × 36mm (2.36" × 9.65" × 1.42")  
60 × 122 × 36mm (2.36" × 4.80" × 1.42")
- Standard wattages available: 125 through 800 watts
- The back of the element is insulated to cool the terminal area and direct heat output to the front surface.
- Heaters are available with optional type K thermocouple
- In Stock for immediate delivery in color changing coral and white @ 220/240V
- Custom radiant panel arrays made to customer specifications

• See pages 7-10 to 7-13



### CRE Series Edison Style Screw-In Bulb

- Standard sizes: 60mm (2.36") dia. × 130mm (5.12") long  
75mm (2.95") dia. × 95mm (3.74") long  
90mm (3.54") dia. × 130mm (5.12") long
- Standard wattages available: 60, 100, 150, & 250 watts
- Provides quick, easy to apply localized heat
- Easy to install bulb style screw-in socket mounting (E 26)
- Produces no visible light, only infrared heat
- Ideal for pet companion industry, small farm livestock, and laboratory applications

• See pages 7-14 to 7-15



## Ceramic Infrared E-Mitters®

### CRB and CRC Elements and Systems



CRB Series — Cold



CRC Series — Cold

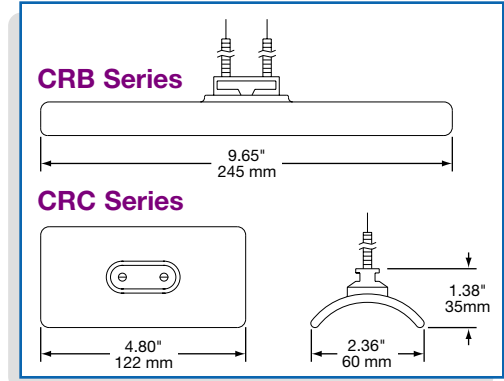
**METAMORPHING** Color Change™  
provides a visible indication of operation



CRB Series — Hot



CRC Series — Hot



**CRB and CRC Elements** are the most commonly used E-Mitter® products and are modular in construction. Therefore, they deliver an effective and simple means for designing an infrared radiant heating system for your application.

Tempco's CRB and CRC Infrared heaters are 60mm (2.36") in width and 245mm (9.65") and 122mm (4.80") in length respectively. The CRB Series is manufactured in 4 standard wattages: 250, 400, 650, & 1000. The CRC Series is manufactured in 4 standard wattages: 125, 200, 325, & 500.

Equivalent watt densities are maintained between full and half size elements (i.e., CRB 1000W-CRC 500W), allowing construction of radiant panels with uniform heat distribution patterns.

The heaters are mounted to a reflector with the built-in mounting neck, and the spring clip included with every heater. The maximum thickness of the reflector that can be used is 1.0mm (.039")

### Design Features

- \* Standard colors are coral, which turns to grey when energized, and traditional white.
- \* Also available in optional yellow, which turns to orange when energized, or black.
- \* Available with built-in standard type K thermocouple.
- \* Optional Type J thermocouple is also available.
- \* Long operating life—over 10,000 plus hours of continuous operation under normal conditions.
- \* Performance is unaffected by vibration or adverse atmospheric conditions.
- \* Large wattage range: From 125 to 1000 watts.
- \* Standard stocked voltage: 220/240V.
- \* 120, 208, 277, and 480 volts are available.

### CRB and CRC E-MITTERS® — TECHNICAL SPECIFICATIONS

Element Type & Wattage	CRB Series (full size) CRC Series (half Size)	250W 125W	400W 200W	650W 325W	1000W 500W
Watt Density	(W/in <sup>2</sup> )	10.3	16.6	26.8	41.3
Typical operating temperature under ideal conditions*	(°F) (°C)	752 400	932 500	1148 620	1346 730
Maximum Voltage	(VAC)	480	480	480	480
Max. Permissible Temperature*	(°F) (°C)	1022 550	1112 600	1292 700	1382 750
Infrared Radiation Wavelength	(µm)	2 to 10 for all wattages			
Heat-up constant to 63% of final temperature	(min)	4.8	3.8	3.0	2.4
Mean cool-down from the final temperature to 392°F (200°C)	(min)	7	9	11	12

\*Measured by internal thermocouple



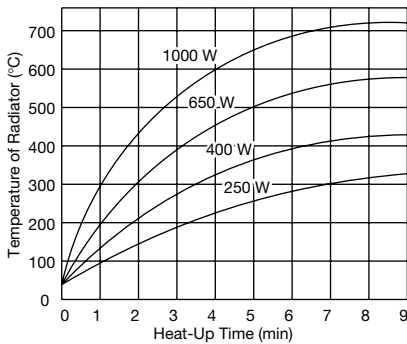
## Technical Support for CRB and CRC E-Mitters

These three graphs illustrate the thermodynamic characteristics of the CRC & CRB elements in the standard wattages manufactured. Further technical data on CRC and CRB E-Mitters is available on pages 7-17 through 7-21.

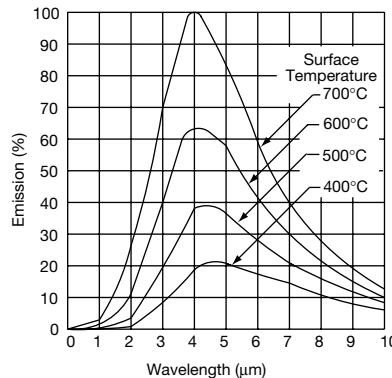
## Ceramic Infrared E-Mitters®

ESH Structural Housings

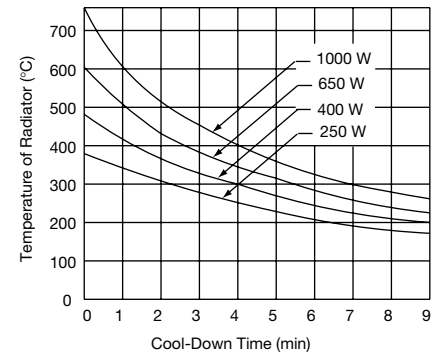
Heat-up Time Graph



Wavelength Graph



Cool-down Time Graph



**STOCK ITEMS**  
ORDER NOW!

Applies to all items in the list below.

## CRB/CRC Standard Sizes and Ratings

SAME DAY SHIPMENT  
on stock items  
ORDERED BY 2 PM CST

	Wattage	CORAL		WHITE	
		without Thermocouple	with Type K Thermocouple	without Thermocouple	with Type K Thermocouple
<b>CRB – Full Size</b> 60mm x 245mm (2.36" x 9.65")	250	CRB10006	CRB10008	CRB00006	CRB00008
	400	CRB10014	CRB10016	CRB00014	CRB00016
	650	CRB10023	CRB10025	CRB00023	CRB00025
	1000	CRB10031	CRB10033	CRB00031	CRB00033
<b>CRC – Half Size</b> 60mm x 122mm (2.36" x 4.80")	125	CRC10005	CRC10007	CRC00005	CRC00007
	200	CRC10013	CRC10015	CRC00013	CRC00015
	325	CRC10021	CRC10023	CRC00021	CRC00023
	500	CRC10027	CRC10029	CRC00027	CRC00029

Ceramic Infrared E-Mitters® listed are 220/240V and include 3½" ceramic bead insulated leads with straight crimp terminal and a spring clip for mounting.

## How to Order

### Catalog Heaters

For shipment directly from Stock choose the Ceramic Infrared Radiant Heater from the above list.

Optional color changing yellow or straight black can be manufactured to order to meet your requirements. A part number will be assigned at time of ordering.

### Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for colors, sizes and ratings not listed, **TEMPCO** can manufacture CRB Full-Size and CRC Half-Size Ceramic Infrared Heaters to meet your requirements.

**Standard lead time is 3 weeks.**

**Please Specify** the following:

- Size** Full or Half-Size
- Color** Standard colors are *color changing coral* and white, optional colors are *color changing yellow* and black
- Voltage and Wattage** 240, 120, 208, 277, & 480V and most other voltages are available
- Thermocouple** Standard Type K, or optional Type J  
*Description of process and temperature required*



## NEW IMPROVED COST EFFECTIVE HOUSING FOR INFRARED E-MITTERS®



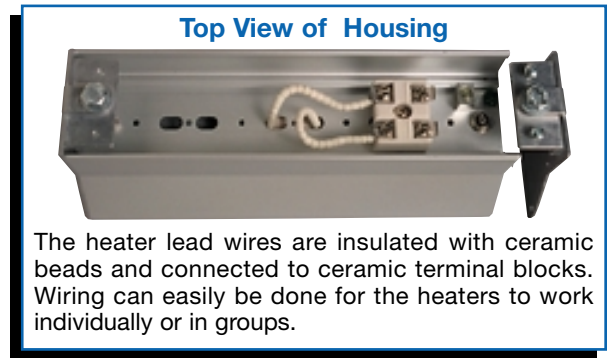
### Makes Assembly Of Large Systems Economical And Easier Than Ever!

Let Tempco's qualified engineering and production staff do the time and cost consuming task of mounting heaters into an array with housing assemblies to your exact specifications. Standard Housings are available from stock in 10", 20", 30", and 40" trade lengths.

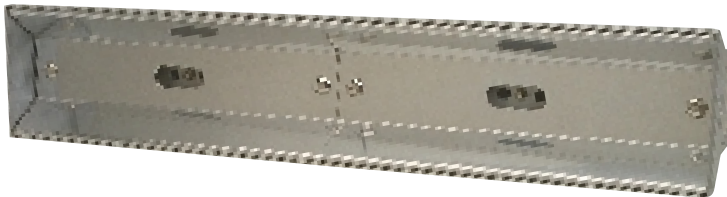
#### ESH Structural Housing Assemblies

##### Design Features

- \* New housing design construction made of lightweight extruded aluminum.
- \* 7/8" dia. through hole is cast in each end cap for standard 1/2" trade size wiring connectors allowing standard armor cable or conduit to be used for AC power input. 1/2" hole plug provided for one end.
- \* Optional internal thermocouple available for individual heater or zone control.
- \* Internal mounting hole pattern makes it convenient to mix and match **E-Mitter®** sizes (full or 1/2-size) and ratings, with or without thermocouples.
- \* Space between reflector and housing wall offers a good thermal barrier to protect the wiring area.
- \* Designed for use with the full families of CRB, CRC and CRH Series B & C.
- \* The ESH housings can be used with any manufacturer's standard 60 mm x 245 mm -or- 60 mm x 122 mm ceramic radiant elements.

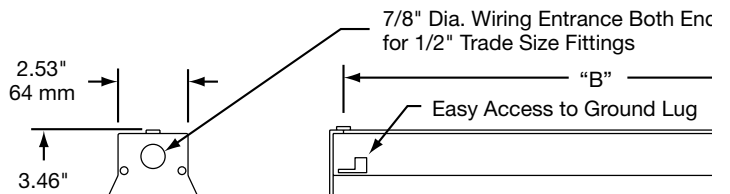


#### Housings for CRC, CRH C and CRB, CRH B Elements



Standard Housings – In Stock

Trade Length	"A"	"B"	# of E-Mitters®
10"	10.13"	8.63"	1 CRB or
	257 mm	219 mm	2 CRC
20"	20.00"	18.50"	2 CRB or
	508 mm	470 mm	4 CRC
30"	29.88"	28.38"	3 CRB or
	759 mm	721 mm	6 CRC
40"	39.75"	38.25"	4 CRB or
	1010 mm	972 mm	8 CRC



##### Design Benefits

- \* User-friendly, common-sense approach to power input wiring.
- \* Offers a great flexibility in the construction of various types of infrared ovens.
- \* The housing and reflectors are very easy to assemble and arrange into radiant panels.
- \* The ESH housings are stocked in four basic modular sizes.

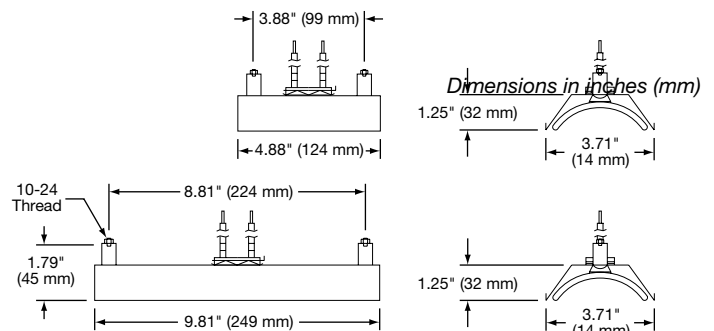
\* Made To Order In Lengths Up To 10 Ft. \* Holds up to 12 CRB E-Mitters® \*

#### Reflectors for CRC, CRH C and CRB, CRH B Elements

- \* Specifically designed to withstand bending and heat distortion.
- \* The reflectors are made from highly polished chrome steel providing superb reflecting characteristics.
- \* Will withstand high operating temperatures.
- \* Available in two standard sizes; Includes standoffs and hardware.
- \* Easy installation into ESH structural housing assemblies.

**STOCK ITEMS**  
**ORDER NOW!**

For **CRC, CRH Series C** (half size) 4.88"L x 3.71"W **CRK00006**  
For **CRB, CRH Series B** (full size) 9.81"L x 3.71"W **CRK00007**







## Complete ESH Assemblies

Includes: housing, heaters, reflectors, terminal blocks, and all hardware shipped fully assembled and ready to go.

To complete the part number, fill in the blank with the number indicating the color element you require:

**0** = White; **1** = Coral; **2** = Yellow; **3** = Black

Heaters rated @ 220/240V

Assemblies with **Tc** include One **E-Mitter®** with built-in Type K thermocouple located in the center area of the housing.

10" ESH with one CRB heater	without Tc	with K Tc
with: 250 W	CRA_0001	CRA_0048
400 W	CRA_0002	CRA_0049
650 W	CRA_0003	CRA_0050
1000 W	CRA_0004	CRA_0051

10" ESH with two CRC heaters		
with: 125 W each heater	CRA_0005	CRA_0052
200 W	CRA_0006	CRA_0053
325 W	CRA_0007	CRA_0054
500 W	CRA_0008	CRA_0055

20" ESH with two CRB heaters		
with: 250 W each heater	CRA_0009	CRA_0056
400 W	CRA_0010	CRA_0057
650 W	CRA_0011	CRA_0058
1000 W	CRA_0012	CRA_0059

20" ESH with four CRC heaters		
with: 125 W each heater	CRA_0013	CRA_0060
200 W	CRA_0014	CRA_0061
325 W	CRA_0015	CRA_0062
500 W	CRA_0016	CRA_0063

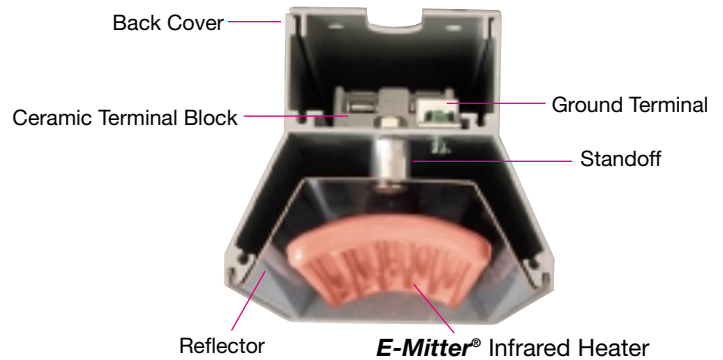
30" ESH with three CRB heaters		
with: 250 W each heater	CRA_0017	CRA_0064
400 W	CRA_0018	CRA_0065
650 W	CRA_0019	CRA_0066
1000 W	CRA_0020	CRA_0066

30" ESH with six CRC heaters		
with: 125 W each heater	CRA_0021	CRA_0067
200 W	CRA_0022	CRA_0068
325 W	CRA_0023	CRA_0069
500 W	CRA_0024	CRA_0070

40" ESH with four CRB heaters		
with: 250 W each heater	CRA_0025	CRA_0071
400 W	CRA_0026	CRA_0072
650 W	CRA_0027	CRA_0073
1000 W	CRA_0028	CRA_0074

40" ESH with eight CRC heaters		
with: 125 W each heater	CRA_0029	CRA_0074
200 W	CRA_0030	CRA_0075
325 W	CRA_0031	CRA_0076
500 W	CRA_0032	CRA_0077

## Ceramic Infrared E-Mitters® ESH Structural Housings



**STOCK ITEMS**  
**ORDER NOW!**

### ESH Housings Only

Description	Part Number
<b>10 in.</b> It can house one CRB or two CRCs. Maximum power 1000 W.	CRK00001
<b>20 in.</b> It can house two CRBs or four CRCs; or one CRB and two CRCs. Maximum power 2000 Watts.	CRK00002
<b>30 in.</b> It can house three CRBs or six CRCs; or a combination of CRBs and CRCs. Maximum power 3000 Watts.	CRK00003
<b>40 in.</b> It can house four CRBs or eight CRCs; or a combination of CRBs and CRCs. Maximum power 4000 Watts.	CRK00004

### Reflectors Alone

Includes standoffs and mounting hardware

For half size CRC, CRH C heaters: 4.88"L x 3.71"W	CRK00006
For full size CRB CRH B heaters: 9.81"L x 3.71"W	CRK00007

### Accessories

Mounting spring clip	SPR-103-102
2-pole ceramic terminal block	EHD-108-101

### Temperature and Power Controls

For discreet temperature and power controls, refer to Section 15.4  
For full panel control systems refer to Section 11.

## How to Order

### Custom Engineered/Manufactured

Understanding that an ESH housing assembly can be very application specific, for sizes and ratings not listed, **TEMPCO** will design and manufacture a ESH housing assembly to meet your requirements. **Standard lead time is 3 weeks.**

Components for ESH housings are optional. To complete the assembly, **Please Specify** the following:

- |  |  |
|--|--|
| <input type="checkbox"/> Housing Length                                    | <input type="checkbox"/> E-Mitter® with Built-In Type K T/C, Size, Electrical Ratings or Part Number |
| <input type="checkbox"/> E-Mitter® Color                                   |  |
| <input type="checkbox"/> E-Mitter® Size, Electrical Ratings or Part Number |  |



If you should encounter any problems or need technical support in the design of the ESH system consult Tempco. Our team of professionals will provide you with the right solution for your application.



## Ceramic Infrared E-Mitters®

CRD and CRH Elements and Systems



## The Hi-Tech Revolution Has Begun!

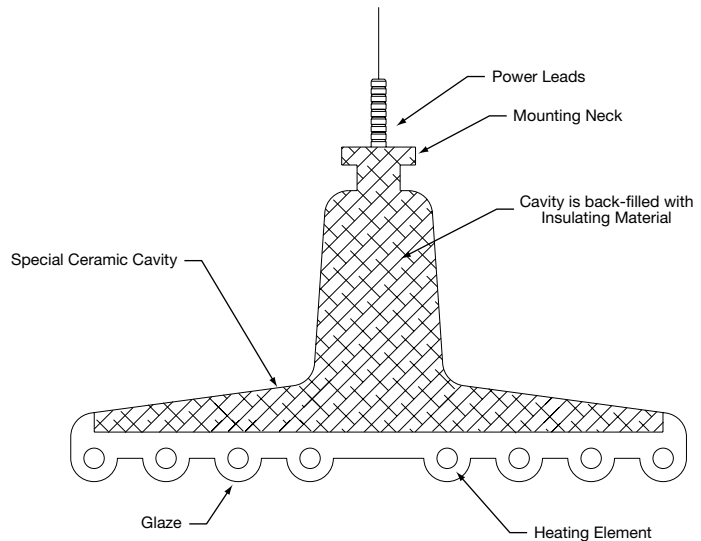
**CRD and CRH Ceramic Infrared E-Mitters®** present revolutionary technical innovations in the field of radiant heating. CRD and CRH elements feature a very low mass construction, achieved by a thin-walled, hollow ceramic body. The resistance coil is embedded into the element's emitter surface within a thin layer of ceramic. The inner section of the element, which is hollow, is filled with low mass ceramic fiber insulation to thermally isolate the emitter surface from the element terminal area, thereby reducing oxidation and corrosion. The net result is a vastly improved heat-up and cool-down cycle time capability coupled with considerable energy savings.

### Design Features

- \* Standard colors are coral, which changes to grey when energized, and traditional white.
- \* Also available in yellow, which changes to orange when energized, and black.
- \* Built-in standard type K thermocouple. Optional Type J thermocouple is also available.
- \* Long operating life; over 10,000 plus hours of continuous operation under normal conditions.
- \* 3 sizes in the CRH Series; 1 size in the CRD series.
- \* Large wattage range: From 125 to 800.
- \* Standard stocked voltage: 220/240.
- \* 120, 208, 277, and 480 Volt are available.

### CRD and CRH Emitter Innovations

- 1. LESS MASS.** A special manufacturing process allows construction with thin walls that withstand larger temperature gradients. The embedded resistance coils heat up the low mass body at a faster rate, providing considerable energy savings.
- 2. SUPERIOR INSULATING MATERIAL.** The hollow inner area is filled with low-mass ceramic fiber to further insulate the contact region from the emitter surface, resulting in an improvement of operating life.



### Infrared Radiation Images

#### Infrared Radiation Images of Tempco's Ceramic E-Mitters®

(White, 240V, 400W)

The temperature scale corresponding to each color is at the right side of the images in °F.

