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section

Radiant Heaters

Infrared Radiant Heating Array Systems

Modular Components Simplify Construction of Large Infrared Heating Systems

5 Easy Steps to a Custom Engineered/Manufacturered Infrared Radiant Array

1. Specify the infrared wavelength required in your process.

2. Specify array physical dimensions.

3. Specify heat zoning requirements.

4. Specify electrical requirements.

5. TEMPCO will simplify your life by designing & manufacturing a panel array system that meets your needs.

Consult us with your requirements. We welcome your inquiries.

Custom Engineered ARA Array Assembly

Built-in mounting hinges and handles allow easy access to the heated materials and a clear, protective, high temperature quartz glass face prevents heater contamination.

Ceramic E-Mitters®

Ceramic E-Mitters® in Linear Housings:

See pages 7-14 through 7-17

VS Glow® Halogen Infrared Heaters

Gemini® Twin Bore Quartz Infrared Heaters

Selection Guide: Infrared Heating Elements

Ceramic E-Mitters®	Helically wound resistance coil casted into ceramic material in either solid or hollow form	**Page 7-4**
Gemini® Twin Bore Infrared Heaters	Twin Bore, Quartz Tube Heaters with gold or white reflective coatings for optimal directional heating applications	**Page 7-72**
Quartz Mini-Tube Elements	Helically wound resistance coil housed in pure vitreous silica fused quartz tubing	**Page 7-48**
VS Glow® Infrared Heaters	Halogen and Carbon lamp infrared technology with highly efficient gold or white reflectors in a zero-thermal-expansion ceramic housing	**Page 7-60**

KTE Quartz Mini-Tube Heaters

Available with gold backing for directional heating applications

Complete Your Thermal Loop System with a Tempco Power & Temperature Control Panel

See Pages 13-42 through 13-49

Delivering Cutting Edge Solutions with Highly Customized/Engineered Infrared Heater Arrays for Every Industrial & Commercial Application Under the Sun!

ARA Array Housing Assemblies for Any Style E-Mitter

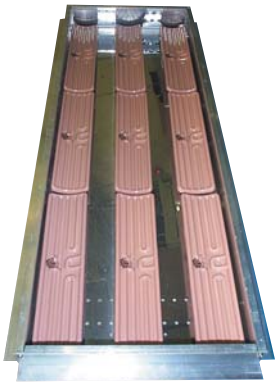
17.5 KW 380V 4 Zone
CRH E-Mitters

There Is No Substitute For Our Experience

Complete, made-to-order infrared heating systems – including the power and process temperature control panel – are available. Our team of professionals will assist you from concept to design/manufacturing.
We Welcome Your Inquiries.

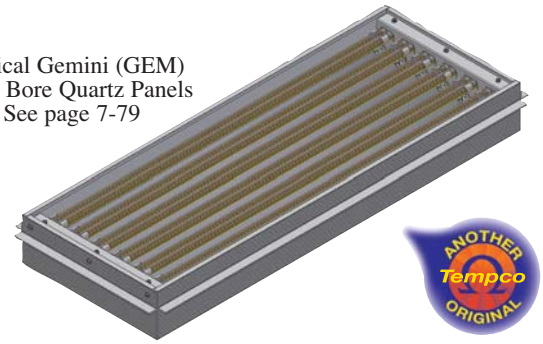
Assembly and Wiring of a Custom E-Mitter Panel

4 Rows CRH E-Mitters
4 Rows CRZ E-Mitters (at ends)



9 KW 480V 3 Zone
3 × 3 CRB E-Mitters

Typical Gemini (GEM)
Twin Bore Quartz Panels
See page 7-79



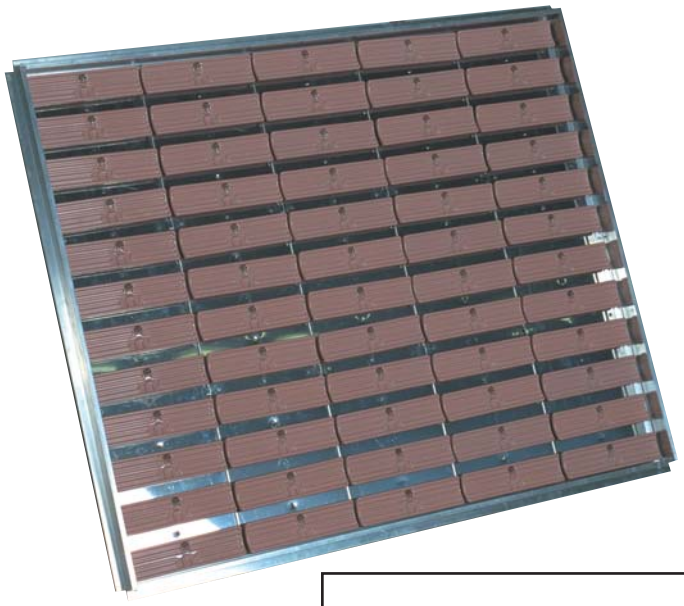
Power/Temperature Control Panels

Design Features

- *Solid or mechanical load switching*
- *Temperature control*
- *Over-temperature control — A second thermocouple senses for over-temperature, shutting down the system while activating a signal light or optional alarm horn. Solid State controls and mechanical contactors can fail in the on position so it is very important to have this safety backup feature.*
- *Control circuit transformer with primary and secondary fusing*
- *NEMA 12 enclosure — NEMA 1 construction*
- *Manual disconnect switch with interlocking operating mechanism so power must be off in order to open cabinet*
- *Cooling fan and filter for solid state units*
- *Wiring diagram, parts list and operating instructions*

Note: See pages 13-42 through 13-49 for more information on Power and Temperature Control Panels.

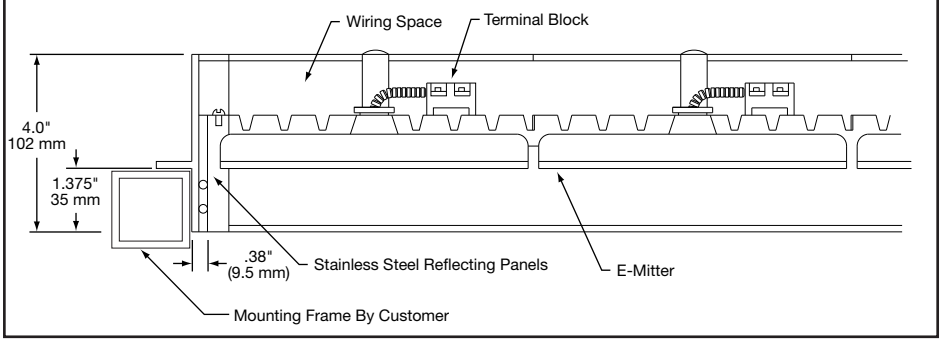
ARA Array Assemblies for CRB, CRC, CRM, CRL, CRH, CRN and CRZ E-Mitters®



Design Features

- *Custom Engineered/Manufactured*
- *Lightweight extruded aluminum outer housing*
- *All metal interior components are stainless steel*
- *Each heater's power leads are connected to an individual ceramic terminal block*
- *NCC or Ni wire with heat resistant insulation is used for circuit wiring between terminal blocks (see pages 7-19 through 7-21)*
- *Zones with different radiant heat levels can be achieved by using different wattage heaters (each zone would have a heater with built-in thermocouple for temperature control)*
- *Shipped fully assembled*
- *Optional factory wiring and power control panels*
- *Optional ceramic fiber insulation in wiring space*
- *Optional entrances in rear cover or sides to customer specs*

DRAWING OF INTERNAL CONSTRUCTION



Steps to Design a Custom ARA E-Mitter Array for your application

1.) Select a panel array size for the Style E-Mitter
CRB and CRN E-Mitter panel sizes can be found on page 7-6.
CRM E-Mitter panel size can be found on page 7-7.
CRC and CRZ E-Mitter panel sizes can be found on page 7-8.
CRL E-Mitter panel sizes can be found on page 7-9.
CRH and CRG E-Mitter panel sizes can be found on page 7-10.
CRD E-Mitter panel sizes can be found on page 7-12.
Gemini E-Mitters can be found on page 7-79

2.) Determine any special heat zoning

3.) Specify any E-Mitters that will have thermocouples.

There is No Substitute for Our Experience

SATISFACTION GUARANTEED!

Ordering Information

Refer to the worksheet on page 7-13

CAUTION

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.