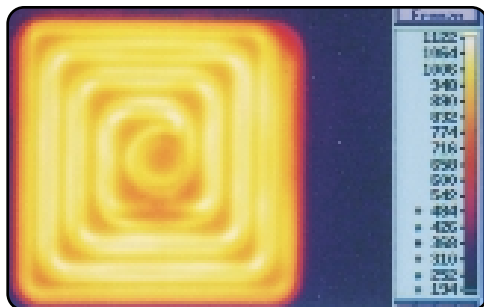


Image of Part Number CRD00002

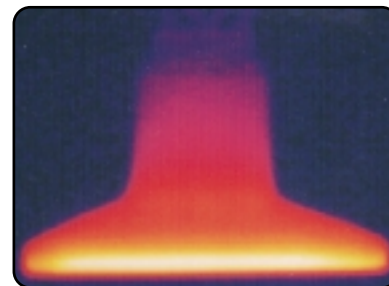


Image of Part Number CRD00002

**Side View** The lighter color (yellow) represents the hottest area(s), while the black (background) represents the ambient temperature. The air gap and the ceramic fiber insulation produce a dramatic temperature gradient between the heating elements (yellow region), and the supporting clamps (purple region).

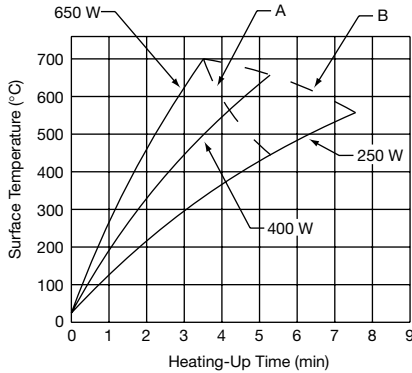
**Bottom View** The temperature distribution in this face is particularly homogeneous, assuring a uniform radiant heat to a given application. The convective heat losses are more noticeable at the edges of the heater. Except in vacuum conditions, convective losses must always be considered in a heating application.



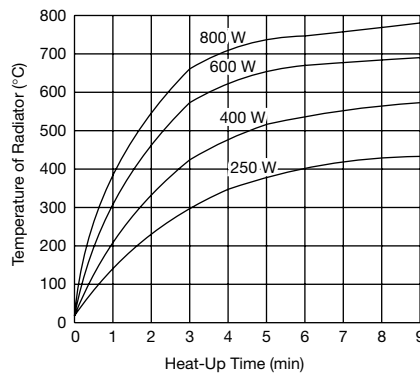
**CRD and CRH E-Mitters®** provide extremely rapid and responsive heat-up and cool-down rates. These important characteristics yield excellent thermal profiling efficiencies and dramatically improve energy conservation.

## Ceramic Infrared E-Mitters® CRD and CRH Elements and Systems

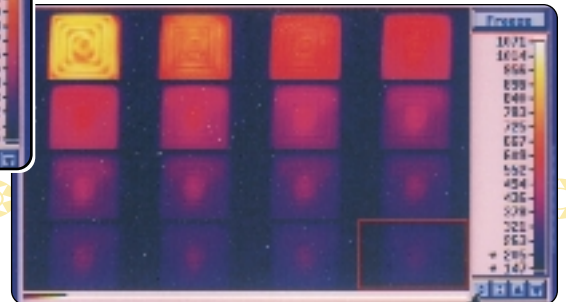
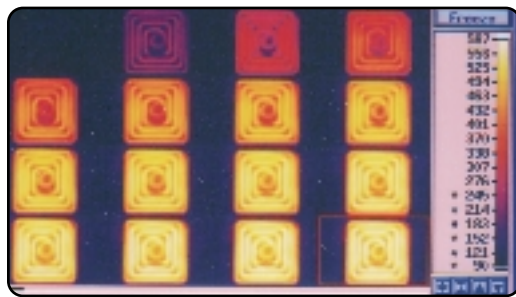
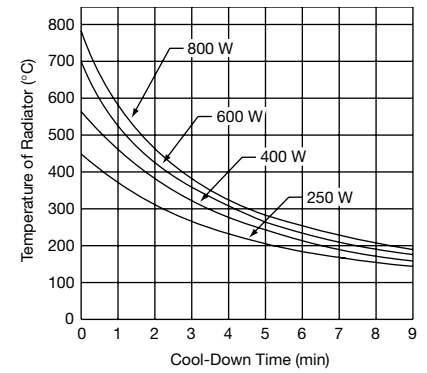
**Warm-up Curve  
CRD Long Shaft**



**Warm-up Curve  
CRH Short Shaft**



**Cool-Down Curve  
CRH Short Shaft**



### Infrared Images

These infrared images were recorded at 30 second intervals. The left photo sequence illustrates how the elements heat up over time. The right photo sequence illustrates how the elements cool down.

### CRD and CRH E-MITTERS® – TECHNICAL SPECIFICATIONS

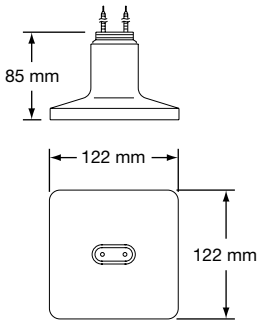
Element Type & Wattage	CRH Series (A & B) CRH Series (C)	250W	400W	600W	800W	CRD Series		
		125W	200W	300W	400W	250W	400W	650W
<b>Watt Density</b>	<b>(W/in<sup>2</sup>)</b>	10.3	16.6	24.8	33.0	10.3	16.6	26.8
<b>Typical operating temperature under ideal conditions*</b>	<b>(°F)</b>	842	1058	1256	1382	842	1022	1256
	<b>(°C)</b>	450	570	680	750	450	550	680
<b>Maximum Voltage</b>	<b>(VAC)</b>	480	480	480	480	480	480	480
<b>Max. Permissible Temperature*</b>	<b>(°F)</b>	1292	1382	1472	1472	1058	1202	1292
	<b>(°C)</b>	700	750	800	800	570	650	700
<b>Infrared Radiation Wavelength</b>	<b>(µm)</b>	2 to 10 for all wattages				2 to 10 for all wattages		
<b>Heat-up constant to 63% of final temperature</b>	<b>(min)</b>	2.8	2.3	1.9	1.6	3.6	3.1	2.1
<b>Mean cool-down from the max. temperature to 392°F (200°C)</b>	<b>(min)</b>	5.5	6.5	7	8	13	14	15

\*Measured by internal thermocouple

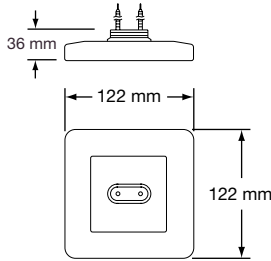


## Ceramic Infrared E-Mitters®

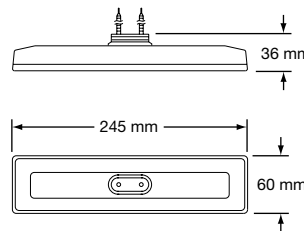
### CRD and CRH Elements and Systems



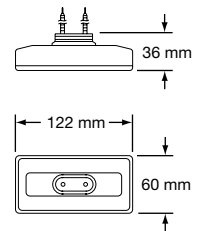
CRD Series



CRH Series A



CRH Series B



CRH Series C

**STOCK ITEMS**  
**ORDER NOW!**

Applies to all items  
in the list below.

### CRD/CRH Standard Sizes and Ratings List

**SAME DAY SHIPMENT**  
on stock items **2 PM**  
ORDERED BY **CST**

	Wattage	CORAL		WHITE	
		without Thermocouple	with Type K Thermocouple	without Thermocouple	with Type K Thermocouple
<b>CRD Series</b> 4.80" × 4.80" 122 mm × 122 mm	250	CRD10001	CRD10005	CRD00001	CRD00005
	400	CRD10002	CRD10006	CRD00002	CRD00006
	650	CRD10004	CRD10008	CRD00004	CRD00008
<b>CRH Series A</b> 4.80" × 4.80" 122 mm × 122 mm	250	CRH10029	CRH10030	CRH00029	CRH00030
	400	CRH10018	CRH10005	CRH00018	CRH00005
	600	CRH10010	CRH10011	CRH00010	CRH00011
	800	CRH10001	CRH10019	CRH00001	CRH00019
<b>CRH Series B</b> 2.36" × 9.65" 60 mm × 245 mm	250	CRH10020	CRH10021	CRH00020	CRH00021
	400	CRH10002	CRH10012	CRH00002	CRH00012
	600	CRH10009	CRH10006	CRH00009	CRH00006
	800	CRH10022	CRH10023	CRH00022	CRH00023
<b>CRH Series C</b> 2.36" × 4.80" 60 mm × 122 mm	125	CRH10024	CRH10007	CRH00024	CRH00007
	200	CRH10025	CRH10026	CRH00025	CRH00026
	300	CRH10003	CRH10013	CRH00003	CRH00013
	400	CRH10027	CRH10028	CRH00027	CRH00028

Ceramic Infrared E-Mitters® listed are 220/240V and include 3½" ceramic bead insulated leads with straight crimp terminal and a spring clip for mounting.

### How to Order

#### Catalog Heaters

For shipment directly from Stock choose the Ceramic Infrared Radiant Heater from the above list.

Optional color changing yellow or straight black can be manufactured to order to meet your requirements. A part number will be assigned at time of ordering.

#### Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for colors, sizes and ratings not listed, **TEMPCO** can manufacture CRD-Long Shaft and CRH-Short Shaft Ceramic Infrared Heaters to meet your requirements. **Standard lead time is 3 weeks.**

**Please Specify** the following:

- Size** Overall dimensions or Series Code
- Color** Standard colors are *color changing coral* and white; optional colors are *color changing yellow* and black
- Voltage and Wattage** 240, 120, 208, 277, 480V and most other voltages are available
- Thermocouple** Standard Type K, or optional Type J  
*Description of process and temperature required*



## Ceramic Infrared E-Mitters®

### CRD and CRH Elements and Systems

### ESHD/S Structural Housing Assemblies for CRD and CRH E-Mitters®

To optimize the use of CRD and CRH Series E-Mitters®, Tempco offers two styles of Structural Housing Assemblies. The 60 mm wide CRH Series B and C is used in the ESH Structural Housing Assemblies— the same as CRB and CRC Series heaters— Refer to pg. 7-8.

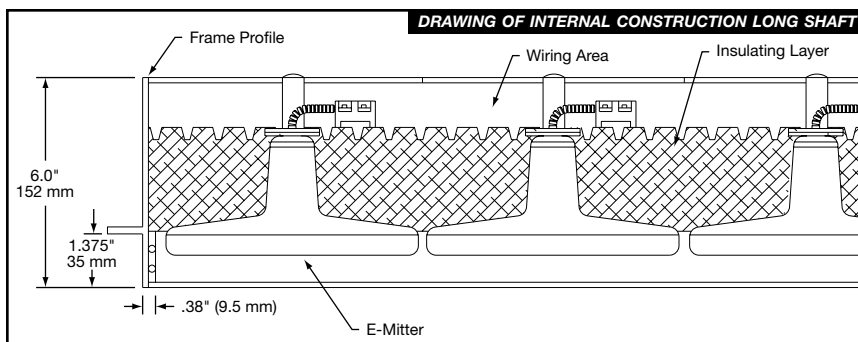
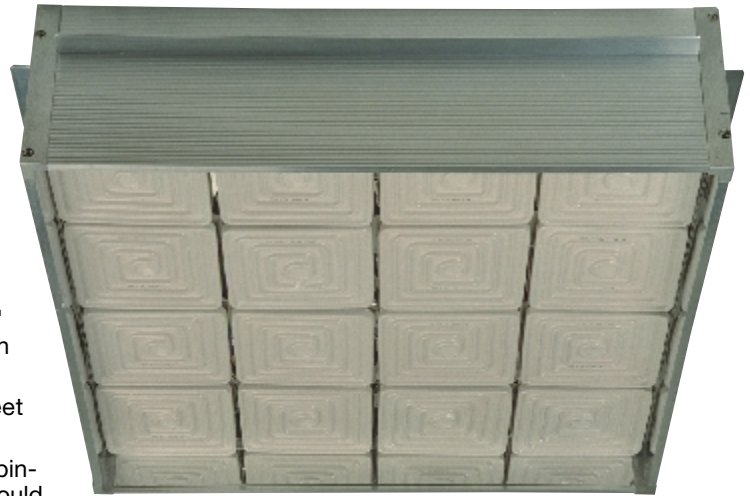
For CRD and CRH 122mm x 122mm sized E-Mitters®, Tempco manufactures ESHS and ESHD custom panel kits, which are preassembled at the factory and shipped complete and can easily be installed into new or existing equipment.

The housing is made of an extruded aluminum alloy and within it there are terminal blocks for each heater. Nickel wire with heat resistant insulation is used for wiring the heaters.

**ESHD/S units** are available in sizes from 5.0" x 10.0" to 45.0" x 55.0". These units can be ordered in a variety of sizes with 5.0" increments in width and length.

**ESHD/S style** housings enable one to fabricate a unit to meet virtually any space requirements.

Zones with different radiant heat levels can be achieved by combining the 250, 400 and 650 Watt CRD or CRH heaters. Each zone would have a heater with built-in thermocouple to assure proper temperature control.



### ESHD Housing Assembly

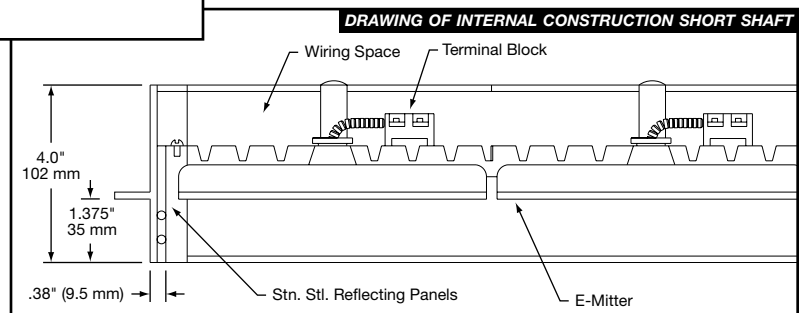
For use with CRD Long Shaft Support E-Mitters®

The reflective surface of the foil backing of the ceramic fiber insulation reflects the heat radiated from the top surface of the E-Mitters®. The ceramic fiber insulation acts as a thermal barrier to inhibit the transfer of residual heat that is conducted through the foil, thus keeping the wiring and terminal area much cooler.

### ESHS Housing Assembly

For use with CRH Short Shaft E-Mitters

This E-Mitters® housing assembly is essentially the same as the ESDH with the exception that it is smaller in height and does not feature thermal insulation, due to the short shaft support employed by the CRH heaters.



### How to Order

Due to the custom nature of these systems, catalog numbers are assigned when orders are placed.

To order a preassembled **ESHD or ESHS E-Mitters® Array**, supply Tempco with the following:

- A.** Type of heater: CRD-long shaft or CRH-short shaft.
- B.** E-Mitter® Color, Wattage and Voltage.
- C.** How many heaters with thermocouple, and location in the array. Specify Type K-Standard or Type J-Optional.
- D.** Quantity of heaters in terms of length times width.

The arrays can be assembled from 1 heater down by 2 heaters across up though 9 heaters down by 11 heaters across.

To order preassembled **ESH Housings** with 60 mm wide CRH elements, consult the how to order section on page 7-9.



## Ceramic Infrared E-Mitters®

### CRE Elements

#### CRE-Edison Screw-In Bulb E-Mitters®

Tempco's Edison Screw-In Bulb Style E-Mitter® is a hollow mushroom shaped ceramic heater. The unique thin wall construction and geometrical shape of the CRE style heaters facilitate very fast heating and cooling rates.

The resistance coil is embedded into the specially designed circular ceramic emitter surface, providing extremely uniform heat transmission with low element surface temperatures. The inner body of the CRE element is hollow and filled with ceramic fiber insulation to maximize energy conservation and thermodynamic efficiency, as well as minimizing heat buildup at the terminal area.

#### Typical Applications

- Plastic Thermoforming and vacuum forming
- Curing adhesives
- Curing dental composite material
- Heating laboratory samples and specimens
- Comfort heat for agricultural, zoological and reptilian pet applications

#### Design Features

- \* Provides safe, clean, radiant heat anywhere
- \* Easy installation
- \* Not affected by vibration—high mechanical strength
- \* Does not generate visible light—only heat
- \* Reversible color change feature
- \* 10,000 Plus hours of operating life

Because of the convenient Edison Screw-In style termination, CRE E-Mitters® are recognized as a tremendously versatile source of localized heat. They can be used virtually anywhere quickly and easily by simply installing the CRE E-Mitter® into common porcelain/ceramic insulated bulb sockets—like any ordinary light bulb!

## 3 STANDARD SIZES

CRE Style E-Mitters® are available in three standard sizes in wattages ranging from 60W through 250W. The unique color changing characteristics found in all Tempco E-Mitters® are standard in the CRE elements as well.

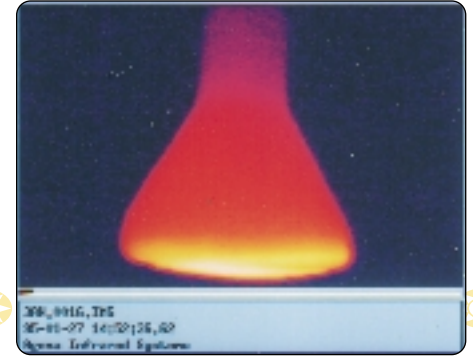
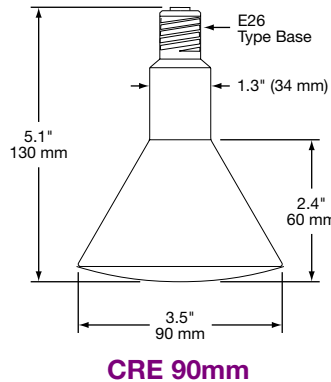
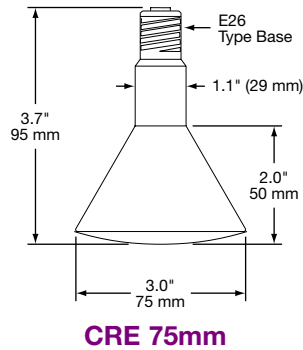
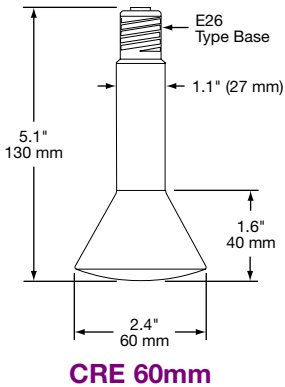
#### CRE E-MITTERS® — TECHNICAL SPECIFICATIONS

Element Type & Wattage	CRE Series	60W	100W	60W	100W	150W	250W
Bulb Diameter	(mm)	60	60	75	75	90	90
Operating Voltage	(VAC)	120	120	120	120	120	120
Maximum Allowable Surface Temperature*	(°F)	842	887	662	788	842	986
	(°C)	450	477	350	420	450	530
Average Base Temperature	(°F)	230	256	158	185	230	284
	(°C)	110	126	70	85	110	140
Infrared Radiation Wavelength	(µm)	2 to 10 for all wattages					
Heat-up time to 90% of maximum temperature	(min)	5.0	4.3	6.8	5.8	5.0	3.9

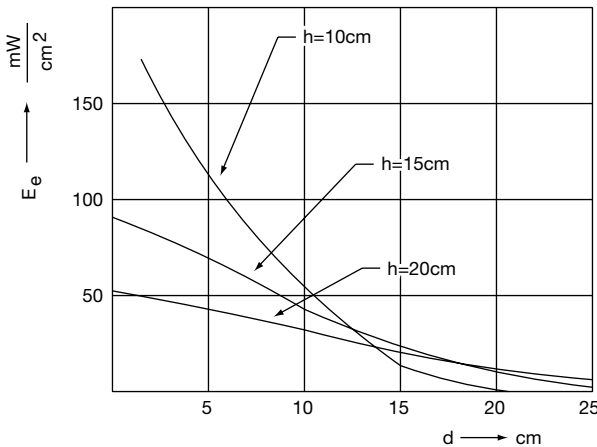
\*Measured by internal thermocouple under laboratory conditions



## Ceramic Infrared E-Mitters® CRE Elements



### Distance vs. Power Curves



Irradiation  $E_e$  intensity at a distance  $h$  from the heated surface and from the center distance  $d$  of a 250 Watt CRE00002 E-Mitter®.

### Infrared Radiation Image of CRE00002 (White, 120V, 250W)

The lighter color (yellow) represents the hottest areas, while the black (background) represents the ambient temperature.

The air gap and the ceramic fiber insulation produce a dramatic temperature gradient between the heating elements (yellow region) and the screw cap (purple region).

### CRE Standard Stock List

120V heaters with E26 Screw-In base



Diameter	Wattage	Part Number	
		Coral	White
60mm	60	CRE10014	CRE00014
	100	CRE10015	CRE00015
75mm	60	CRE10012	CRE00012
	100	CRE10013	CRE00013
90mm	150	CRE10008	CRE00008
	250	CRE10002	CRE00002

**SAME DAY SHIPMENT**  
on stock items **2 PM**  
ORDERED BY **CST**

## How to Order

### Catalog Heaters

For shipment directly from Stock, choose the Ceramic Infrared Radiant Heater from the above list that fills your requirements.

Optional color changing yellow or straight black can be manufactured to order to meet your requirements. A part number will be assigned when an order is placed.

### Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** will design and manufacture a CRE Bulb Style Ceramic Infrared Heater to meet your requirements. **Standard lead time is 3 weeks.**

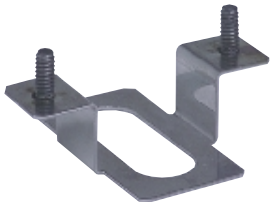
**Please Specify** the following:

- Size** Overall dimensions or Series Code
- Color** Standard colors are *color changing coral* and white; optional colors are *color changing yellow* and black
- Voltage and Wattage** 120, 208, 240, 277V and most other voltages are available  
*Description of process and temperature required*



## Ceramic Infrared E-Mitters®

### Accessories



#### Single Element Mounting Bracket

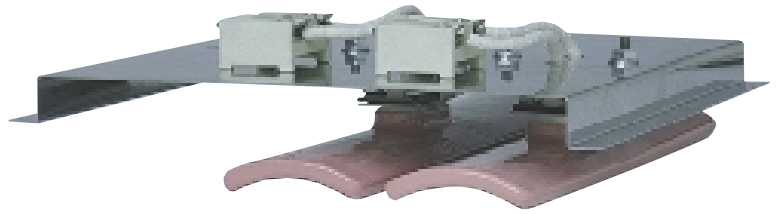
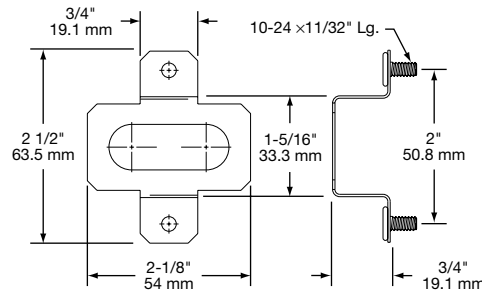
A convenient method for mounting individual E-Mitters® to a flat surface or panel for spot heating applications.

**Part Number: CRK00018**

*Example:*

The picture shows how the single element mounting can be used to develop a panel array using CRB or CRC Series Ceramic E-Mitters® and others with same new design.

Note the use of EHD-108-101 High Temperature Ceramic Terminal Blocks for wiring of power input and the thermocouples.

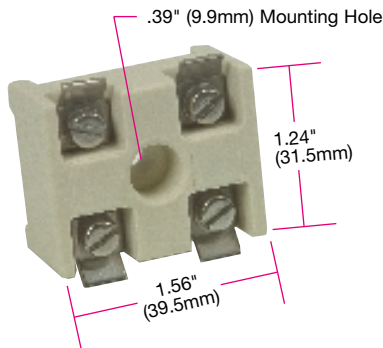


#### Ceramic 2-Pole Terminal Block

Used for wiring of heater power and thermocouple wiring in high temperature locations.

- Maximum Voltage: 600 VAC
- Maximum Current: 20 Amp
- Body Material: Fired Porcelain
- Hardware: Stainless Steel
- Maximum Temperature: 500°C/940°F

**Part Number: EHD-108-101**



#### Screw-In Base for CRE E-Mitters®

Ceramic receptacle for use with CRE screw-in bulb E-Mitters®.

**Part Number: CRK00016**



#### Thermocouple Lead Wire

General purpose high temperature thermocouple hookup wire.

- Insulation: Fiberglass
- Nominal Size: .064" × .104"
- Wire Gauge: 20 ga. stranded

Type K: **TCW-103-101**  
Type J: **TCW-101-109**

**Note:** 50 ft. minimum

#### Power Lead Wire

General purpose high temperature power hookup wire.

- Insulation: Mica/Fiberglass
- Voltage: 600 V
- Type: Stranded
- Max. Temperature: 450°C (842°F)

14 ga. (.144" dia.): **LDW-103-104**  
16 ga. (.128" dia.): **LDW-104-104**

**Note:** 100 ft. minimum





### A Little Bit of Heat Transfer Theory...

A heat transfer mode that will naturally occur at the surface of the heater is called **radiation**. Its intensity does not depend on the characteristics of the surrounding fluid (it works in a vacuum too) but on the characteristics of the heater and the surrounding bodies.

Therefore, the efficiency of radiation heat transfer exchange between bodies depends on:

1. **The emissivity values of the emitter (i.e. ceramic heaters).**
2. **The absorption, reflection and transmission properties associated with the receiving medium.**
3. **The relative temperature differences.**
4. **The surface characteristics.**
5. **Relative position and physical geometry.**

**The Technical References** presented throughout the Ceramic Infrared E-Mitters® section are intended to enhance your knowledge of various aspects of infrared radiant heating, enabling you to make better choices when selecting Tempco ceramic infrared E-Mitters®.

Many applications in the field are unique and present substantially different operational parameters and characteristics. This application diversity should be evaluated accordingly, and while the material presented in this section is intended to provide some background reference, it is very generalized and is not to be construed as application specific.



**It is highly recommended that you contact our staff of knowledgeable sales engineers with specific technical questions relating to your application.**

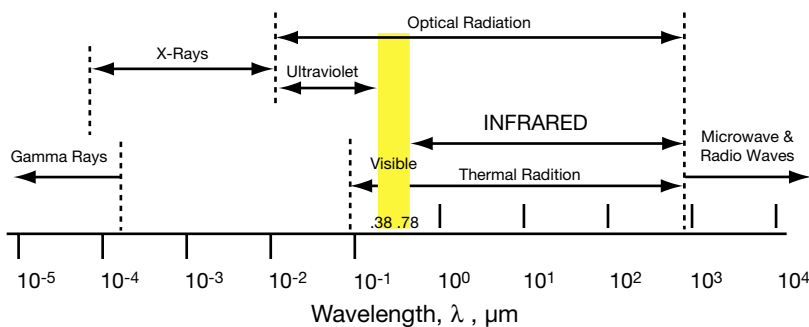
Infrared radiant energy is transported through space by electromagnetic waves without the need of a conductive media (as opposed to conduction or convection processes). Consequently, **heat can be delivered in concentrated areas at very fast rates.**

Understanding of these important characteristics will lead to a better utilization of infrared heating technology.

## Taking the Mystery Out of Infrared Energy



### Spectrum of Electromagnetic Radiation



### WHY CAN'T WE SEE INFRARED RADIATION?

Electromagnetic radiation is measured in wavelength "l" or in frequency "f." Both quantities are related by the equation:

$$l = \frac{c}{f} \quad \text{"c" is the speed of light}$$

Infrared radiation wavelengths fall outside the visible range in the electromagnetic spectrum; see adjacent Figure. One micrometer, μm, is equal to 10<sup>-6</sup> meter.

The total radiant energy "W" in watts per square centimeter emitted by an object is found with the Stefan-Boltzmann law:

$$W = e s T^4$$

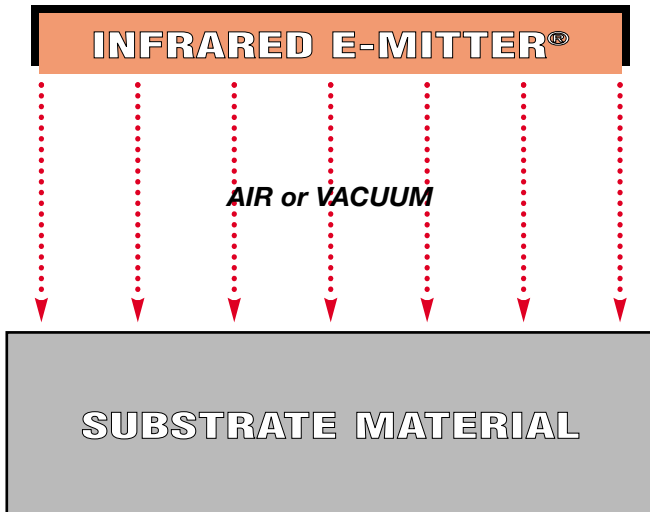
where "e" is the emissivity factor, "s" is the Stefan-Boltzmann constant (5.67 × 10<sup>-12</sup> W/cm<sup>2</sup>K<sup>4</sup>) and "T" is the surface temperature of the object in °K (0°C equals 273°K).

**All matter emits radiant energy as a consequence of its finite temperature.** Only at absolute zero (-273°C), when all molecular activity ceases does matter stop emitting radiant energy. In solids and liquids, emission of radiant energy is considered a surface phenomenon, while for gases and certain semi-transparent solids, such as glass and salt crystals (at elevated temperature), emission is considered a volumetric phenomenon.



## Ceramic Infrared E-Mitters®

### Technical Reference



### What Kind of Material Do You Want to Heat or Dry?

This information is used to compare the absorption spectra of the material with the emission spectra of the infrared heaters. A good match ensures that the radiant energy from the emitter will be effectively absorbed by the material with minimum losses due to transmittance or reflectance. The table below was prepared to help you select the best heater rating for your particular application. If you need additional information, contact **Tempco** for technical assistance.



In situations where the material or its released solvents/vapors are easily flammable, special protection is required. Explosion protected types of E-Mitters® are not available. You will have to take proper steps to prevent the flammable media from coming into contact with the hot heater surfaces and electrical wiring. Current regulations and electrical codes must be complied with to prevent unsafe conditions.

### Examples of Common Applications

The table below presents some of the most common infrared applications encountered in several industries. The wavelength of the infrared energy was matched to the absorption characteristics of the material to be heated. Various wattages for the same

application are recommended due to the absorption characteristics and variables of the application. Select the wattage according to the application requirements. Testing is strongly recommended before final selections are made.

Industry	Infrared Heater Wattage (Watts)								
	150	250	300	350	400	500	650	750	1000
<b>PAPER</b>									
• Heating paper pulp and papier-mâché before pressing/molding							■		
• Quick drying of lacquered paper, gummed or glued paper and cardboard								■	■
<b>PLASTICS &amp; RUBBER</b>									
• Drying/curing plastic/latex emulsion/surfacing				■	■				
• Gelling PVC paste/film on fabrics etc.				■	■				
• Preheating plastic foil/sheet/vacuum forming				■	■	■	■	■	■
• Preheating rubber sheeting prior to extrusion					■	■			
<b>TEXTILES, SILK &amp; FIBERS</b>									
• Drying washed, dyed and finished textiles							■	■	■
• Fiberglass layup and molding; Resin curing		■	■	■					
• Silk-screen printing; Fusing metallic inks				■	■	■			■
• Stress curing ovens for synthetic fibers			■	■	■	■			
<b>TOBACCO &amp; FOOD INDUSTRY</b>									
• Heating food in restaurants		■	■	■					
• Tobacco drying; Grain drying		■	■						
<b>GENERAL</b>									
• Activation of adhesives and surface sealing				■	■				
• Drying/baking lacquered tin components		■	■	■	■	■			
• Heat/dry/fixing adhesives (Boot and shoe trade)							■	■	■
• Low temperature drying of atomized chemicals			■	■	■	■			
• Ore drying and sampling for laboratory work				■	■	■			
• Preheating large metal embossing rollers				■	■	■			
• Powder coating processes			■	■	■	■			
• Setting Nylon® and Perlon® threads, etc.		■	■	■	■				
• Water evaporation								■	■



## Ceramic Infrared E-Mitters®

### How to select a Ceramic Infrared Heater

Safe, economical and efficient infrared radiation heating systems can be designed, installed and operated by following some basic rules and guidelines.

#### Heating Distance for Stationary and Moving Systems

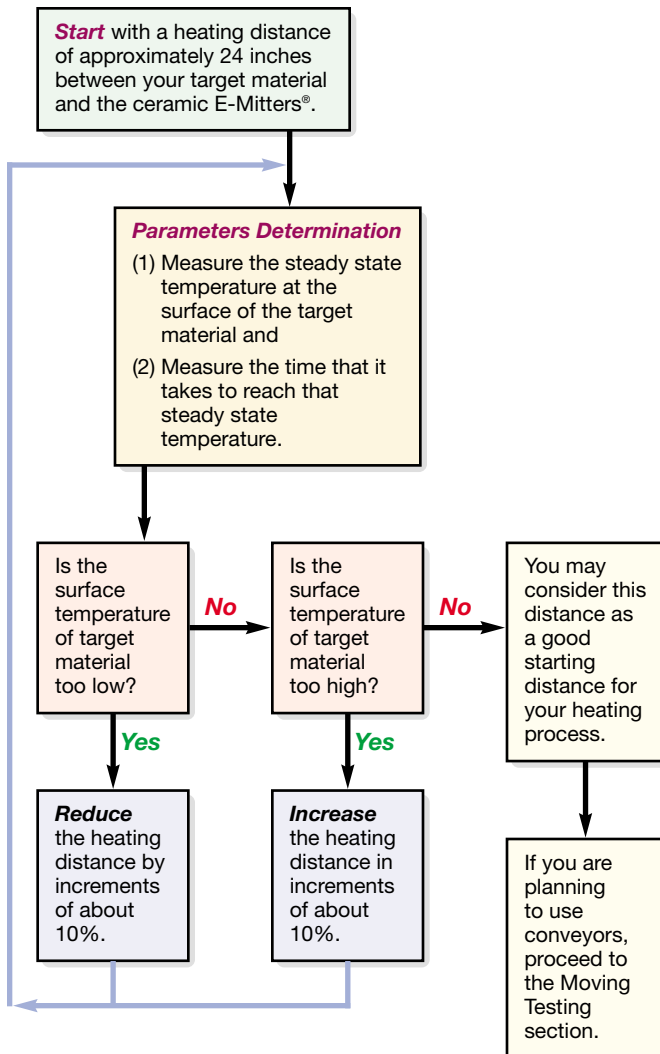
The optimum heating distance cannot be accurately determined for a given application without some preliminary testing because of the many different factors that affect the radiation transfer of heat. Therefore only general guidelines can be offered here.

In any heating application, it is recommended that Stationary Testing be done first. This can be accomplished by following some simple steps.

#### Stationary Testing

##### OBJECTIVE

Determination of the heating distance.



#### DESIGN GUIDELINE

#### A General Information

1. Use the table on page 7-18 to match your target material with its corresponding ceramic E-Mitter® rating. If the table does not list your target material, consult Tempco for assistance.

2. Select and Order the ceramic E-Mitter® based on the wattage rating. Tempco offers a complete line of industrial ceramic infrared heaters for you to choose from. Other wattage and voltage combinations can be designed and manufactured to suit your particular application. Consult Tempco with your requirements.

3. Next, what heating process are you going to apply to your target material: Process Heating, Drying, Curing, Cooking or another process? **Your answer will dictate the next design guideline and how to proceed for the determination of the correct heating distance.**

#### DESIGN GUIDELINE

#### B Process Heating

In many industrial applications, heat has to be applied to a target material before being processed further. In some cases, hot spots or large temperature gradients must be avoided. For this reason, it is highly recommended that several temperature controllers be used together with ceramic E-Mitters® and integrated thermocouples. Three main processes require special attention:

**1. Plastic sheets** The fact that plastics have very low internal thermal conductivity causes localized heating if the applied heat is not uniformly distributed or if the sheets are too thick. In this situation, it is recommended that heat be applied to both sides of the sheet for the heat to be distributed throughout the material.

**2. Metallic sheets or strips** Metals are better internal conductors of heat than plastics but they absorb much less radiant energy because most of it is reflected at the surface. To overcome this problem, you match the emission spectra of the radiant heater with the absorption spectra of the metal. Tempco's sales engineering staff will gladly help you in this endeavor.

**3. Granular form material** A relatively uniform heating of granulated compounds can be achieved by placing a thin layer of granules on a vibrating surface or conveyor to aerate the material while heating.

#### DESIGN GUIDELINE

#### C Drying, Curing & Cooking

**Drying** involves the release of water vapor, solvents or other materials that are vaporized during the process. In some cases, the solvents may be harmful or explosive and would require special protection. The user is solely responsible for the installation of the heating system and the strict observance of all applicable regulations.

**Water vaporization**, on the other hand, does not present this problem, but offers other related ones that also require special handling, such as how to remove the water vapor as it comes off the material being processed.

As for **curing and cooking**, because of the many different applications encountered within the various industries, no specific rules can be offered in this general guideline. Testing of the application is recommended to determine the process requirements. Contact Tempco's sales engineers if assistance is needed.



## Ceramic Infrared E-Mitters®

### Technical Reference

#### Tips for Infrared Heating Systems

Infrared heating works best with materials that are thin enough for the heat to be absorbed and/or when the target material has high internal thermal conductivity. In metals, for example heat is easily conducted from the surface to the interior of the material.

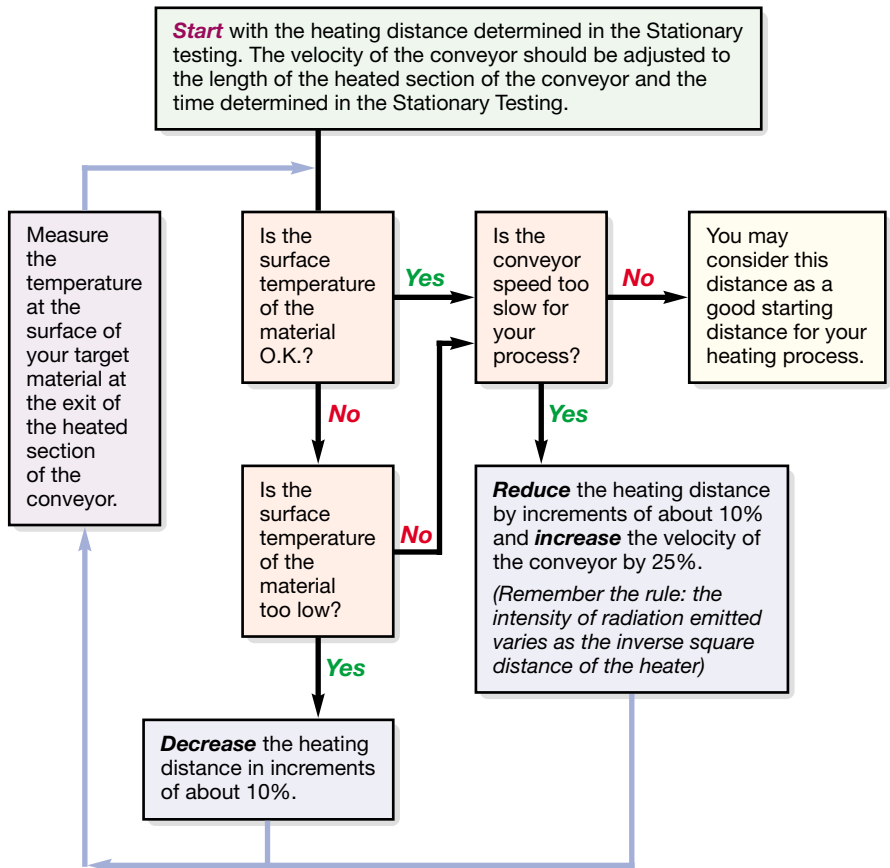
Multilayer materials present some difficulties when they are to be heated with infrared heaters. The top layer dries faster than the lower layers, causing different rates of shrinkage throughout the material. Infrared heat energy is transmitted with the speed of light from the surface of an emitter source (i.e. a ceramic heater) to the surface of the target material. Consequently, the top layer may be subjected to thermal loads that are too high for the composite target material to handle without degradation. In such cases, detection systems and/or overtemperature controls must be incorporated into the heating system to detect changes in normal operating conditions and trigger safety devices.

Higher thermal loading can be achieved in moving systems that result in higher production output. This higher output can be easily accomplished without complications on properly designed, installed, and maintained infrared heating systems.

#### Moving Testing

##### OBJECTIVES

Determination of the heating distance and the velocity of the conveyor.

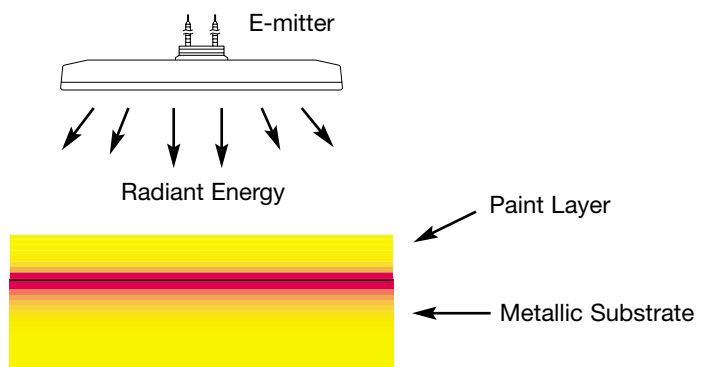
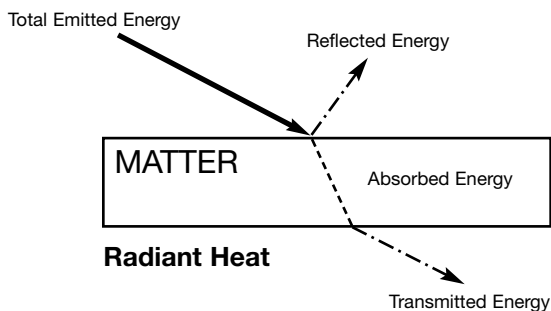


#### Material Thickness

The thickness of any given material is very important for most infrared heating applications. This is due to the fact that many materials, with the exception of the glass-like ones, do not transmit the infrared energy past a few tenths of an inch; therefore, the heat is either reflected or absorbed.