CONTINUED

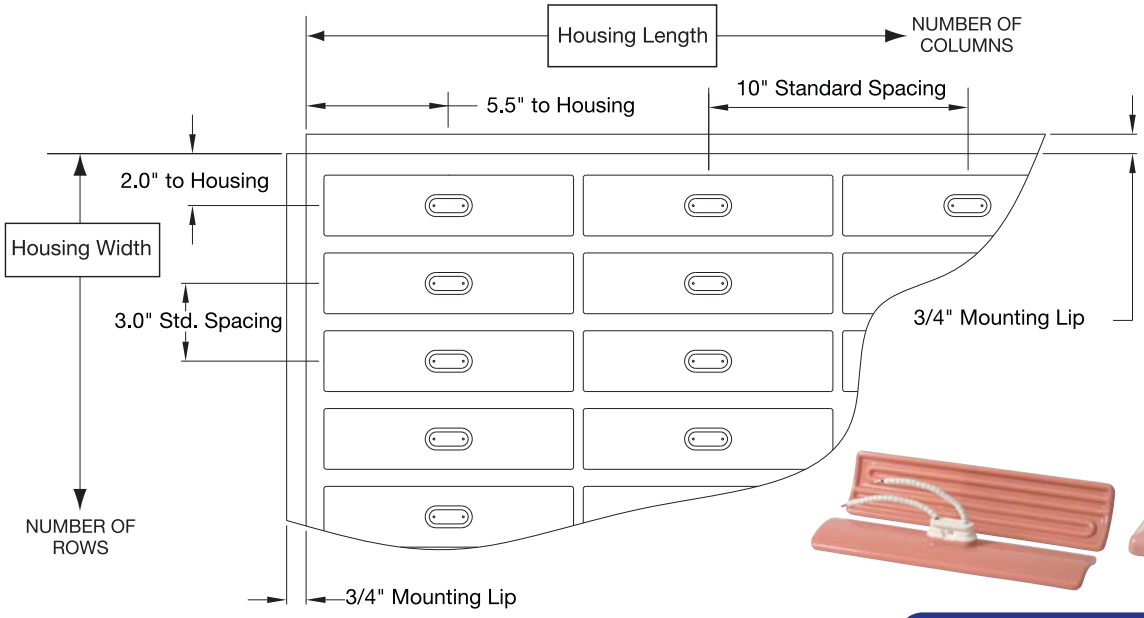
Series CRB and CRN E-Mitter Panel Arrays
Standard Style ARA Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1-1/2 inches (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1-1/2 inches (for the mounting lips).

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L	6 W x L
1	4 × 11	4 × 21	4 × 31	4 × 41	4 × 51	4 × 61
2	7 × 11	7 × 21	7 × 31	7 × 41	7 × 51	7 × 61
3	10 × 11	10 × 21	10 × 31	10 × 41	10 × 51	10 × 61
4	13 × 11	13 × 21	13 × 31	13 × 41	13 × 51	13 × 61
5	16 × 11	16 × 21	16 × 31	16 × 41	16 × 51	16 × 61
6	19 × 11	19 × 21	19 × 31	19 × 41	19 × 51	19 × 61
7	22 × 11	22 × 21	22 × 31	22 × 41	22 × 51	22 × 61
8	25 × 11	25 × 21	25 × 31	25 × 41	25 × 51	25 × 61
9	28 × 11	28 × 21	28 × 31	28 × 41	28 × 51	—
10	31 × 11	31 × 21	31 × 31	31 × 41	—	—
11	34 × 11	34 × 21	34 × 31	34 × 41	—	—
12	37 × 11	37 × 21	37 × 31	37 × 41	—	—
13	40 × 11	40 × 21	40 × 31			
14	43 × 11	43 × 21	43 × 31			
15	46 × 11	46 × 21	46 × 31	—	—	—
16	49 × 11	49 × 21	—	—	—	—
17	52 × 11	52 × 21	—	—	—	—
18	55 × 11	55 × 21	—	—	—	—

Dimensions are in inches

Note: Structural Housing Dimensions (width x length) are in inches. For overall dimensions add 3/4 inch per side for the mounting lip.



CRB & CRN E-Mitters (60 x 245 mm)

Custom Engineered/Manufactured Panels

- Multiple panels are used for larger arrays.
- Consult factory for larger panels not shown in table or custom panels with other spacings. Minimum spacing for CRB and CRN heaters is 2.5" × 10.0".
- Special narrow panels having a maximum 40 rows × 1 or 2 columns, & up to 8 rows × 12 columns can be made on special order (max. housing size 121" × 25").

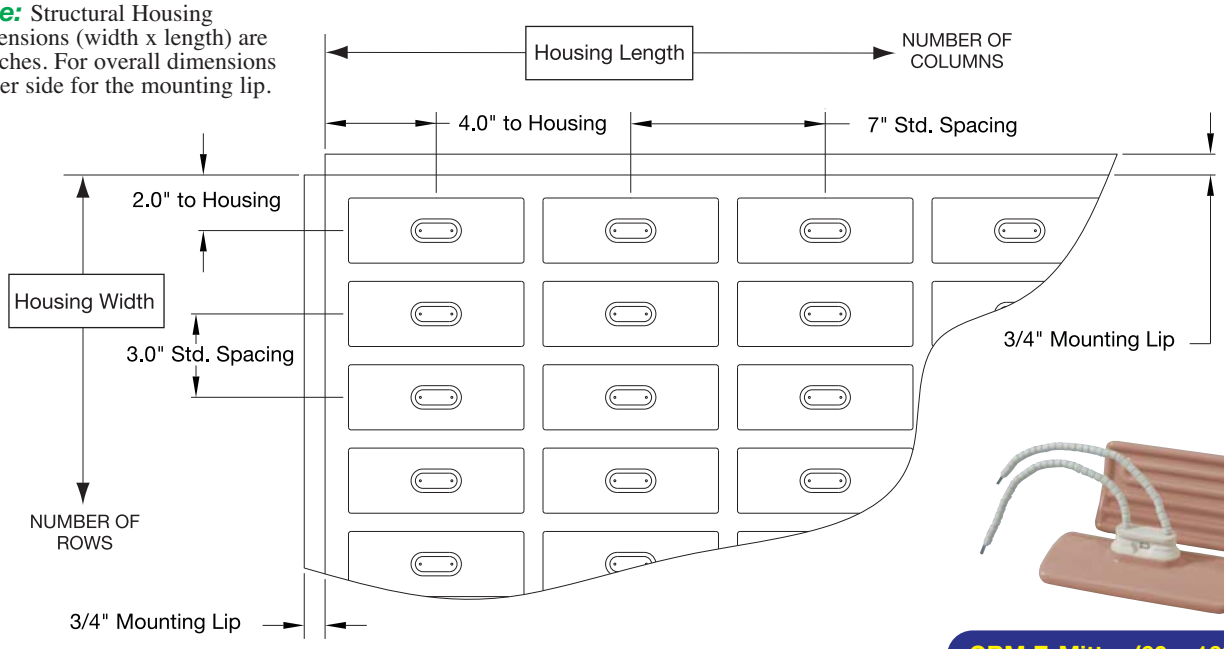
We welcome your inquiries.
Take advantage of Tempco's economical approach to manufacturing panels.

Series CRM E-Mitter Panel Arrays
Standard Style ARA Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1-1/2 inches (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1-1/2 inches (for the mounting lips).

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L	6 W x L	7 W x L	8 W x L	9 W x L
1	4 × 8	4 × 15	4 × 22	4 × 29	4 × 36	4 × 43	4 × 50	4 × 57	4 × 64
2	7 × 8	7 × 15	7 × 22	7 × 29	7 × 36	7 × 43	7 × 50	7 × 57	7 × 64
3	10 × 8	10 × 15	10 × 22	10 × 29	10 × 36	10 × 43	10 × 50	10 × 57	10 × 64
4	13 × 8	13 × 15	13 × 22	13 × 29	13 × 36	13 × 43	13 × 50	13 × 57	13 × 64
5	16 × 8	16 × 15	16 × 22	16 × 29	16 × 36	16 × 43	16 × 50	16 × 57	16 × 64
6	19 × 8	19 × 15	19 × 22	19 × 29	19 × 36	19 × 43	19 × 50	19 × 57	19 × 64
7	22 × 8	22 × 15	22 × 22	22 × 29	22 × 36	22 × 43	22 × 50	22 × 57	22 × 64
8	25 × 8	25 × 15	25 × 22	25 × 29	25 × 36	25 × 43	25 × 50	25 × 57	25 × 64
9	28 × 8	28 × 15	28 × 22	28 × 29	28 × 36	28 × 43	28 × 50	—	—
10	31 × 8	31 × 15	31 × 22	31 × 29	31 × 36	31 × 43	31 × 50	—	—
11	34 × 8	34 × 15	34 × 22	34 × 29	34 × 36	34 × 43	—	—	—
12	37 × 8	37 × 15	37 × 22	37 × 29	37 × 36	37 × 43	—	—	—
13	40 × 8	40 × 15	40 × 22	40 × 29	40 × 36	—	Dimensions are in inches		
14	43 × 8	43 × 15	43 × 22	43 × 29	—	—			
15	46 × 8	46 × 15	46 × 22	46 × 29	—	—	—	—	—
16	49 × 8	49 × 15	49 × 22	—	—	—	—	—	—
17	52 × 8	52 × 15	52 × 22	—	—	—	—	—	—
18	55 × 8	55 × 15	55 × 22	—	—	—	—	—	—

Note: Structural Housing Dimensions (width x length) are in inches. For overall dimensions add 3/4 inch per side for the mounting lip.



CRM E-Mitter (60 x 163 mm)

Custom Engineered/Manufactured Panels

- Multiple panels are used for larger arrays.
- Consult factory for larger panels not shown in table or custom panels with other spacings. Minimum spacing for CRM heaters is 2.5" × 7.0".
- Special narrow panels having a maximum 40 rows × 1, 2, or 3 columns, & up to 8 rows × 18 columns can be made on special order (max. housing size 127" × 25").

Consult us with your requirements.
There is no substitute for our experience.