The absorbed heat is conducted in all directions with intensities that depend on the thermal characteristics of the material. In some paint processes, it is more convenient to select an infrared heater

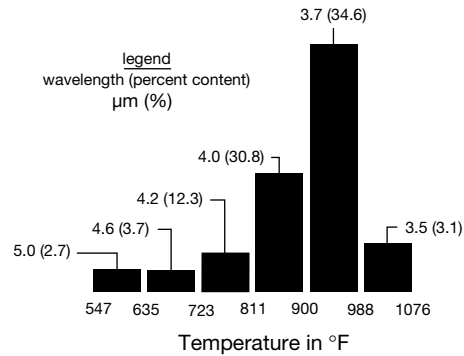
based on the absorption characteristic of the substrate and the transmittance characteristic of the paint. By doing so, the radiant energy will be transmitted farther within the material and absorbed mostly in the substrate material. The temperature in the top layer of the substrate material will rise and heat the material above, a sort of heating from the *inside out!* Blistering is avoided or reduced to a minimum by employing this technique.





### An Example of Emissive Power

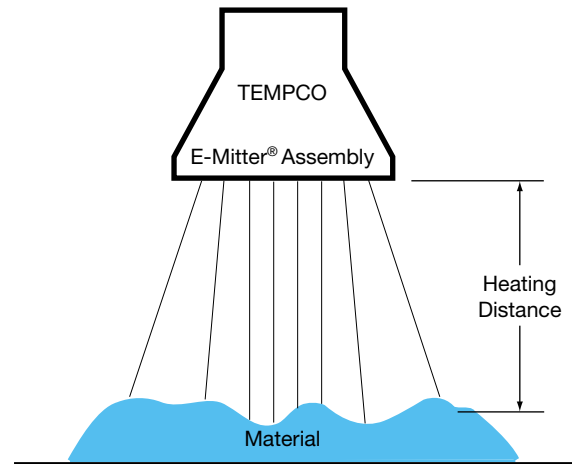
All E-Mitter® ceramic infrared heaters emit infrared energy in various wavelengths depending on their surface temperature. The CRE00002 E-Mitter® (bulb style, 250W, 120V, white) was tested as an example, and the results are shown on the right. The values associated with temperature: wavelength and their percentages, were obtained when the heater reached steady state conditions. The values of the wavelength,  $\mu_{max}$  (in  $\mu m$ ), were calculated using the Wien's law for a blackbody. These calculations were possible because our ceramic E-Mitters® spectral emissive power closely approximates the theoretical values in the Planck's formulation.



### Conveyor Systems

Moving heating systems generally achieve higher output per hour than is possible with static systems. The radiant heater's setpoint temperature is set higher in conveyor systems than static systems due to the limited time the product is under the heaters. Tests should be carried out to determine the optimum conveyor speed, heating distance, and E-Mitter® operating temperature.

**CAUTION** In applications such as drying pulp paper, the higher power level required can potentially create a fire hazard if there are not safety mechanisms built into the system. If a malfunction of the conveyor system slows down or stops the conveyor completely, safety mechanisms should be triggered that would shut down power to the heaters to avoid burning the material being cured or dried.



### Maximum Operating Temperature

Every heater has its maximum operating temperature printed on the base. This temperature was measured with a thermocouple and with the heater facing down on a highly reflective material.

In many practical situations, however, this maximum temperature is rarely reached because most of the industrial materials absorb and transmit the heat while reflecting only a fraction of the infrared energy.

### A Safety Issue

**CAUTION** A ceramic infrared E-Mitter® reaches steady-state temperature in a few minutes. However, the material that is in the direct path of the infrared heat **heats up instantly at its surface!** The intensity of this heat depends on the inverse square of the distance from the heater. The user must be aware of this instant heat and design the heating system accordingly.

### Explosion Protection

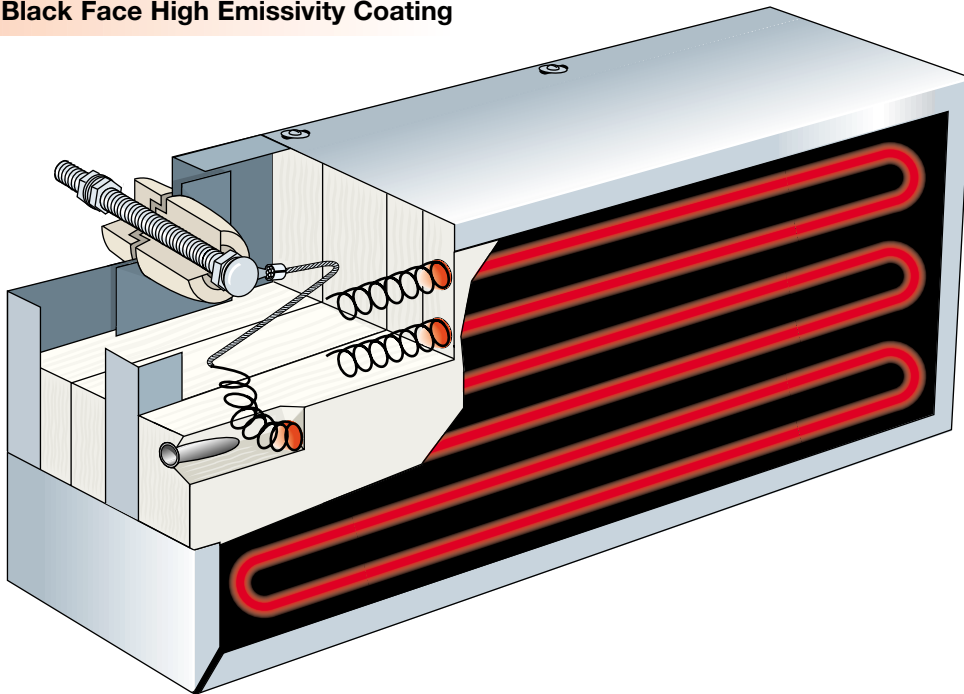
**CAUTION** Ceramic Infrared Heaters are not explosion-proof heaters. These heaters can only be used in atmospheres where the vapor concentration is well below the explosion limits of the processed material. Special provisions, such as forced ventilation, must be made to remove highly flammable vapors from the heaters path. Strict observance of the drying temperature is required for enamel-based materials.

The user is solely responsible for the installation of the E-Mitters® and with the strict observance of all applicable regulations.



## Style RB Panel Heater

Black Face High Emissivity Coating



### Main Construction Features

- \* High temperature ceramic fiber emitter
- \* High temperature black coating
- \* High temperature cement bond
- \* Molded ceramic fiber to hold resistance wire
- \* Precision resistance wire
- \* Quartz thermowell tube
- \* Heavy gauge aluminized steel frame
- \* Refractory blanket insulation
- \* Bulk insulation
- \* Ceramic bushings
- \* Industry standard screw terminals

### Design Features

Tempco Style RB heaters can transmit up to 80% of the input energy. They can operate at temperatures up to 1600°F (872°C) with watt densities up to 25 Watts/in<sup>2</sup>. They can be positioned as close as 2" from the material being heated.

Style RB heaters are available in convenient building block sizes and are equipped with mounting studs on the back for easy installation. These can be mounted in any direction, and due to the bonded construction, they are resistant to shock and vibration. The simple yet rigid construction enables them to be easily adapted to many applications. This style of infrared radiant heater does not require any reflectors, which would require periodic cleaning or replacement.

Thermowells and thermocouples can be installed to control the temperature of the heater. The standard location is centered on the short side, parallel to the face. A standoff mounting bracket is included with the thermowell.

The majority of the heaters in the table of standard sizes are dual voltage rated. Using three terminals and a jumper, either voltage will produce the same wattage.

### Construction Characteristics

Tempco Style RB panel infrared heaters have a ceramic fiber surface that is transparent to radiant energy and is coated with a high temperature black coating for high emissivity.

The resistance wire is helically wound from a high temperature iron/chromium/aluminum alloy. The insulation material is molded around the heater coils from a wet ceramic base material. This produces a very reliable infrared radiant emitter because the coil is literally "cast in" to the surrounding material.

The placement of the resistance coils are carefully designed to provide uniform heat distribution.

The refractory material is backed by layers of insulation to minimize back heat loss. The housing is made of heavy gauge aluminized steel.

The backside of the housing has a terminal box for electrical wiring with ceramic terminal bushings and stainless steel screw terminals.

Options available for this style include: quartz tube thermowell & bracket and type K or J 1/8" diameter thermocouple probe.

### Typical Applications

- Thermoforming*
- Paint Drying*
- Ink Drying*
- Curing of Plastic Coatings*
- Heat Setting*
- Solvent Removal*
- Silk Screen Painting*
- Food Warming*
- Laminating*
- Plastic Forming*

### SPECIFICATIONS

**Sizes:** Standard sizes are listed on the following page; special sizes can be engineered to fit specific applications.

**Standard Thickness:** 3"

**Maximum Watt Density:** 25 Watts/in<sup>2</sup>

**Maximum Voltage:** 600 VAC

**Wavelength Range:** Between 2.5 and 6.0 microns

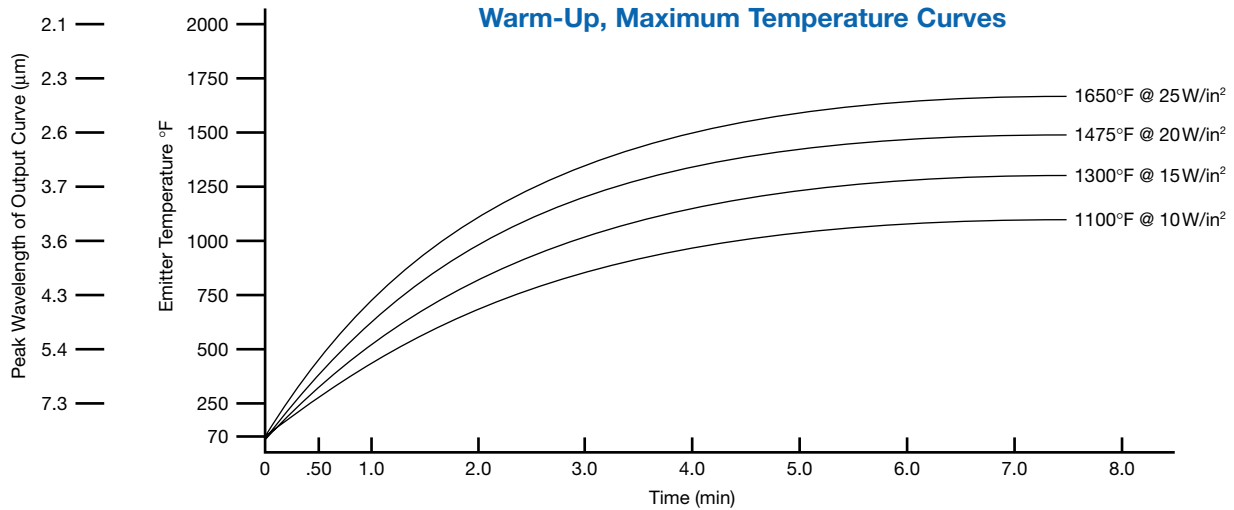
**Maximum Temperature:** 1600°F (872°C)

**Distributed Wattage and Zoning:** Yes



## Style RB Panel Heater

Black Face High Emissivity Coating



**Warm-up curves** are measured from heaters running facedown in open air. The thermocouple is located in the standard location, in the thermowell located behind the coil. The curves will change with environment and thermocouple location.

The curves are also useful in determining what the potential maximum temperature and peak wavelength are for various watt density heaters.

### Standard Sizes and Ratings of Style RB Black Face Infrared Heaters

Width		Length		15W/in <sup>2</sup>			25W/in <sup>2</sup>			Part Number
in	mm	in	mm	Watts	Volts	Ph.	Watts	Volts	Ph.	Part Number
6	152	12	305	1080	120	1	1800	240/480	1	RPB0201__
6	152	18	457	1620	240	1	2700	240/480	1	RPB0202__
6	152	24	610	2160	240/480	1	3600	240/480	1	RPB0203__
6	152	30	762	2700	240/480	1	4500	240/480	1	RPB0204__
6	152	36	914	3240	240/480	1	5400	240/480	1	RPB0205__
6	152	48	1219	4320	240/480	1	7200	240/480	1	RPB0206__
12	305	12	305	2160	240/480	1	3600	240/480	1	RPB0207__
12	305	18	457	3240	240/480	1	5400	240/480	1	RPB0208__
12	305	24	610	4320	240/480	1	7200	240	3	RPB0209__
12	305	30	762	5400	240/480	1	9000	240	3	RPB0210__
12	305	36	914	6480	240	3	10800	480	3	RPB0211__
12	305	48	1219	8640	240	3	14400	480	3	RPB0212__
12	305	60	1524	10800	480	3	18000	480	3	RPB0213__
12	305	72	1829	12960	480	3	21600	480	3	RPB0214__
16	406	16	406	3840	240/480	1	6400	240/480	1	RPB0215__
16	406	24	610	5760	240/480	1	9600	240	3	RPB0216__
18	457	18	457	4860	240/480	1	8100	240	3	RPB0217__
24	610	24	610	8640	240	3	14400	480	3	RPB0218__

### How to Order

#### Catalog Heaters

To order a **Radiant Panel** from the above table, fill in the last digit of the catalog number indicating built-in thermowell and thermocouple as follows:

- 0** = Plain, no thermowell or T/C
- 1** = Thermowell only
- 2** = Thermowell and type K T/C
- 3** = Thermowell and type J T/C

#### Custom Engineered/Manufactured Heaters

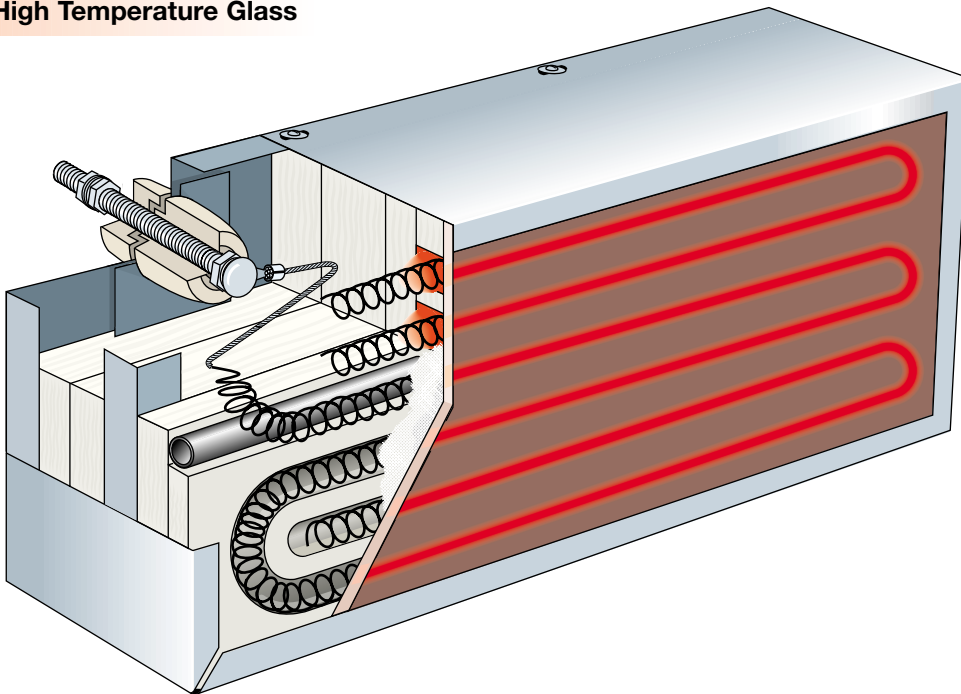
Understanding that an electric heater can be very application specific, for sizes and ratings not listed, Tempco can manufacture a Radiant Panel Heater to meet your requirements. **Standard lead time is 3 weeks.**

**Please Specify** the following:

- Length and Width
- Watts, Volts and Phase
- Operating Temperature, and thermowell/thermocouple if required



**Style RG Panel Heater**  
High Temperature Glass



**Main Construction Features**

- \* High temperature black glass emitter
- \* Ceramic cloth is placed between the glass and the resistance wire
- \* High temperature cement bond
- \* Grooved refractory board to hold resistance wire
- \* Precision resistance wire
- \* Quartz thermowell tube
- \* Heavy gauge aluminized steel frame
- \* Refractory blanket insulation
- \* Bulk insulation
- \* Ceramic bushings
- \* Industry standard screw terminals

**Design Features**

Tempco Style RG is the ideal heater when a cleanable surface (ie. food service applications) is required. **Note:** Not hermetically sealed.

It can operate at temperatures up to 1600°F (872°C) with watt densities up to 20 watts/in<sup>2</sup>. It can be positioned as close as 2" from the material being heated.

Style RG heaters are available in convenient building block sizes and are equipped with mounting studs for easy installation. These can be mounted in any direction and due to the bonded construction, they are resistant to shock and vibration. The simple yet rigid construction enables them to be easily adapted to many applications. This style of infrared radiant heater does not require any reflectors, which would require periodic cleaning or replacement.

Thermowells and thermocouples can be installed to control the temperature of the heater. The standard location is centered on the short side, parallel to the face. A standoff mounting bracket is included with the thermowell.

The majority of the heaters in the table of standard sizes are dual voltage rated. Using three terminals and a jumper, either voltage will produce the same wattage.

**Construction Characteristics**

The Tempco Style RG Radiant Panel Heater has a black Ceran® glass or equivalent for the exterior radiant surface. Black Ceran® glass provides the cleanability of fused quartz at a more economical price.

Behind the glass a 1" thick ceramic fiber refractory board is grooved out to support the helically wound iron/chromium/aluminum alloy based resistance element. The resistance coils are placed into the precision machined grooved board and press fit into place. Ceramic cloth is placed between the glass and the resistance coil.

The resistance coil and the grooves are carefully designed to provide uniform heat distribution. The refractory board is backed by layers of insulation to minimize heat loss.

The backside of the housing has a terminal box for electrical wiring with ceramic terminal bushings and stainless steel terminals.

Options available for this style include: quartz tube thermowell & bracket and type K or J 1/8" diameter thermocouple probe.

**Typical Applications**

- Moisture Removal*
- Paint Drying*
- Glass Processing*
- Curing of plastic coatings, paint, ink, etc.*
- Thermoforming*
- Heat Setting*
- Film Shrinking*
- Blister Packaging*
- Food Processing*
- Textile Drying*

**SPECIFICATIONS**

**Sizes:** Standard sizes are listed on the following page; special sizes can be engineered to fit specific applications.

**Standard Thickness:** 3"

**Maximum Watt Density:** 20 Watts/in<sup>2</sup>

**Maximum Voltage:** 600 VAC

**Wavelength Range:** Between 2.5 and 6.0 microns

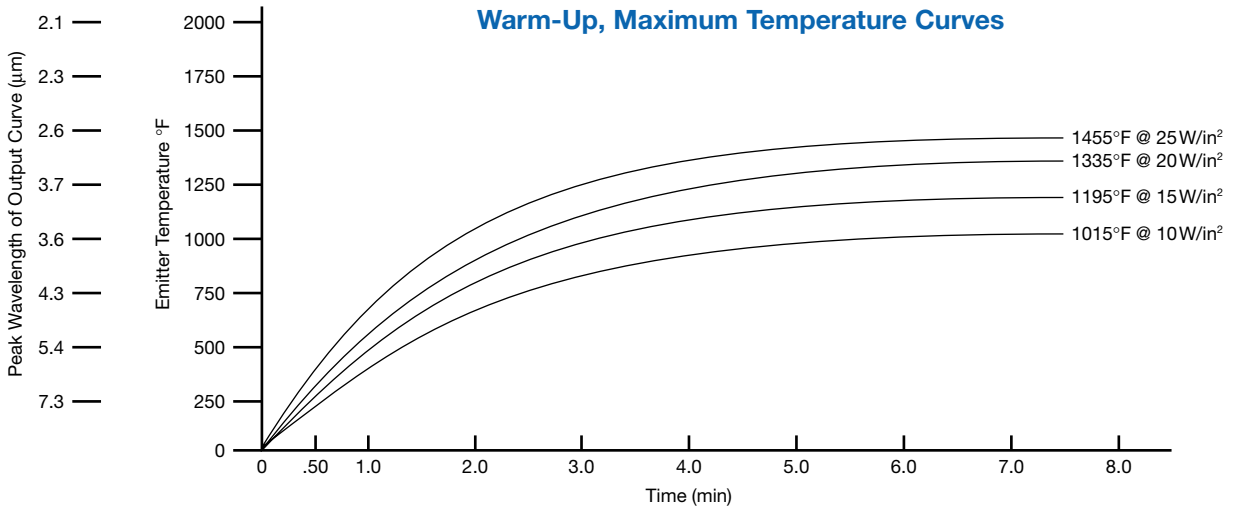
**Maximum Temperature:** 1600°F (872°C)

**Distributed Wattage and Zoning:** Yes





## Style RG Panel Heater High Temperature Glass



**Warm-up curves** are measured from heaters running face down in open air. The thermocouple is located in the standard location, in the thermowell located behind the coil. The curves will change with environment and thermocouple location.

The curves are also useful in determining what the potential maximum temperature and peak wavelength are for various watt density heaters.