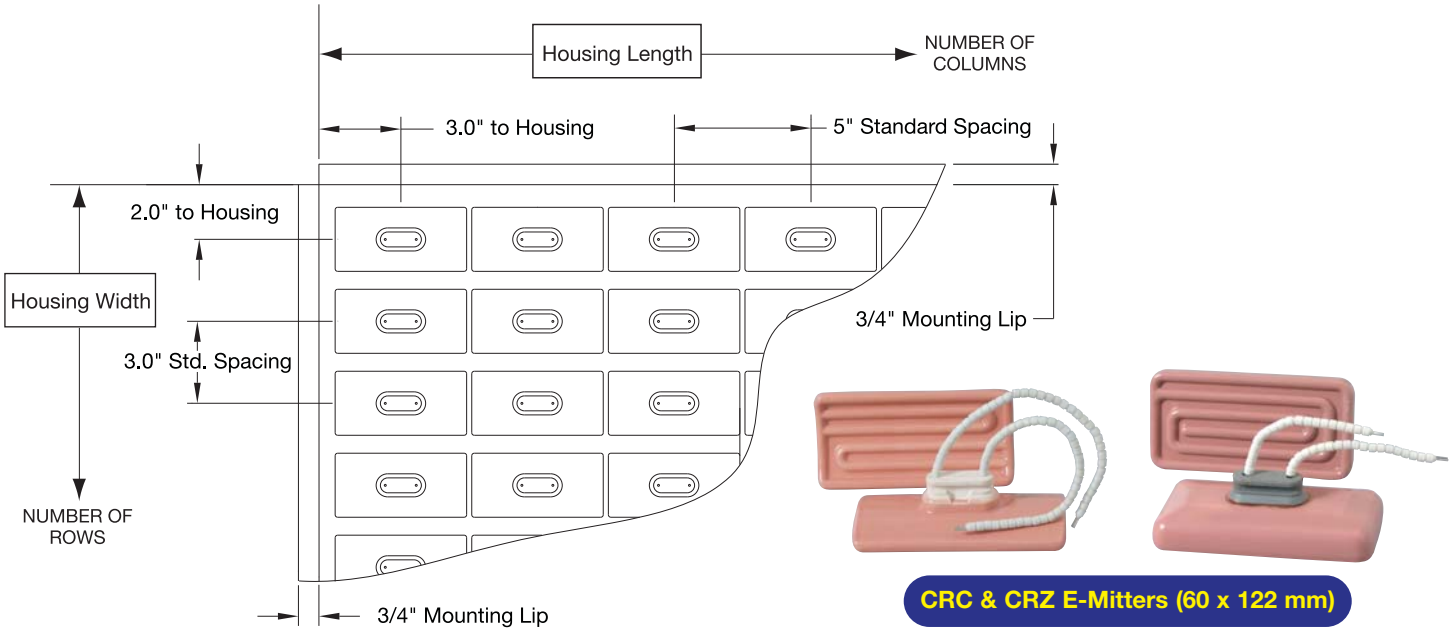
Series CRC and CRZ E-Mitter Panel Arrays

Standard Style ARA Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1-1/2 inches (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1-1/2 inches (for the mounting lips).

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L	6 W x L	7 W x L	8 W x L	9 W x L	10 W x L	11 W x L	12 W x L
1	4 × 6	4 × 11	4 × 16	4 × 21	4 × 26	4 × 31	4 × 36	4 × 41	4 × 46	4 × 51	4 × 56	4 × 61
2	7 × 6	7 × 11	7 × 16	7 × 21	7 × 26	7 × 31	7 × 36	7 × 41	7 × 46	7 × 51	7 × 56	7 × 61
3	10 × 6	10 × 11	10 × 16	10 × 21	10 × 26	10 × 31	10 × 36	10 × 41	10 × 46	10 × 51	10 × 56	10 × 61
4	13 × 6	13 × 11	13 × 16	13 × 21	13 × 26	13 × 31	13 × 36	13 × 41	13 × 46	13 × 51	13 × 56	13 × 61
5	16 × 6	16 × 11	16 × 16	16 × 21	16 × 26	16 × 31	16 × 36	16 × 41	16 × 46	16 × 51	16 × 56	16 × 61
6	19 × 6	19 × 11	19 × 16	19 × 21	19 × 26	19 × 31	19 × 36	19 × 41	19 × 46	19 × 51	19 × 56	19 × 61
7	22 × 6	22 × 11	22 × 16	22 × 21	22 × 26	22 × 31	22 × 36	22 × 41	22 × 46	22 × 51	22 × 56	22 × 61
8	25 × 6	25 × 11	25 × 16	25 × 21	25 × 26	25 × 31	25 × 36	25 × 41	25 × 46	25 × 51	25 × 56	25 × 61
9	28 × 6	28 × 11	28 × 16	28 × 21	28 × 26	28 × 31	28 × 36	28 × 41	28 × 46	28 × 51	—	—
10	31 × 6	31 × 11	31 × 16	31 × 21	31 × 26	31 × 31	31 × 36	31 × 41	—	—	—	—
11	34 × 6	34 × 11	34 × 16	34 × 21	34 × 26	34 × 31	34 × 36	34 × 41	—	—	—	—
12	37 × 6	37 × 11	37 × 16	37 × 21	37 × 26	37 × 31	37 × 36	37 × 41	—	—	—	—
13	40 × 6	40 × 11	40 × 16	40 × 21	40 × 26	40 × 31	—	—	Dimensions are in inches			—
14	43 × 6	43 × 11	43 × 16	43 × 21	43 × 26	43 × 31	—	—				—
15	46 × 6	46 × 11	46 × 16	46 × 21	46 × 26	46 × 31	—	—	—	—	—	—
16	49 × 6	49 × 11	49 × 16	49 × 21	—	—	—	—	—	—	—	—
17	52 × 6	52 × 11	52 × 16	52 × 21	—	—	—	—	—	—	—	—
18	55 × 6	55 × 11	55 × 16	55 × 21	—	—	—	—	—	—	—	—

Note: Structural Housing Dimensions (width x length) are in inches.
For overall dimensions add 3/4 inch per side for the mounting lip.



Custom Engineered/Manufactured Panels

- Multiple panels are used for larger arrays.
- Consult factory for larger panels not shown in table or custom panels with other spacings. Minimum spacing for CRC and CRZ heaters is 2.5" × 5.0".
- Special narrow panels having a maximum 40 rows × 1, 2, 3 or 4 columns, & up to 8 rows × 12 columns can be made on special order (max. housing size 121" × 25").

We welcome your inquiries.
Take advantage of Tempco's economical approach to manufacturing panels.

Product Inventory Available for Viewing and Selection @ www.tempco.com

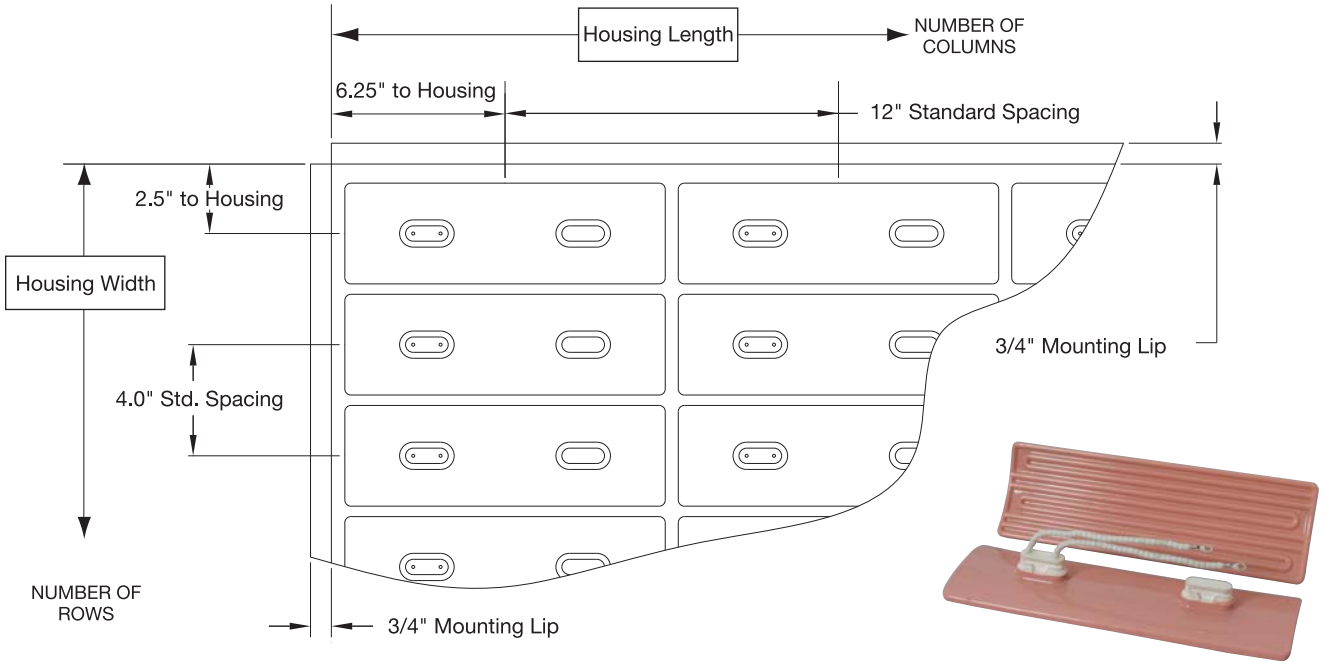
Series CRL E-Mitter Panel Arrays
Standard Style ARA Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1-1/2 inches (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1-1/2 inches (for the mounting lips).