### Standard Sizes and Ratings of Style RG High Temperature Glass Infrared Heaters

Width		Length		10W/in <sup>2</sup>				15W/in <sup>2</sup>			
in	mm	in	mm	Watts	Volts	Ph.	Part Number	Watts	Volts	Ph.	Part Number
6	152	12	305	720	120	1	RPG0101__	1080	120/240	1	RPG0201__
6	152	18	457	1080	120/240	1	RPG0102__	1620	240	1	RPG0202__
6	152	24	610	1140	120/240	1	RPG0103__	2160	240/480	1	RPG0203__
12	305	12	305	1440	120/240	1	RPG0104__	2160	240/480	1	RPG0204__
12	305	18	457	2160	240/480	1	RPG0105__	3240	240/480	1	RPG0205__
12	305	24	610	2880	240/480	1	RPG0106__	4320	240/480	1	RPG0206__
16	406	24	610	3840	240/480	1	RPG0107__	5760	240/480	1	RPG0207__
24	610	24	610	5760	240	1	RPG0108__	8640	480	1	RPG0208__

### How to Order

#### Catalog Heaters

To order a **Radiant Panel** from the above table, fill in the last digit of the catalog number indicating built-in thermowell and thermocouple as follows:

- 0** = Plain, no thermowell or T/C
- 1** = Thermowell only
- 2** = Thermowell and type K T/C
- 3** = Thermowell and type J T/C

#### Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, Tempco can manufacture a Radiant Panel Heater to meet your requirements. **Standard lead time is 3 weeks.**

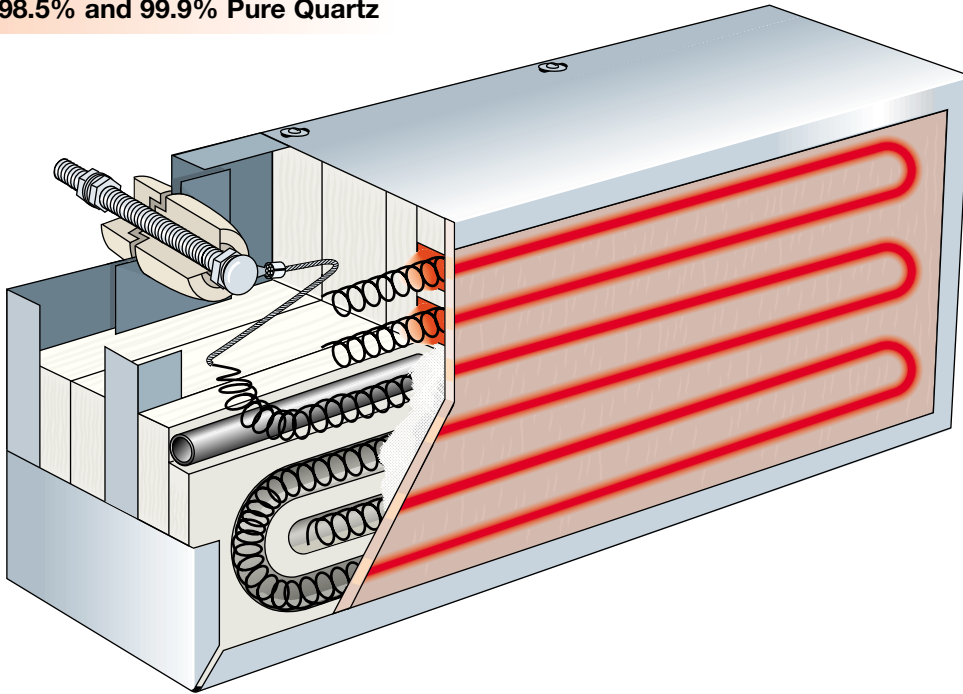
**Please Specify** the following:

- Length and Width
- Watts, Volts and Phase
- Operating Temperature, and thermowell/thermocouple if required



## Style RW Panel Heater

98.5% and 99.9% Pure Quartz



### Main Construction Features

- \* *Fused translucent quartz emitter surface*
- \* *Precision wound resistance wire*
- \* *Heavy gauge aluminized steel frame*
- \* *High temperature, rigid refractory board*
- \* *Support angle secures quartz plate in frame*
- \* *Refractory insulation blanket layer*
- \* *Bulk insulation*
- \* *Ceramic bushings to insulate terminals*
- \* *Stainless steel terminals*
- \* *Optional thermowell*

### Design Features

Tempco Style RW heaters can transmit up to 89% of the power input as infrared energy. They can operate at temperatures up to 1800°F (982°C) using 99.9% pure fused quartz at watt densities up to 60 watts/in<sup>2</sup>. For watt densities up to 40 watts/in<sup>2</sup>, fused quartz of 98.5% purity can be used. They can be positioned as close as 2" from the material being heated.

Style RW heaters are available in convenient building block sizes and are equipped with mounting studs for easy installation. These can be mounted in any direction and due to the bonded construction, they are resistant to shock and vibration. The simple yet rigid construction enables them to be easily adapted to many applications. This style of infrared radiant heater does not require any reflectors, which would require periodic cleaning or replacement.

Thermowells and thermocouples can be installed to control the temperature of the heater. The standard location is centered on the short side, parallel to the face. A standoff mounting bracket is included with the thermowell.

The majority of the heaters in the table of standard sizes are dual voltage rated. Using three terminals and a jumper, either voltage will produce the same wattage.

### Construction Characteristics

Tempco Style RW Radiant Panel Heaters use 98.5% or 99.9% pure fused quartz for the emitter surface, dependent on watt density.

Behind the fused quartz a 1" thick ceramic fiber refractory board is grooved out to accept the helically wound iron/chromium/aluminum alloy resistance element. The resistance coils are set into the precision machined grooved board and press fit into place. A ceramic cloth is placed between the fused quartz and the resistance coils.

The resistance coil and the grooves are carefully designed to provide uniform heat distribution. The refractory board is backed by layers of insulation to minimize heat loss and direct power output.

The backside of the housing has a terminal box for electrical wiring with ceramic terminal bushings and stainless steel terminals.

Options available for this style include: quartz tube thermowell & bracket and type K or J 1/8" diameter thermocouple probe.

### Typical Applications

- Moisture Removal*
- Paint Drying*
- Glass Processing*
- Curing of plastic coatings, paint, ink, etc.*
- Thermoforming*
- Heat Setting*
- Film Shrinking*
- Blister Packaging*
- Food Processing*
- Textile Drying*

### SPECIFICATIONS

**Sizes:** Standard sizes are listed below; special sizes can be engineered to fit specific applications. Min.: 4" x 4"; Max.: 20" x 20"

**Standard Thickness:** 3"

**Maximum Watt Density:**

40 Watts/in<sup>2</sup> for 98.5% Quartz Purity

60 Watts/in<sup>2</sup> for 99.9% Quartz Purity

**Maximum Voltage:** 600 VAC

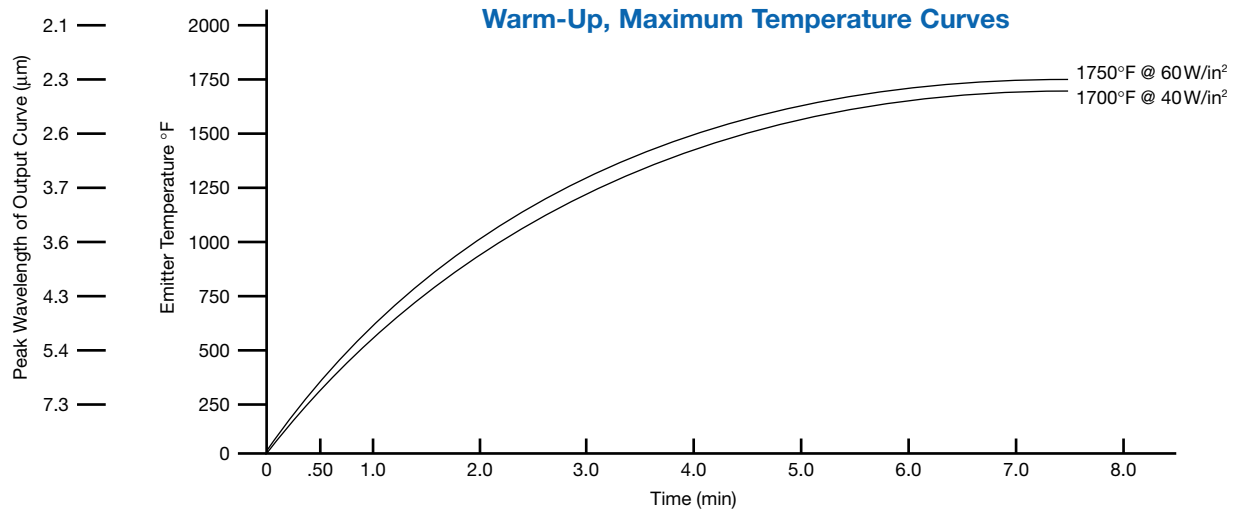
**Wavelength Range:** Between 2.5 and 6.0 microns

**Maximum Temperature:** 1800°F (982°C)

**Distributed Wattage and Zoning:** Yes



**Style RW Panel Heater**  
98.5% and 99.9% Pure Quartz



**Warm-up curves** are measured from heaters running face down in open air. The thermocouple is located in the standard location, in the thermowell located behind the coil. The curves will change with environment and thermocouple location.

The curves are also useful in determining what the potential maximum temperature and peak wavelength are for various watt density heaters.

### Standard Sizes and Ratings of Style RW High Temperature Glass Infrared Heaters

Width		Length		40W/in <sup>2</sup>				60W/in <sup>2</sup>			
in	mm	in	mm	Watts	Volts	Ph.	Part Number	Watts	Volts	Ph.	Part Number
4	102	10	254	1600	240	1	RPW0101__	2400	240/480	1	RPW0201__
6	152	10	254	2400	240/480	1	RPW0102__	3600	240/480	1	RPW0202__
6	152	12	305	2880	240/480	1	RPW0103__	4320	240/480	1	RPW0203__
8	203	10	254	3200	240/480	1	RPW0104__	4800	240/480	1	RPW0204__
10	254	10	254	4000	240/480	1	RPW0105__	6000	240/480	1	RPW0205__
12	305	10	254	4800	240/480	1	RPW0106__	7200	240/480	1	RPW0206__
12	305	12	305	5760	240/480	1	RPW0107__	8640	240/480	1	RPW0207__

### How to Order

#### Catalog Heaters

To order a **Radiant Panel** from the above table, fill in the last digit of the catalog number indicating built-in thermowell and thermocouple as follows:

- 0** = Plain, no thermowell or T/C
- 1** = Thermowell only
- 2** = Thermowell and type K T/C
- 3** = Thermowell and type J T/C

#### Custom Engineered/Manufactured Heaters

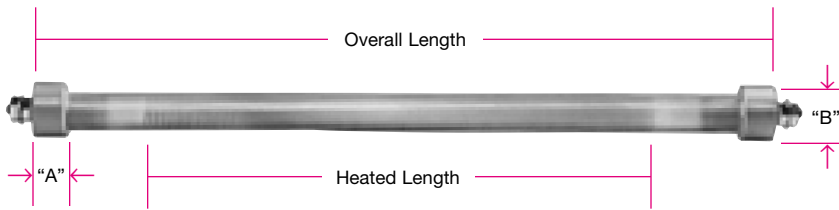
Understanding that an electric heater can be very application specific, for sizes and ratings not listed, Tempco can manufacture a Radiant Panel Heater to meet your requirements. **Standard lead time is 3 weeks.**

**Please Specify** the following:

- Length and Width
- Watts, Volts and Phase
- Operating Temperature, and thermowell/thermocouple if required



## Vitreous Silica Quartz Tube



### Ceramic End Caps

Quartz Tube O.D.	"A"	"B"
3/8"	3/8"	5/8"
1/2"	1/2"	7/8"
5/8"	1/2"	7/8"

**Tempco Radiant Quartz heaters** are specially designed for applications that require infrared radiant heating. Quartz Heaters consist of a helically wound resistance coil housed in a pure vitreous silica fused quartz tube. The heating coil is specially designed to provide long life at rated voltage. The quartz tubing is terminated with specially designed ceramic insulating caps that allow the quartz tubing to breathe. The ceramic caps are securely fastened to the quartz tube with high temperature cement, providing excellent support to the power connecting termination.

### Features

- \* **Compact and Versatile**
- \* **Quick Heat and Cool Down Response**
- \* **Functional Design**
- \* **Clean Heat Energy**
- \* **Lower Power Consumption**
- \* **High Operating Temperatures**

Tempco Radiant Quartz heaters are one of the most efficient sources of radiant energy. Quartz heaters can deliver near and far infrared wavelengths, which is more effective than a single wavelength,

capable of generating full heat output capacity in 40 to 50 seconds and cool down in less than 15 seconds. They offer excellent life characteristics whether operated continuously or intermittently. For most efficient heating and longer operating life, quartz heating applications should be rated around 35 to 40 watts per square inch.

Quartz heating elements do not give off an objectionable glare because of a very low emission in the visible spectrum. Optimum design provides a clear red color on the translucent quartz tube when operating at full voltage, providing an infrared wavelength at energy peak of 2.5 to 3.0 microns. The wavelength is almost completely absorbed by the process, and considered best for most industrial applications.



**Warning: Quartz Heaters are Designed to be Used in a Horizontal Position Only**

## QUARTZ HEATER SPECIFICATIONS

### Dimensional

**Diameters:** 3/8", 1/2", and 5/8"  
**Max. Length:** 72"  
**Min. Length:** 12"  
**Length Tolerance:** Minimum  $\pm 1/8$ " up to 12" long  
 $\pm 2\%$  over 12" long

### Electrical

**Max. Volts:** 480 Volts when applicable  
**Max. Amperage:** 20 Amps when applicable  
**Resistance Tolerance:** +10%, -5%  
**Wattage Tolerance:** +5%, -10%  
**Max Watt Density:** 40 Watts/in<sup>2</sup>

### Terminations



**Type T1 Standard Termination**  
**10-32 thread screw terminal standard termination.**



**Type ST Tabs with Slotted Holes**  
**1/2" wide  $\times$  3/4" long, with a 9/32"  $\times$  3/8" slot. Alternate mounting method.**



**Type FT Quick Disconnect Fuse Type**  
**Fuse type connector provides ease of installation. Bar 3/8" diameter  $\times$  1/2" long.**



**Type L1 Straight-Out Leads**  
**10" flexible lead wire externally spliced standard. If longer leads are required, specify.**



**Type C4 Ceramic Caps with Leads**  
**This termination provides 10-32 screw terminals insulated with ceramic terminal covers. Screws are prewired with 10" flexible lead wire. If longer leads are required, specify.**



### Typical Applications

- Shrink Packaging Tunnels
  - Laminating
  - Thermoforming
  - Plastic Forming
- Fusing Plastics
  - Vulcanizing Rubber
  - Sterilization
  - Sealing
- Food Warming
  - Thawing
  - Electrostatic Copying Equipment
  - Food Processing
- Drying Photo Film Equipment
  - Curing Rubber
  - Drying Textiles
  - Drying Lacquers and Paints
- Drying Sand Cores
  - Space Heaters
  - Thermal Copying Equipment

### Standard Sizes and Electrical Ratings

Quartz Tube Diameter	Overall Length		Heated Length		Watts	Part Number	
	in	mm	in	mm		120V	240V
3/8"	14	355.6	12½	317.5	480	KRD00001	KRD00002
	20	508.0	18½	469.9	720	KRD00003	KRD00004
	26	660.4	24½	622.3	960	KRD00005	KRD00006
	38	965.2	36½	927.1	1450	KRD00007	KRD00008
	48	1219.2	46½	1181.1	1900	—	KRD00009
1/2"	18	457.2	16½	419.1	900	KRD00010	KRD00011
	20	508.0	18½	469.9	900	KRD00012	KRD00013
	26	660.4	24½	622.3	1200	KRD00014	KRD00015
	36	914.4	34½	876.3	1800	KRD00016	KRD00017
	38	965.2	36½	927.1	1800	KRD00018	KRD00019
	42	1066.8	40½	1028.7	1580	KRD00020	KRD00021
	48	1219.2	46½	1181.1	1820	KRD00022	KRD00023
	50	1270.0	48½	1231.9	2400	—	KRD00024
	54	1371.6	52½	1333.5	2060	—	KRD00025
	60	1524.0	58½	1485.9	2300	—	KRD00026
	66	1676.4	64½	1638.3	2540	—	KRD00027
72	1828.8	70½	1790.7	2780	—	KRD00028	
5/8"	24	609.6	21	533.4	1075	KRD00029	KRD00030
	26	660.4	23	584.2	1800	KRD00031	KRD00032
	30	762.0	27	685.8	1375	KRD00033	KRD00034
	38	965.2	35	889.0	2500	—	KRD00035
	42	1066.8	39	990.6	1975	KRD00036	KRD00037
	48	1219.2	45	1143.0	2275	—	KRD00038
	50	1270.0	47	1193.8	3400	—	KRD00039
	54	1371.6	51	1295.4	2575	—	KRD00040
	60	1524.0	57	1447.8	2875	—	KRD00041
	62	1574.8	59	1498.6	4200	—	KRD00042
	66	1676.4	63	1600.2	3175	—	KRD00043
72	1828.8	69	1752.6	3475	—	KRD00044	

### How to Order

#### Catalog Heaters

Order by Part number for standard heaters listed above.

Part Numbers listed are for heaters supplied with Type 1 Termination. For other Terminations a Part Number will be issued at time of order.

#### Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** will design and manufacture a Radiant Quartz Heater to meet your requirements.

**Standard lead time is 3 weeks.**

**Please Specify** the following:

- Diameter
  - Overall Length
  - Heated Length
  - Wattage
- Voltage
  - Termination Type
  - Lead Length if applicable

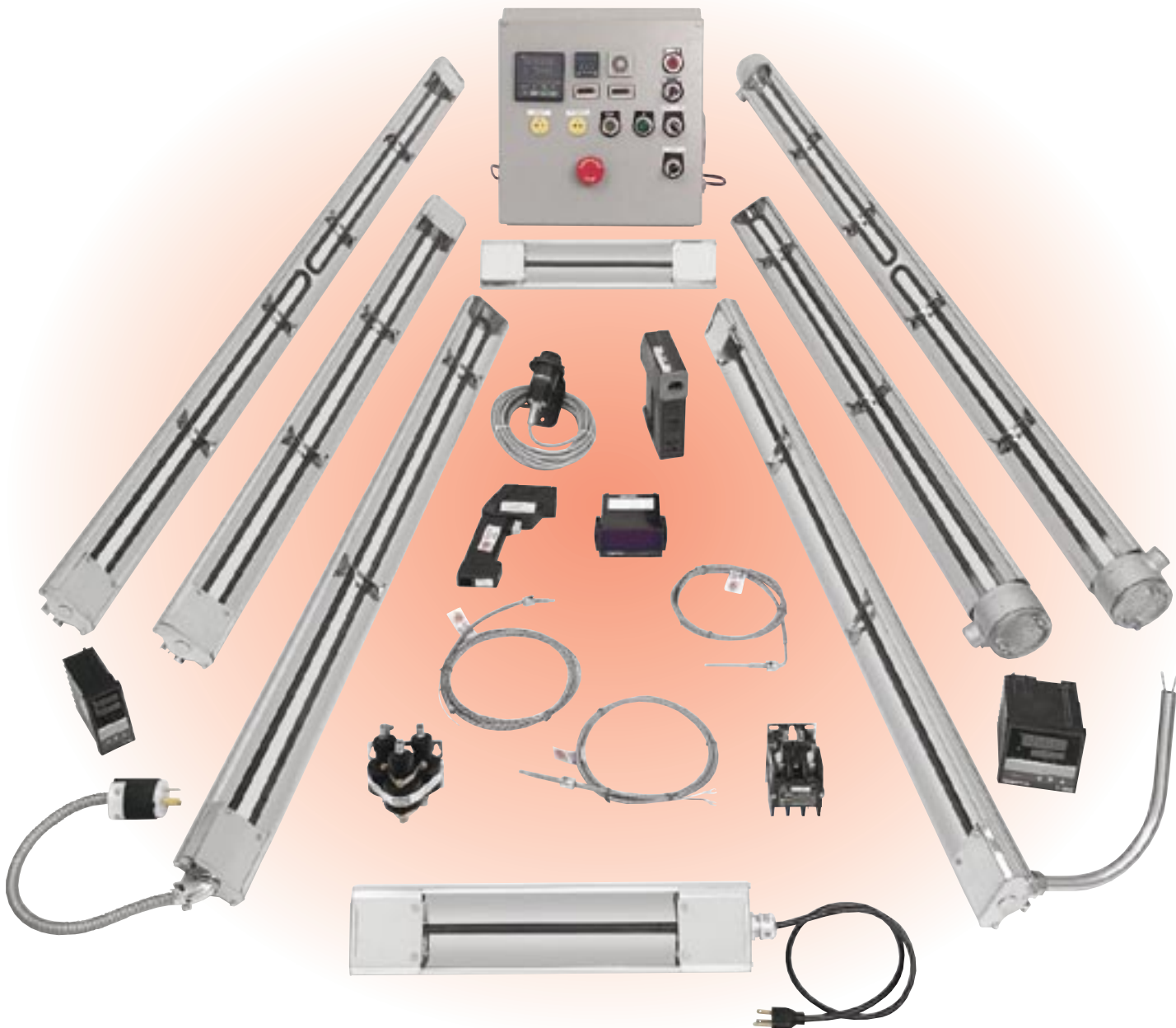


## Universal 2000<sup>®</sup>

# Tubular Radiant Heater Assemblies

- \* .430" diameter Incoloy<sup>®</sup> heating elements
- \* Polished aluminum reflector

- \* Sliding mounting clamps that can be positioned anywhere along the length of the housing.
- \* Anodized extruded aluminum housing



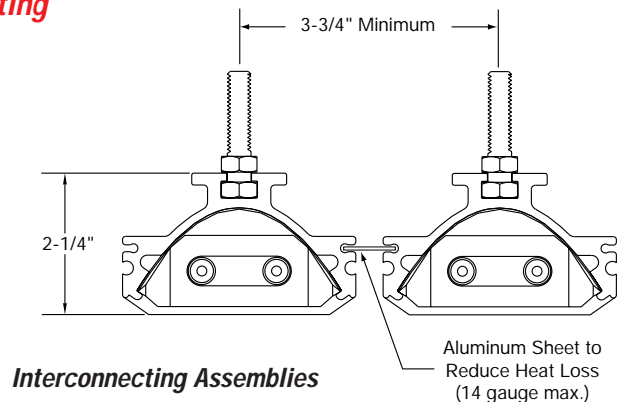
### Typical Applications

- Conveyorized drying
- Food warming
- Resin curing
- Shrink fitting
- Ink drying
- Thermoforming
- Welding preheating
- Paint drying
- Moisture evaporation
- Adhesive drying
- Comfort Heating



## Universal Mounting

The Universal 2000 housing has been designed to work with any industry standard mounting clamps. This allows the unit to be dropped into existing systems regardless of make or application. Each housing is supplied with fixed and/or sliding 3/8-16 hex bolts and hardware. The top of the extrusion has a machined entrance slot for easy installation of the bolts. The 1/2" NPT holes at the ends of the unit will accept 1/2" threaded pipe for mounting and/or wiring of the unit.