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L
1	5 × 12.5	5 × 24.5	5 × 36.5	5 × 48.5	5 × 60.5
2	9 × 12.5	9 × 24.5	9 × 36.5	9 × 48.5	9 × 60.5
3	13 ×12.5	13 × 24.5	13 × 36.5	13 × 48.5	13 × 60.5
4	17 × 12.5	17 × 24.5	17 × 36.5	17 × 48.5	17 × 60.5
5	21 × 12.5	21 × 24.5	21 × 36.5	21 × 48.5	21 × 60.5
6	25 × 12.5	25 × 24.5	25 × 36.5	25 × 48.5	25 × 60.5
7	29 × 12.5	29 × 24.5	29 × 36.5	29 × 48.5	—
8	33 × 12.5	33 × 24.5	33 × 36.5	—	—
9	37 × 12.5	37 × 24.5	37 × 36.5	—	—
10	41 × 12.5	41 × 24.5	41 × 36.5	—	—
11	45 × 12.5	45 × 24.5	45 × 36.5	—	—
12	49 × 12.5	49 × 24.5	—	—	—
13	53 × 12.5	53 × 24.5			
14	57 × 12.5	57 × 24.5			
15	61 × 12.5	61 × 24.5	—	—	—

Dimensions are in inches

Note: Structural Housing Dimensions (width x length) are in inches. For overall dimensions add 3/4 inch per side for the mounting lip.



CRL E-Mitter (95 x 295 mm)

Custom Engineered/Manufactured Panels

- Multiple panels are used for larger arrays.
- Consult factory for larger panels not shown in table or custom panels with other spacings. Minimum spacing for CRL heaters is 4.0" × 11.69".
- Special narrow panels having a maximum 30 rows × 1 or 2 columns, & up to 6 rows × 9 columns can be made on special order (max. housing size 121" × 25").

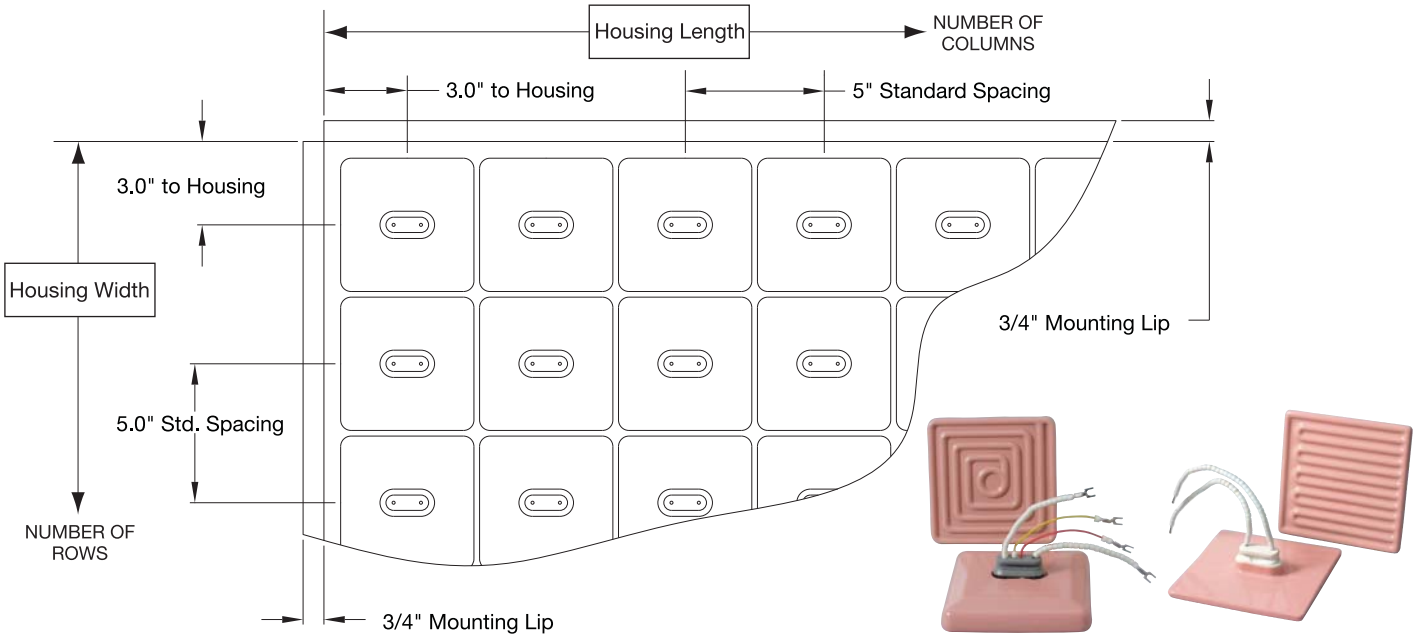
Consult us with your requirements
There is no substitute for our experience.

Series CRH and CRG E-Mitter Panel Arrays
Standard Style ARA Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1-1/2 inches (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1-1/2 inches (for the mounting lips).