## Tubular Infrared Radiant Process Heaters Installation & Maintenance Recommendations

### Installation

1. Mounting bolts are provided that can be attached anywhere along the length of the heater. The distance between bolts should not exceed 42" on very long assemblies.
2. Standard NEMA 1 units are provided with both a 1/2" NPT conduit threaded opening out the top at each end and a 1/2" K.O. in the side terminal box(s). Units can accept flex, rigid conduit, BX, or other standard electrical fittings (NEMA 3-4 units have dual 1/2" trade size hubs oriented 90° to each other).
3. Be sure all electrical connections are tightly made. Hold terminal with pliers when tightening screws. Make sure all connectors are properly insulated and routed to allow for expansion and contraction of the unit. High temperature hook-up wire is available from Tempco.
4. In high temperature applications fiber insulation can be placed behind the heaters.



**WARNING.** Do not use Copper Wire to make connections inside this heater. High temperatures will oxidize copper. Use of Nickel Plated or Nickel Clad Insulated Copper Wire Is Recommended. Wire insulation rating must be suitable for the ambient temperature of the wiring installation.

### Maintenance

1. Disconnect power to installation before servicing
2. Clean reflector periodically. Do not use strong alkali cleaners on the aluminum reflector as they will dull the finish. A mild soap and water solution is recommended.
3. Replacement elements are available from Tempco. When elements are replaced it is recommended that reflectors also be replaced. Access to the element(s) is easily attained from the front side of the housing by removing the terminal box covers. The housing does not have to be removed from its mounting. Then disconnect the element terminals and snap out the support brackets if needed and remove the element(s). With the element(s) out the reflector can then also be replaced.



**DANGER. Hazard of Fire.** These heaters are not for use in atmospheres where flammable vapors, gases or liquids are present as defined in the National Electrical Code. Where solvents, water, etc. are being evaporated from the process it is necessary to provide substantial quantities of ventilating air to carry away all resulting vapors. Do not mount heater closer than 6 inches to any structural material that does not have at least a 200°C continuous temperature rating.

**WARNING. Hazard of Electric Shock.** Installation must be grounded to earth to avoid shock hazard. Disconnect power to installation before servicing or installing heater.



## TRH1 Series — Single Straight Element Double End Termination

### Standard Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number	Replacement Element Part Number
600	120	18	10	TRH10001	THE09100
600	208	18	10	TRH10002	THE09101
600	240	18	10	TRH10003	THE09102
600	277	18	10	TRH10004	THE09103
800	120	24	16	TRH10005	THE09104
800	208	24	16	TRH10006	THE09105
800	240	24	16	TRH10007	THE09106
800	277	24	16	TRH10008	THE09107
1100	120	30	22	TRH10009	THE09108
1100	208	30	22	TRH10010	THE09109
1100	240	30	22	TRH10011	THE09110
1100	277	30	22	TRH10012	THE09111
1100	480	30	22	TRH10013	THE09112
1300	208	36	28	TRH10014	THE09113
1300	240	36	28	TRH10015	THE09114
1300	277	36	28	TRH10016	THE09115
1300	480	36	28	TRH10017	THE09116
1800	208	48	40	TRH10018	THE09117
1800	240	48	40	TRH10019	THE09118
1800	277	48	40	TRH10020	THE09119
1800	480	48	40	TRH10021	THE09120
2500	208	60	51	TRH10022	THE09121
2500	240	60	51	TRH10023	THE09122
2500	277	60	51	TRH10024	THE09123
2500	480	60	51	TRH10025	THE09124
3000	208	72	63	TRH10026	THE09125
3000	240	72	63	TRH10027	THE09126
3000	277	72	63	TRH10028	THE09127
3000	480	72	63	TRH10029	THE09128
3600	208	84	75	TRH10030	THE09129
3600	240	84	75	TRH10031	THE09130
3600	277	84	75	TRH10032	THE09131
3600	480	84	75	TRH10033	THE09132

### Replacement Reflectors for the TRH1

(installation instructions included)

Reflector Kit Part Number	*Number of Reflectors Supplied	Over All Length (in.)	Heated Length (in.)
SMPR-1018	1	18	10
SMPR-1019	1	24	16
SMPR-1020	1	30	22
SMPR-1021	1	36	28
SMPR-1022	1	48	40
SMPR-1023	2	60	52
SMPR-1024	2	72	64
SMPR-1025	2	84	76
SMPR-1026	2	96	86
SMPR-1027	2	108	100

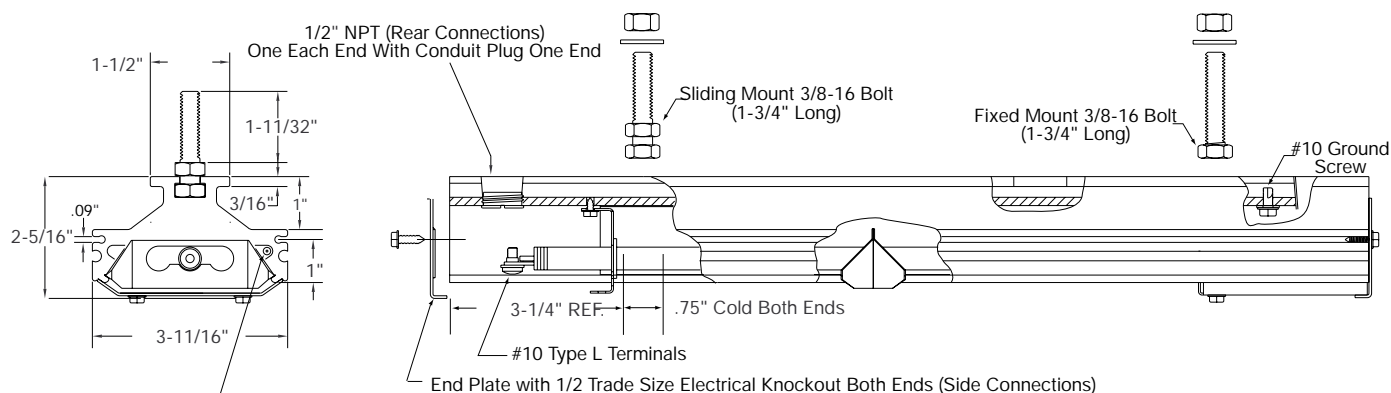
\*Units over 60 inches have segmented reflectors

### REPLACEMENT ELEMENT SUPPORT BRACKETS

(may be needed when changing elements or reflector)

Part Number  
SMPR-1013

See Page 7-43 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

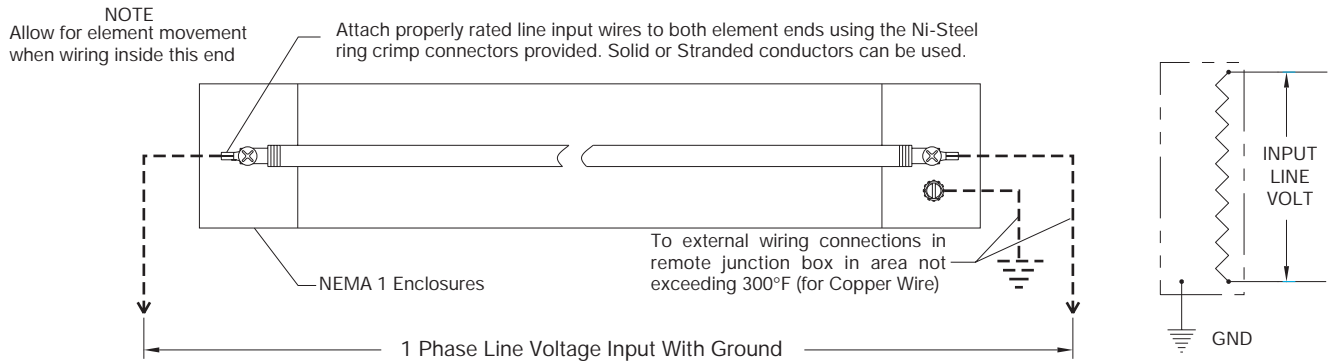


Dual Internal Wireways For Optional Single End Wiring.

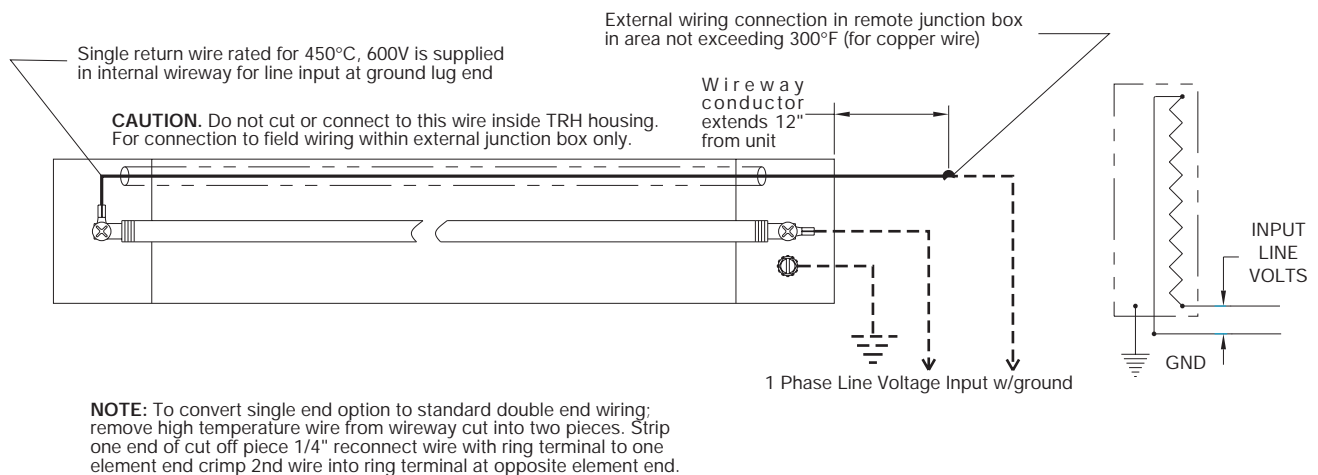




### Standard Double End Wiring



### Optional Single End Wiring



### Wiring Note

Electrical connections to the heater are made through the 1/2 NPT tapped holes in the top of the housing or through the K.O.'s at ends. Do not use Copper Wire to make connections inside this heater. High temperatures will oxidize copper. Use of Nickel Plated or Nickel Clad Insulated Copper Wire Is Recommended (12ga for units over 20A & 14ga for 20A or lower). Wiring should be run in rigid or flexible metal conduit and installed in accordance with

NEC and all local codes that may be applicable. Access terminals by removing the enclosure cover screws. Lead wire rated at 250°C or higher is recommended inside the heater junction box. Use of 200°C wire is permitted only if unit is used at ambient conditions below 104°F. High temperature wire is available from Tempco.



## TRH2 Series — Dual Straight Element Double End Termination

Note: Tubular elements are supplied at the same rated voltage as the overall assembly to be wired in parallel. 120 or 240V rated assemblies can be used at twice the rated voltage by wiring the elements in series (120/240V or 240/480V).

### Standard Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number	Replacement Elements Part Number
1200	120	18	10	TRH20001	THE09100
1200	208	18	10	TRH20002	THE09101
1200	240	18	10	TRH20003	THE09102
1200	277	18	10	TRH20004	THE09103
1600	120	24	16	TRH20005	THE09104
1600	208	24	16	TRH20006	THE09105
1600	240	24	16	TRH20007	THE09106
1600	277	24	16	TRH20008	THE09107
2200	120	30	22	TRH20009	THE09108
2200	208	30	22	TRH20010	THE09109
2200	240	30	22	TRH20011	THE09110
2200	277	30	22	TRH20012	THE09111
2200	480	30	22	TRH20013	THE09112
2600	208	36	28	TRH20014	THE09113
2600	240	36	28	TRH20015	THE09114
2600	277	36	28	TRH20016	THE09115
2600	480	36	28	TRH20017	THE09116
3600	208	48	40	TRH20018	THE09117
3600	240	48	40	TRH20019	THE09118
3600	277	48	40	TRH20020	THE09119
3600	480	48	40	TRH20021	THE09120
5000	208	60	51	TRH20022	THE09121
5000	240	60	51	TRH20023	THE09122
5000	277	60	51	TRH20024	THE09123
5000	480	60	51	TRH20025	THE09124
6000	208	72	63	TRH20026	THE09125
6000	240	72	63	TRH20027	THE09126
6000	277	72	63	TRH20028	THE09127
6000	480	72	63	TRH20029	THE09128
7200	208	84	75	TRH20030	THE09129
7200	240	84	75	TRH20031	THE09130
7200	277	84	75	TRH20032	THE09131
7200	480	84	75	TRH20033	THE09132

### Replacement Reflectors for the TRH2 (installation instructions included)

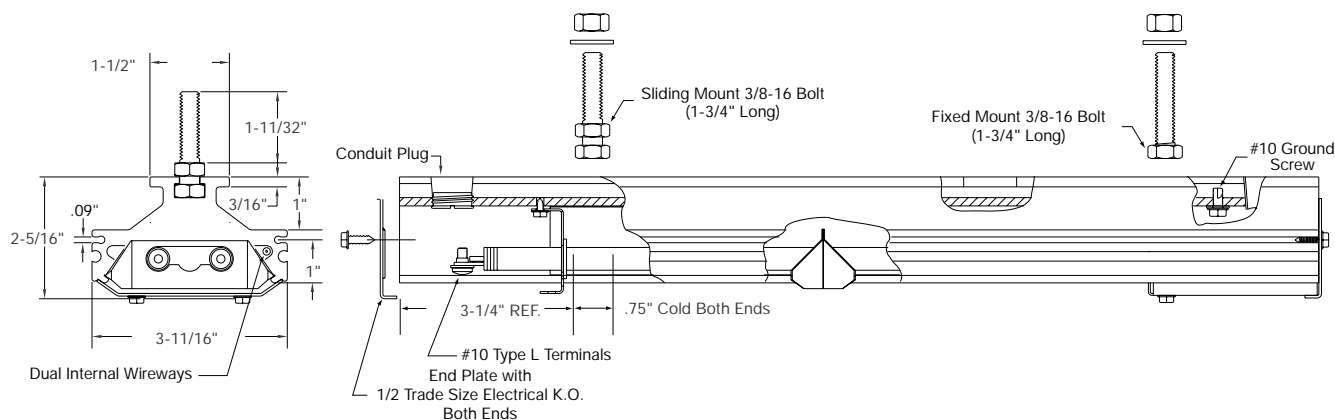
Reflector Kit Part Number	*Number of Reflectors Supplied	Over All Length (in.)	Heated Length (in.)
SMPR-1018	1	18	10
SMPR-1019	1	24	16
SMPR-1020	1	30	22
SMPR-1021	1	36	28
SMPR-1022	1	48	40
SMPR-1023	2	60	52
SMPR-1024	2	72	64
SMPR-1025	2	84	76
SMPR-1026	2	96	86
SMPR-1027	2	108	100

\*Units over 60 inches have segmented reflectors

### REPLACEMENT ELEMENT SUPPORT BRACKETS (may be needed when changing elements or reflector)

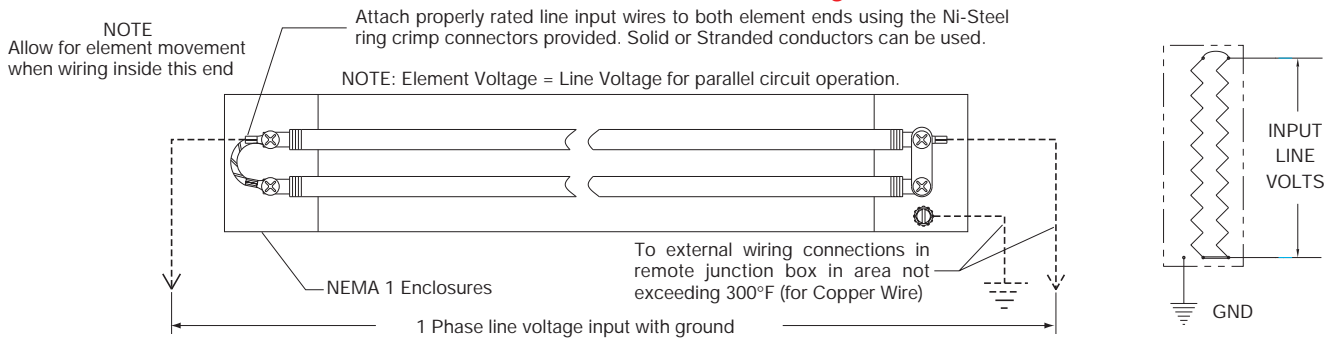
Part Number  
SMPR-1013

See Page 7-43 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

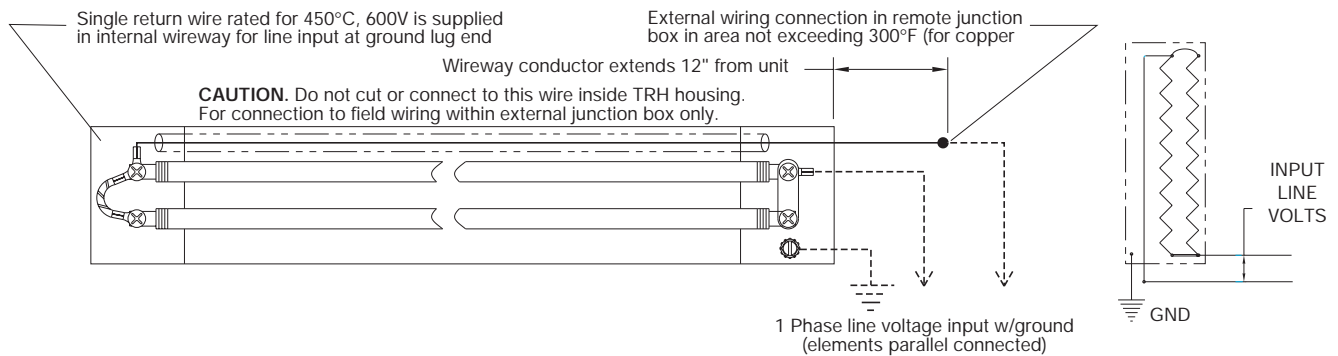




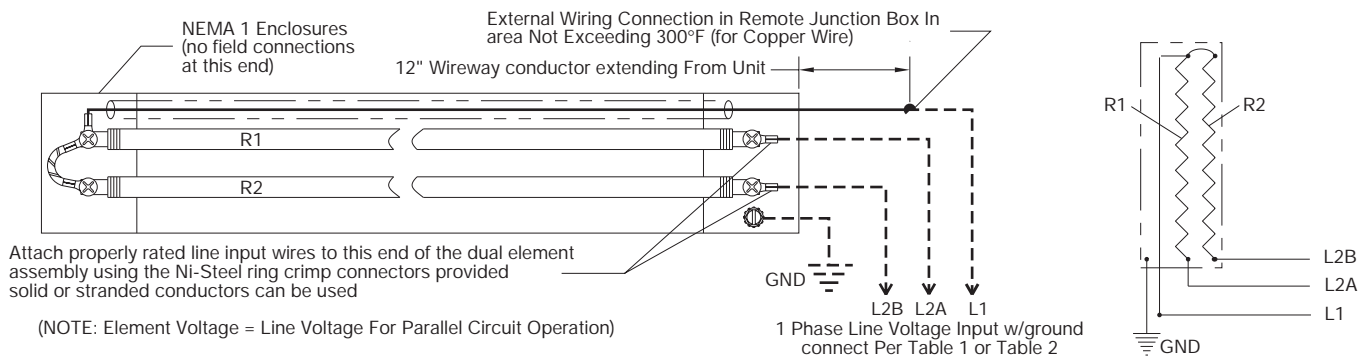
### Standard Double End Wiring



### Optional Single End Wiring



### Multiple Heat/ Dual Voltage Wiring



**TABLE 1**

Multiple Heat Connections (Single Input Voltage)

Heat Range	Line Input Wiring
Max Heat	L1 to L2A & L2B in parallel
Medium Heat	L1 to L2A or L2B only
Low Heat	L2A to L2B (L1 not used)

**TABLE 2**

Dual Voltage Connections (for 480/240 or 240/120V rated units)

Input Voltage	Line Input Wiring
High (480 or 240V)	L1 to L2A & L2B in Parallel
Low (240 or 120V)	L2A to L2B (L1 not used)

### Wiring Note

Electrical connections to the heater are made through the 1/2 NPT tapped holes in the top of the housing or through the K.O.'s at ends. Do not use Copper Wire to make connections inside this heater. High temperatures will oxidize copper. Use of Nickel Plated or Nickel Clad Insulated Copper Wire Is Recommended (12ga for units over 20A & 14ga for 20A or lower). Wiring should be run in rigid or flexible metal conduit and installed in accordance with

NEC and all local codes that may be applicable. Access terminals by removing the enclosure cover screws. Lead wire rated at 250°C or higher is recommended inside the heater junction box. Use of 200°C wire is permitted only if unit is used at ambient conditions below 104°F. High temperature wire is available from Tempco.



**TRH3 Series — Single Hairpin Element Bend Single End Termination**

### Standard Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number	Replacement Element Part Number
800	120	12	7	TRH30001	THE09133
800	208	12	7	TRH30002	THE09134
800	240	12	7	TRH30003	THE09135
800	277	12	7	TRH30004	THE09136
1200	120	18	13	TRH30005	THE09137
1200	208	18	13	TRH30006	THE09138
1200	240	18	13	TRH30007	THE09139
1200	277	18	13	TRH30008	THE09140
1800	208	24	19	TRH30009	THE09141
1800	240	24	19	TRH30010	THE09142
1800	277	24	19	TRH30011	THE09143
1800	480	24	19	TRH30012	THE09144
2500	208	30	25	TRH30013	THE09145
2500	240	30	25	TRH30014	THE09146
2500	277	30	25	TRH30015	THE09147
2500	480	30	25	TRH30016	THE09148
3000	208	36	31	TRH30017	THE09149
3000	240	36	31	TRH30018	THE09150
3000	277	36	31	TRH30019	THE09151
3000	480	36	31	TRH30020	THE09152
3600	208	48	43	TRH30021	THE09153
3600	240	48	43	TRH30022	THE09154
3600	277	48	43	TRH30023	THE09155
3600	480	48	43	TRH30024	THE09156
5000	208	60	55	TRH30025	THE09157
5000	240	60	55	TRH30026	THE09158
5000	277	60	55	TRH30027	THE09159
5000	480	60	55	TRH30028	THE09160

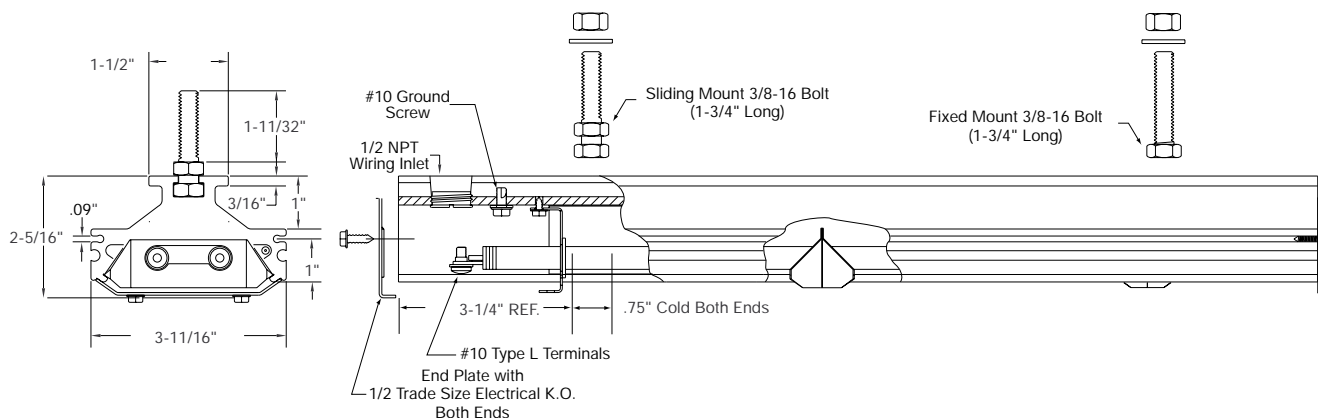
### Replacement Reflectors for the TRH3 (installation instructions included)

Reflector Kit Part Number	*Number of Reflectors Supplied	Over All Length (in.)	Heated Length (in.)
SMPR-1028	1	12	7
SMPR-1029	1	18	13
SMPR-1030	1	24	19
SMPR-1031	1	30	25
SMPR-1032	1	36	31
SMPR-1033	1	48	43
SMPR-1034	2	60	55

### REPLACEMENT ELEMENT SUPPORT BRACKETS (may be needed when changing elements or reflector)

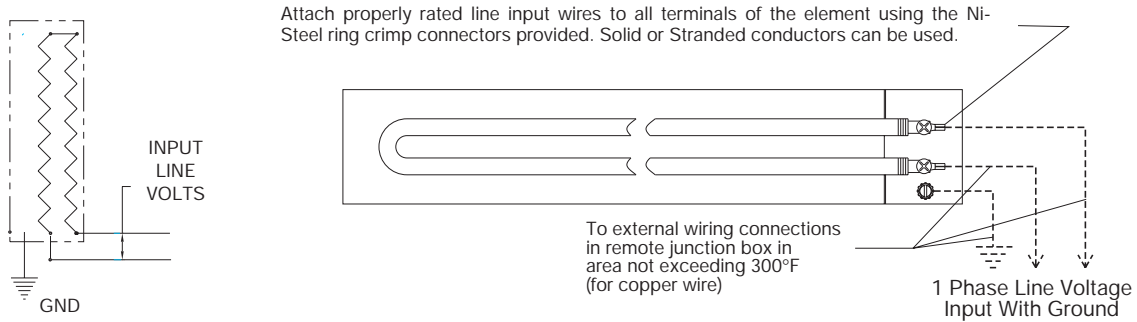
Part Number  
SMPR-1014

See Page 7-43 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles





### Single End Wiring



### Wiring Note

Electrical connections to the heater are made through the 1/2 NPT tapped holes in the top of the housing or through the K.O.'s at ends. Do not use Copper Wire to make connections inside this heater. High temperatures will oxidize copper. Use of Nickel Plated or Nickel Clad Insulated Copper Wire Is Recommended (12ga for units over 20A & 14ga for 20A or lower). Wiring should be run in rigid or flexible metal conduit and installed in accordance with

NEC and all local codes that may be applicable. Access terminals by removing the enclosure cover screws. Lead wire rated at 250°C or higher is recommended inside the heater junction box. Use of 200°C wire is permitted only if unit is used at ambient conditions below 104°F. High temperature wire is available from Tempco.



**TRH4 Series —Dual Hairpin Element Bend Double End Termination**

## Standard Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number	Replacement Element Part Number
6000	208	72	64	TRH40001	THE09161
6000	240	72	64	TRH40002	THE09162
6000	277	72	64	TRH40003	THE09163
6000	480	72	64	TRH40004	THE09164
7200	208	84	76	TRH40005	THE09165
7200	240	84	76	TRH40006	THE09166
7200	277	84	76	TRH40007	THE09167
7200	480	84	76	TRH40008	THE09168
8000	208	96	88	TRH40009	THE09169
8000	240	96	88	TRH40010	THE09170
8000	277	96	88	TRH40011	THE09171
8000	480	96	88	TRH40012	THE09172
9000	208	108	100	TRH40013	THE09173
9000	240	108	100	TRH40014	THE09174
9000	277	108	100	TRH40015	THE09175
9000	480	108	100	TRH40016	THE09176

## Replacement Reflectors for the TRH4

(installation instructions included)

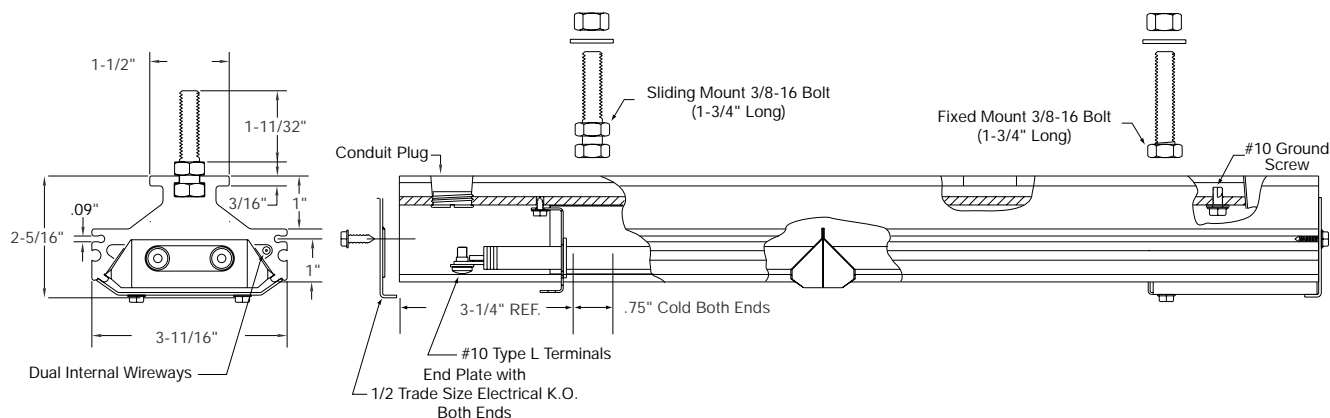
Reflector Kit Part Number	*Number of Reflectors Supplied	Over All Length (in.)	Heated Length (in.)
SMPR-1018	1	18	10
SMPR-1019	1	24	16
SMPR-1020	1	30	22
SMPR-1021	1	36	28
SMPR-1022	1	48	40
SMPR-1023	2	60	52
SMPR-1024	2	72	64
SMPR-1025	2	84	76
SMPR-1026	2	96	86
SMPR-1027	2	108	100

\*Units over 60 inches have segmented reflectors

## REPLACEMENT ELEMENT SUPPORT BRACKETS (may be needed when changing elements or reflector)

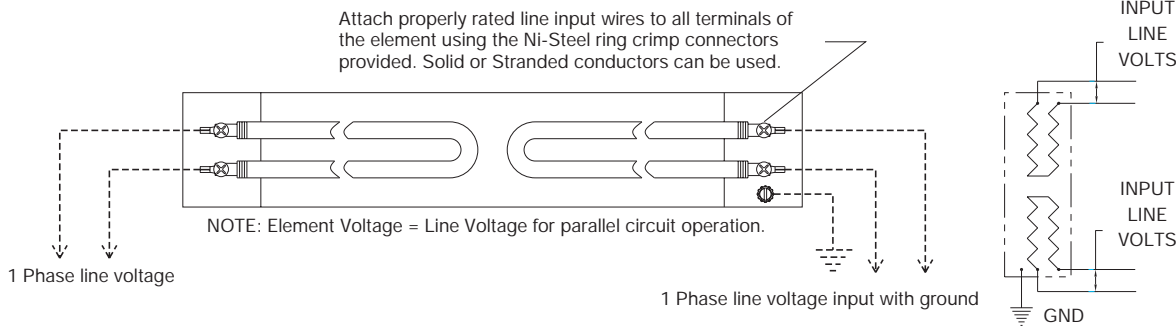
Part Number  
SMPR-1014

See Page 7-43 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles



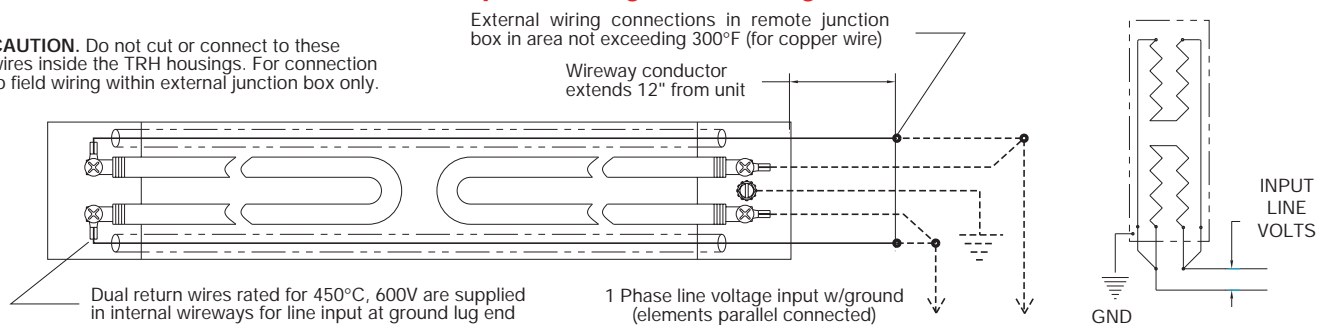


### Standard Double End Wiring

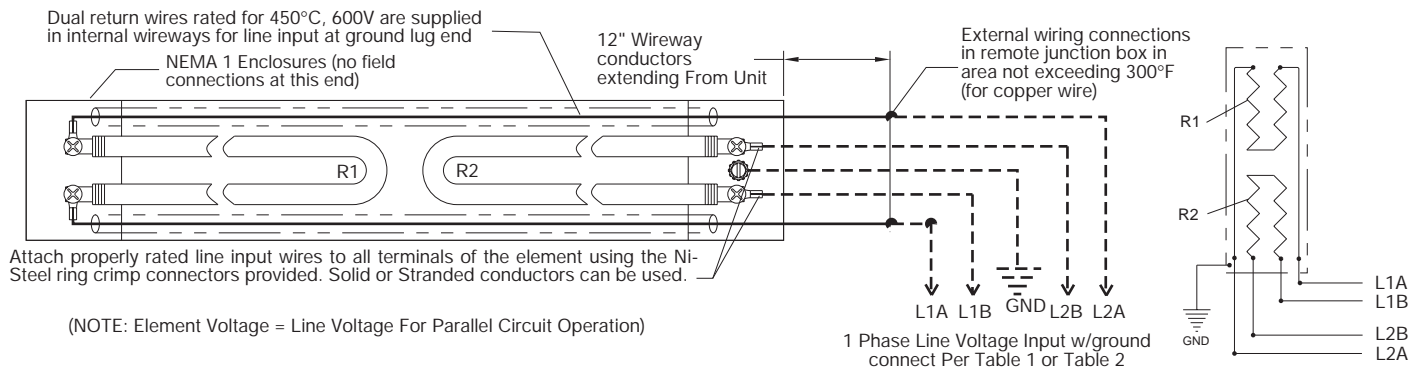


### Optional Single End Wiring

**CAUTION.** Do not cut or connect to these wires inside the TRH housings. For connection to field wiring within external junction box only.



### Multiple Heat/ Dual Voltage Wiring



**TABLE 1**

Multiple Heat Connections (Single Input Voltage)

Heat Range	Line Input Wiring
Max Heat	L1A & L1B to L2A & L2B in parallel
Medium Heat	L1A to L1B or L2A to L2B only
Low Heat	L1A to L1B, input to L2A to L2B

**TABLE 2**

Dual Voltage Connections (for 480/240 or 240/120V rated units)

Input Voltage	Line Input Wiring
High (480 or 240V)	L1A & L1B to L2A & L2B in parallel
Low (240 or 120V)	L1A to L1B, input L2A to L2B

### Wiring Note

Electrical connections to the heater are made through the 1/2 NPT tapped holes in the top of the housing or through the K.O.'s at ends. Do not use Copper Wire to make connections inside this heater. High temperatures will oxidize copper. Use of Nickel Plated or Nickel Clad Insulated Copper Wire Is Recommended (12ga for units over 20A & 14ga for 20A or lower). Wiring should be run in rigid or flexible metal conduit and installed in accordance with

NEC and all local codes that may be applicable. Access terminals by removing the enclosure cover screws. Lead wire rated at 250°C or higher is recommended inside the heater junction box. Use of 200°C wire is permitted only if unit is used at ambient conditions below 104°F. High temperature wire is available from Tempco.



## TRH5 Series —Single Hairpin Element Liquid Tight Single End Termination

### Standard Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number	Replacement Element Part Number
800	120	12	7	TRH50001	THE09177
800	208	12	7	TRH50002	THE09178
800	240	12	7	TRH50003	THE09179
800	277	12	7	TRH50004	THE09180
1200	120	18	13	TRH50005	THE09181
1200	208	18	13	TRH50006	THE09182
1200	240	18	13	TRH50007	THE09183
1200	277	18	13	TRH50008	THE09184
1800	208	24	19	TRH50009	THE09185
1800	240	24	19	TRH50010	THE09186
1800	277	24	19	TRH50011	THE09187
1800	480	24	19	TRH50012	THE09188
2500	208	30	25	TRH50013	THE09189
2500	240	30	25	TRH50014	THE09190
2500	277	30	25	TRH50015	THE09191
2500	480	30	25	TRH50016	THE09192
3000	208	36	31	TRH50017	THE09193
3000	240	36	31	TRH50018	THE09194
3000	277	36	31	TRH50019	THE09195
3000	480	36	31	TRH50020	THE09196
3600	208	48	43	TRH50021	THE09197
3600	240	48	43	TRH50022	THE09198
3600	277	48	43	TRH50023	THE09199
3600	480	48	43	TRH50024	THE09200
5000	208	60	55	TRH50025	THE09201
5000	240	60	55	TRH50026	THE09202
5000	277	60	55	TRH50027	THE09203
5000	480	60	55	TRH50028	THE09204

### Replacement Reflectors for the TRH5

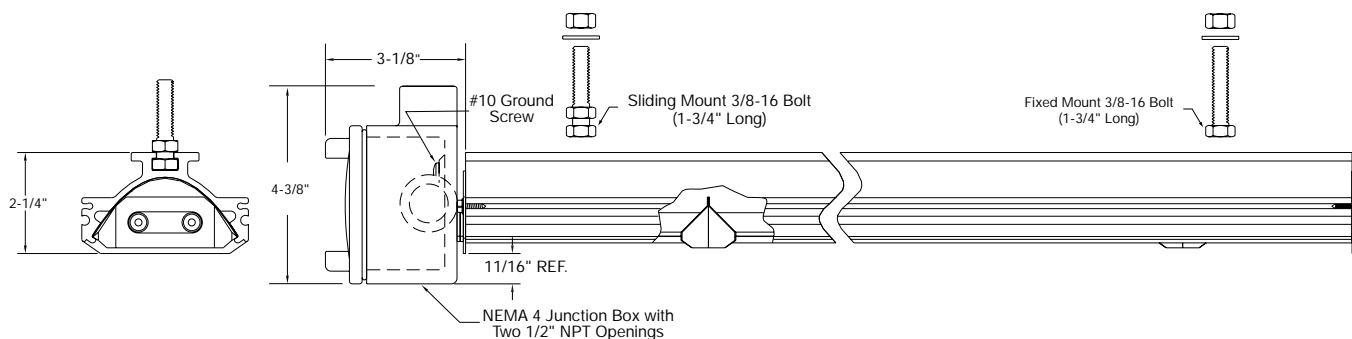
(installation instructions included)

Reflector Kit Part Number	*Number of Reflectors Supplied	Over All Length (in.)	Heated Length (in.)
SMPR-1035	1	12	7
SMPR-1036	1	18	13
SMPR-1037	1	24	19
SMPR-1038	1	30	25
SMPR-1039	1	36	31
SMPR-1040	1	48	43
SMPR-1041	2	60	55

### REPLACEMENT ELEMENT SUPPORT BRACKETS (may be needed when changing elements or reflector)

Part Number  
SMPR-1014

See Page 7-43 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

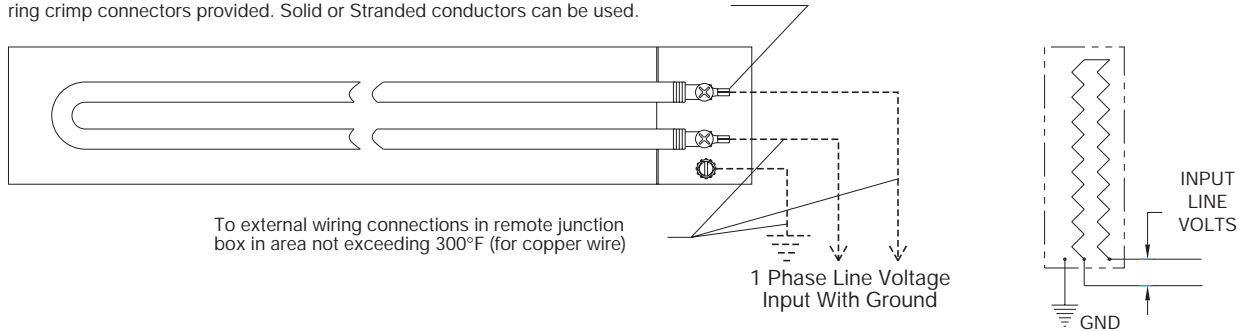






### Single End Wiring

Attach properly rated line input wires to all terminals of the element using the Ni-Steel ring crimp connectors provided. Solid or Stranded conductors can be used.



### Wiring Note

Electrical connections to the heater are made through the 1/2" trade size entrance hubs oriented 90° to each other on the NEMA 3-4 terminal enclosure. Do not use Copper Wire to make connections inside this heater. High temperatures will oxidize copper. Use of Nickel Plated or Nickel Clad Insulated Copper Wire Is Recommended (12ga for units over 20A & 14ga for 20A or lower). Wiring should be run in rigid or flexible metal conduit and installed

in accordance with NEC and all local codes that may be applicable. Access terminals by removing the enclosure cover screws. Lead wire rated at 250°C or higher is recommended inside the heater junction box. Use of 200°C wire is permitted only if unit is used at ambient conditions below 104°F. High temperature wire is available from Tempco.



## TRH6 Series —Dual Hairpin Element Liquid Tight Double End Termination

### Standard Sizes and Electrical Ratings

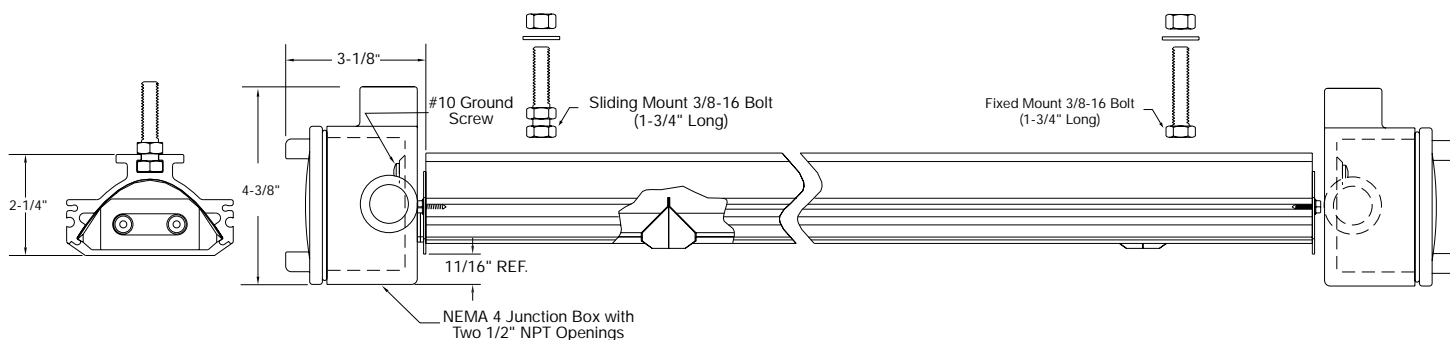
Wattage	Volts	Overall Length in.	Heated Length in.	Part Number	Replacement Element Part Number
6000	208	72	64	TRH60001	THE09205
6000	240	72	64	TRH60002	THE09206
6000	277	72	64	TRH60003	THE09207
6000	480	72	64	TRH60004	THE09208
7200	208	84	76	TRH60005	THE09209
7200	240	84	76	TRH60006	THE09210
7200	277	84	76	TRH60007	THE09211
7200	480	84	76	TRH60008	THE09212
8000	208	96	88	TRH60009	THE09213
8000	240	96	88	TRH60010	THE09214
8000	277	96	88	TRH60011	THE09215
8000	480	96	88	TRH60012	THE09216
9000	208	108	100	TRH60013	THE09217
9000	240	108	100	TRH60014	THE09218
9000	277	108	100	TRH60015	THE09219
9000	480	108	100	TRH60016	THE09220

### Replacement Reflectors for the TRH6 (installation instructions included)

Reflector Kit Part Number	*Number of Reflectors Supplied	Over All Length (in.)	Heated Length (in.)
SMPR-1042	1	24	16
SMPR-1043	1	30	22
SMPR-1044	1	36	28
SMPR-1045	1	48	40
SMPR-1046	1	60	52
SMPR-1047	2	72	64
SMPR-1048	2	84	76
SMPR-1049	2	96	86
SMPR-1050	2	108	100

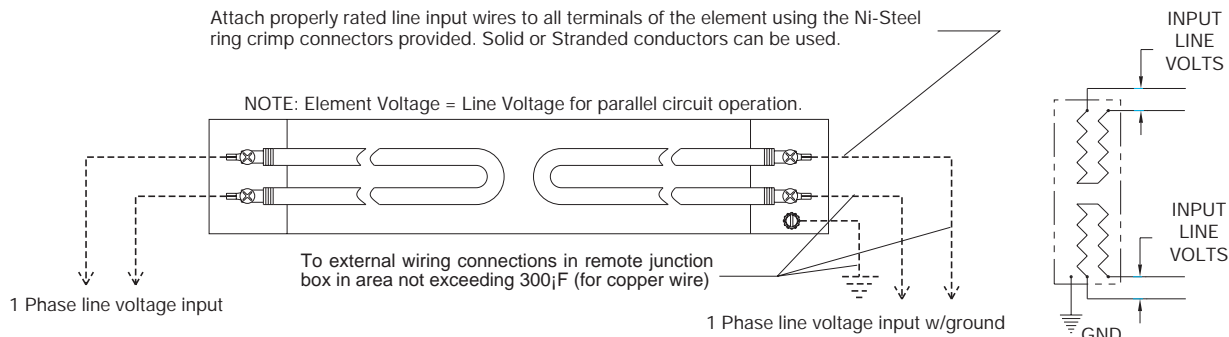
### REPLACEMENT ELEMENT SUPPORT BRACKETS (may be needed when changing elements or reflector)

Part Number  
SMPR-1014





### Double End Wiring



### Wiring Note

Electrical connections to the heater are made through the 1/2" trade size entrance hubs oriented 90° to each other on the NEMA 3-4 terminal enclosure. Do not use Copper Wire to make connections inside this heater. High temperatures will oxidize copper. Use of Nickel Plated or Nickel Clad Insulated Copper Wire Is Recommended (12ga for units over 20A & 14ga for 20A or lower). Wiring should be run in rigid or flexible metal conduit and installed

in accordance with NEC and all local codes that may be applicable. Access terminals by removing the enclosure cover screws. Lead wire rated at 250°C or higher is recommended inside the heater junction box. Use of 200°C wire is permitted only if unit is used at ambient conditions below 104°F. High temperature wire is available from Tempco.

### Stock Heavy Duty Quick Disconnect Plugs and Receptacles



Reference	NEMA P or R	Amps	Volts	Plug Part No.	Receptacle Part No.
PA straight	L5-15	15A	125V	EHD-102-103	EHD-103-102
PB twist lock	L5-15	15A	125V	EHD-102-113	EHD-103-101
PC twist lock	L6-20	20A	250V	EHD-102-122	EHD-103-105

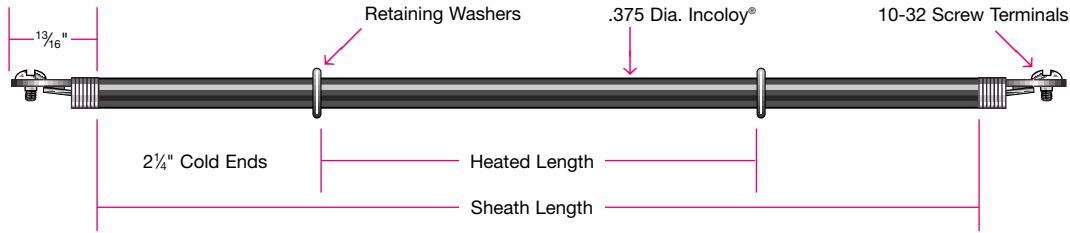
**Prewired with Galvanized Armor Cable (includes ground wire)**  
18" galvanized armor cable over 24" leads  
If longer leads and/or longer armor cable is required, specify when ordering

**Prewired with SS Armor Cable (includes ground wire)**  
18" SS armor cable over 24" leads  
If longer leads and/or longer armor cable is required, specify when ordering

**Prewired with 24" SJO cable (includes ground wire)**  
16 ga cable (Up to 15 Amps)  
14 ga cable (Up to 20 Amps Max.)  
Max. Terminal Box Temperature 90°C  
If longer cable is required, specify when ordering



## Tubular Infrared Radiant Process Heaters "Straight" Standard Universal Replacements



### Straight Elements Standard Sizes and Electrical Ratings/Universal Replacement Cross Reference

Watts	Volts	Overall Length in.	Heated Length in.	Cold Ends in.	Watlow No.	Chromalox Catalog No.	PCN	TEMPCO Part Number
400	120	10 $\frac{1}{4}$	7 $\frac{1}{4}$	1 $\frac{1}{2}$	RDN10E1	RTU-2063AX35	147766	THE04300
650	120	16 $\frac{5}{8}$	13 $\frac{5}{8}$	1 $\frac{1}{2}$	RDN16L1	RTU-2063AX29	147774	THE04301
800	120	21 $\frac{1}{16}$	16 $\frac{13}{16}$	2 $\frac{1}{8}$	RDN21B1	RTU-2083A	106112	THE04302
800	208	21 $\frac{1}{16}$	16 $\frac{13}{16}$	2 $\frac{1}{8}$	RDN21B2	RTU-2083AV	106120	THE04303
800	240	21 $\frac{1}{16}$	16 $\frac{13}{16}$	2 $\frac{1}{8}$	RDN21B10	RTU-2083A	106139	THE04304
800	277	21 $\frac{1}{16}$	16 $\frac{13}{16}$	2 $\frac{1}{8}$	RDN21B4	RTU-2083AV	106147	THE04305
1100	120	27 $\frac{7}{8}$	22 $\frac{7}{8}$	2 $\frac{1}{8}$	RDN27C1	RTU-3113A	106155	THE04306
1100	208	27 $\frac{7}{8}$	22 $\frac{7}{8}$	2 $\frac{1}{8}$	RDN27C2	RTU-3113AV	106163	THE04307
1100	240	27 $\frac{7}{8}$	22 $\frac{7}{8}$	2 $\frac{1}{8}$	RDN27C10	RTU-3113A	106171	THE04308
1100	277	27 $\frac{7}{8}$	22 $\frac{7}{8}$	2 $\frac{1}{8}$	RDN27C4	RTU-3113AV	106180	THE04309
1300	240	32 $\frac{1}{8}$	27 $\frac{1}{8}$	2 $\frac{1}{8}$	RDN32C10	RTU-3133A	108409	THE04310
1300	480	32 $\frac{1}{8}$	27 $\frac{1}{8}$	2 $\frac{1}{8}$	RDN32C11	RTU-3133A	108396	THE04311
1800	208	42 $\frac{7}{8}$	38 $\frac{5}{8}$	2 $\frac{1}{8}$	RDN42R2	RTU-4183AV	106198	THE04312
1800	240	42 $\frac{7}{8}$	38 $\frac{5}{8}$	2 $\frac{1}{8}$	RDN42R10	RTU-4183A	106200	THE04314
1800	277	42 $\frac{7}{8}$	38 $\frac{5}{8}$	2 $\frac{1}{8}$	RDN42R4	RTU-4183AV	106219	THE04315
1800	480	42 $\frac{7}{8}$	38 $\frac{5}{8}$	2 $\frac{1}{8}$	RDN42R11	RTU-4183A	106227	THE04316
2500	208	57 $\frac{1}{2}$	53 $\frac{1}{4}$	2 $\frac{1}{8}$	RDN57J2	RTU-5253AV	106235	THE04317
2500	240	57 $\frac{1}{2}$	53 $\frac{1}{4}$	2 $\frac{1}{8}$	RDN57J10	RTU-5253A	106243	THE04318
2500	277	57 $\frac{1}{2}$	53 $\frac{1}{4}$	2 $\frac{1}{8}$	RDN57J4	RTU-5253AV	106251	THE04319
2500	480	57 $\frac{1}{2}$	53 $\frac{1}{4}$	2 $\frac{1}{8}$	RDN57J11	RTU-5253A	106260	THE04320
3000	208	69 $\frac{1}{4}$	65	2 $\frac{1}{8}$	RDN69E2	RTU-6303AV	106278	THE04321
3000	240	69 $\frac{1}{4}$	65	2 $\frac{1}{8}$	RDN69E10	RTU-6303A	106286	THE04322
3000	277	69 $\frac{1}{4}$	65	2 $\frac{1}{8}$	RDN69E4	RTU-6303AV	106294	THE04323
3000	480	69 $\frac{1}{4}$	65	2 $\frac{1}{8}$	RDN69E11	RTU-6303A	106307	THE04324
3600	208	81 $\frac{1}{4}$	77	2 $\frac{1}{8}$	RDN81E2	RTU-7363AV	106315	THE04325
3600	240	81 $\frac{1}{4}$	77	2 $\frac{1}{8}$	RDN81E10	RTU-7363A	106323	THE04326
3600	277	81 $\frac{1}{4}$	77	2 $\frac{1}{8}$	RDN81E4	RTU-7363AV	106331	THE04327
3600	480	81 $\frac{1}{4}$	77	2 $\frac{1}{8}$	RDN81E11	RTU-7363A	106340	THE04328
4000	240	109 $\frac{1}{4}$	105	2 $\frac{1}{8}$	RDN109E10	RTU-7303AX10	106358	THE04329
5000	240	134 $\frac{1}{2}$	127 $\frac{3}{4}$	3 $\frac{3}{8}$	RDN134J10	RTU-7303AX13	106366	THE04330
5500	240	153 $\frac{3}{8}$	145 $\frac{5}{8}$	4	RDN153R10	RTU-7303AX9A	106374	THE04331
6500	240	179 $\frac{1}{4}$	171 $\frac{1}{4}$	4	RDN179E10	RTU-7363AX38	106382	THE04332

#### How to Order

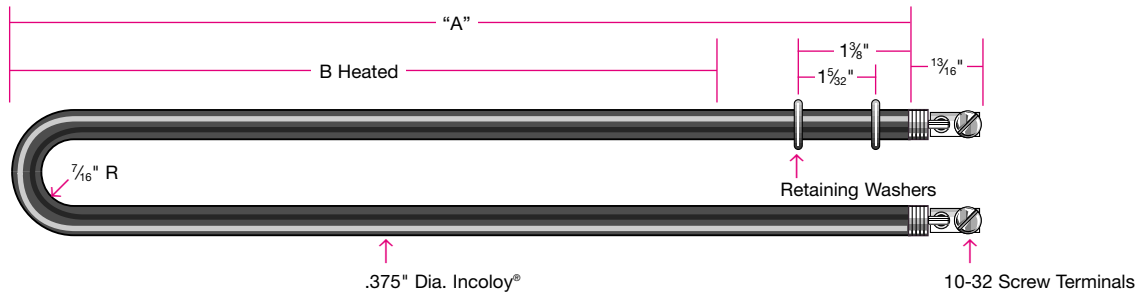
Select the Part Number of the Tubular Radiant Heater assembly or replacement Tubular Element that meets your requirement.

**Standard lead time is 2 to 3 weeks.**



# Radiant Process Heaters

## Tubular Infrared Radiant Process Heaters "U" Bend Standard Universal Replacements



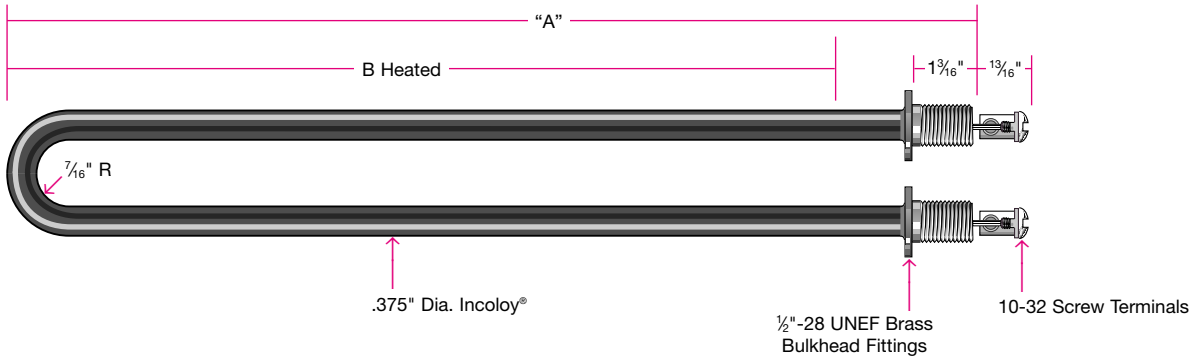
### "U" Bend Elements • Standard Sizes and Electrical Ratings/Universal Replacement Cross Reference

Watts	Volts	Heated "B" Dim. in.	Overall "A" Dim. in.	Watlow No.	Chromalox Catalog No.	PCN	TEMPCO Part Number
800	120	8 <sup>3</sup> / <sub>16</sub>	10 <sup>1</sup> / <sub>2</sub>	RDN21B1U	UTU-2	106438	THE04333
800	240	8 <sup>3</sup> / <sub>16</sub>	10 <sup>1</sup> / <sub>2</sub>	RDN21B10U	UTU-2	106454	THE04334
800	277	8 <sup>3</sup> / <sub>16</sub>	10 <sup>1</sup> / <sub>2</sub>	RDN21B4U	UTU-2V	106462	THE04335
1100	120	11 <sup>7</sup> / <sub>16</sub>	13 <sup>3</sup> / <sub>16</sub>	RDN27C1U	UTU-3	106470	THE04336
1100	208	11 <sup>7</sup> / <sub>16</sub>	13 <sup>3</sup> / <sub>16</sub>	—	UTU-3V	106489	THE04350
1100	240	11 <sup>7</sup> / <sub>16</sub>	13 <sup>3</sup> / <sub>16</sub>	RDN27C10U	UTU-3	106497	THE04337
1100	277	11 <sup>7</sup> / <sub>16</sub>	13 <sup>3</sup> / <sub>16</sub>	RDN27C4U	UTU-3V	106500	THE04338
1800	208	19 <sup>3</sup> / <sub>16</sub>	21 <sup>5</sup> / <sub>16</sub>	RDN42R2U	UTU-4V	106518	THE04339
1800	240	19 <sup>3</sup> / <sub>16</sub>	21 <sup>5</sup> / <sub>16</sub>	RDN42R10U	UTU-4	106526	THE04340
1800	480	19 <sup>3</sup> / <sub>16</sub>	21 <sup>5</sup> / <sub>16</sub>	RDN42R11U	UTU-4	106542	THE04341
2500	208	26 <sup>3</sup> / <sub>16</sub>	28 <sup>1</sup> / <sub>16</sub>	RDN57J2U	UTU-5V	106550	THE04342
2500	240	26 <sup>3</sup> / <sub>16</sub>	28 <sup>1</sup> / <sub>16</sub>	—	UTU-5	106569	THE04351
2500	277	26 <sup>3</sup> / <sub>16</sub>	28 <sup>1</sup> / <sub>16</sub>	RDN57J4U	UTU-5V	106577	THE04343
2500	480	26 <sup>3</sup> / <sub>16</sub>	28 <sup>1</sup> / <sub>16</sub>	RDN57J11U	UTU-5	106585	THE04344
3000	240	32 <sup>7</sup> / <sub>16</sub>	34 <sup>9</sup> / <sub>16</sub>	RDN69E10U	UTU-6	106606	THE04345
3000	480	32 <sup>7</sup> / <sub>16</sub>	34 <sup>9</sup> / <sub>16</sub>	RDN69E11U	UTU-6	106622	THE04346
3600	208	38 <sup>7</sup> / <sub>16</sub>	40 <sup>9</sup> / <sub>16</sub>	—	UTU-7V	106630	THE04352
3600	240	38 <sup>7</sup> / <sub>16</sub>	40 <sup>9</sup> / <sub>16</sub>	RDN81E10U	UTU-7	106649	THE04347
3600	277	38 <sup>7</sup> / <sub>16</sub>	40 <sup>9</sup> / <sub>16</sub>	RDN81E4U	UTU-7V	106657	THE04348
3600	480	38 <sup>7</sup> / <sub>16</sub>	40 <sup>9</sup> / <sub>16</sub>	RDN81E11U	UTU-7	106665	THE04349



## Tubular Infrared Radiant Process Heaters

"U" Bend with Liquid Tight Bulkhead Fittings



### "U" Bend Elements with Liquid Tight Bulkhead Fittings Standard Sizes and Electrical Ratings/Universal Replacement Cross Reference

Watts	Volts	Overall "A" Dim. in.	Heated "B" Dim. in.	Watlow No.	Chromalox		TEMPCO Part Number
					Catalog No.	PCN	
800	120	10½	8¾	RDN21B1B	UTU-2LT	106673	THE04353
800	240	10½	8¾	RDN21B10B	UTU-2LT	106681	THE04354
1100	120	13¾	11¾	RDN27C1B	UTU-3LT	106690	THE04355
1100	240	13¾	11¾	RDN27C10B	UTU-3LT	106702	THE04356
1800	240	21⅝	19⅞	RDN42R10B	UTU-4LT	106710	THE04357
1800	480	21⅝	19⅞	RDN42R11B	UTU-4LT	106729	THE04358
2500	240	28⅞	26½	RDN57J10B	UTU-5LT	106737	THE04359
2500	480	28⅞	26½	RDN57J11B	UTU-5LT	106745	THE04360
3000	240	34⅞	32½	RDN69E10B	UTU-6LT	106753	THE04361
3000	480	34⅞	32½	RDN69E11B	UTU-6LT	106761	THE04362
3600	240	40⅞	38½	RDN81E10B	UTU-7LT	106770	THE04363
3600	480	40⅞	38½	RDN81E11B	UTU-7LT	106788	THE04364

#### How to Order

Select the Part Number of the Tubular Radiant Heater assembly or replacement Tubular Element that meets your requirement.

**Standard lead time is: 2 to 3 weeks for straight elements  
4 weeks for bent elements**