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L	6 W x L	7 W x L	8 W x L	9 W x L	10 W x L	11 W x L	12 W x L
1	6 × 6	6 × 11	6 × 16	6 × 21	6 × 26	6 × 31	6 × 36	6 × 41	6 × 46	6 × 51	6 × 56	6 × 61
2	11 × 6	11 × 11	11 × 16	11 × 21	11 × 26	11 × 31	11 × 36	11 × 41	11 × 46	11 × 51	11 × 56	11 × 61
3	16 × 6	16 × 11	16 × 16	16 × 21	16 × 26	16 × 31	16 × 36	16 × 41	16 × 46	16 × 51	16 × 56	16 × 61
4	21 × 6	21 × 11	21 × 16	21 × 21	21 × 26	21 × 31	21 × 36	21 × 41	21 × 46	21 × 51	21 × 56	21 × 61
5	26 × 6	26 × 11	26 × 16	26 × 21	26 × 26	26 × 31	26 × 36	26 × 41	26 × 46	26 × 51	26 × 56	26 × 61
6	31 × 6	31 × 11	31 × 16	31 × 21	31 × 26	31 × 31	31 × 36	31 × 41	31 × 46	31 × 51	—	—
7	36 × 6	36 × 11	36 × 16	36 × 21	36 × 26	36 × 31	36 × 36	36 × 41	36 × 46	—	—	—
8	41 × 6	41 × 11	41 × 16	41 × 21	41 × 26	41 × 31	41 × 36	41 × 41	—	—	—	—
9	46 × 6	46 × 11	46 × 16	46 × 21	46 × 26	46 × 31	46 × 36	—	—	Dimensions are in inches		
10	51 × 6	51 × 11	51 × 16	51 × 21	51 × 26	51 × 31	—	—	—			
11	56 × 6	56 × 11	56 × 16	56 × 21	56 × 26	—	—	—	—	—	—	—
12	61 × 6	61 × 11	61 × 16	61 × 21	61 × 26	—	—	—	—	—	—	—

Note: Structural Housing Dimensions (width x length) are in inches.
For overall dimensions add 3/4 inch per side for the mounting lip.



CRH & CRG E-Mitter (122 x 122 mm)

Custom Engineered/Manufactured Panels

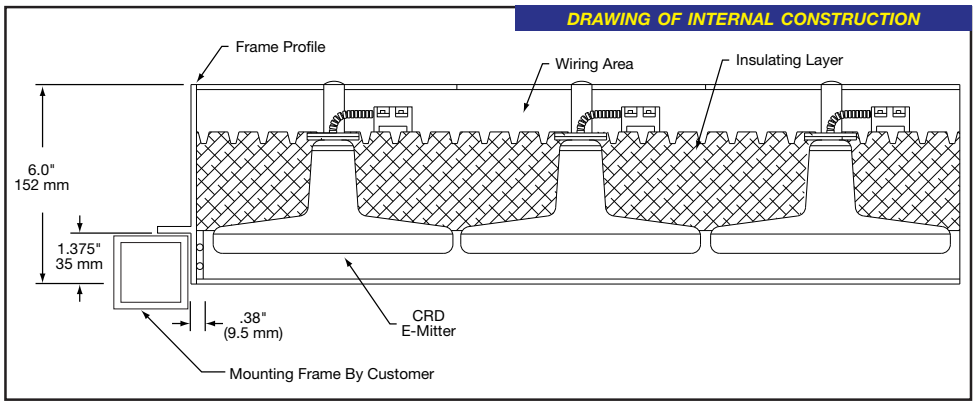
- Multiple panels are used for larger arrays.
- Consult factory for larger panels not shown in table or custom panels with other spacings. Minimum spacing for CRH and CRG heaters is 5.0" × 5.0".
- Special narrow panels having a maximum 25 rows × 1 or 2 columns, & up to 8 rows × 9 columns can be made on special order (max. housing size 121" × 26").

We welcome your inquiries.
Take advantage of Tempco's economical approach to manufacturing panels.

ARA Array Assemblies for CRD E-Mitters®

Design Features

- *Lightweight extruded aluminum outer housing*
- *All metal interior components are stainless steel.*
- *Designed for use with E-Mitters Style CRD, pages 7-37 and 7-38.*
- *Each heater's power leads are connected to an individual ceramic Terminal Block.*
- *Nickel wire with heat resistant insulation is used for circuit wiring between terminal blocks.*
- *Zones with different radiant heat levels can be achieved by using different wattage heaters (each zone would have a heater with built-in thermocouple for temperature control).*
- *Shipped fully assembled*
- *Optional factory wiring and power control panels*
- *Optional ceramic fiber insulation in wiring space*
- *Optional entrances in rear cover or sides to customer specs*



The housing for the CRD heaters is the same construction as all CRA arrays except for the extra height needed for the long shaft of the CRD heaters. This space is then filled with ceramic fiber insulation with foil backing to keep the wiring and terminal area much cooler.

Ordering Information

Refer to the worksheet on page 7-13

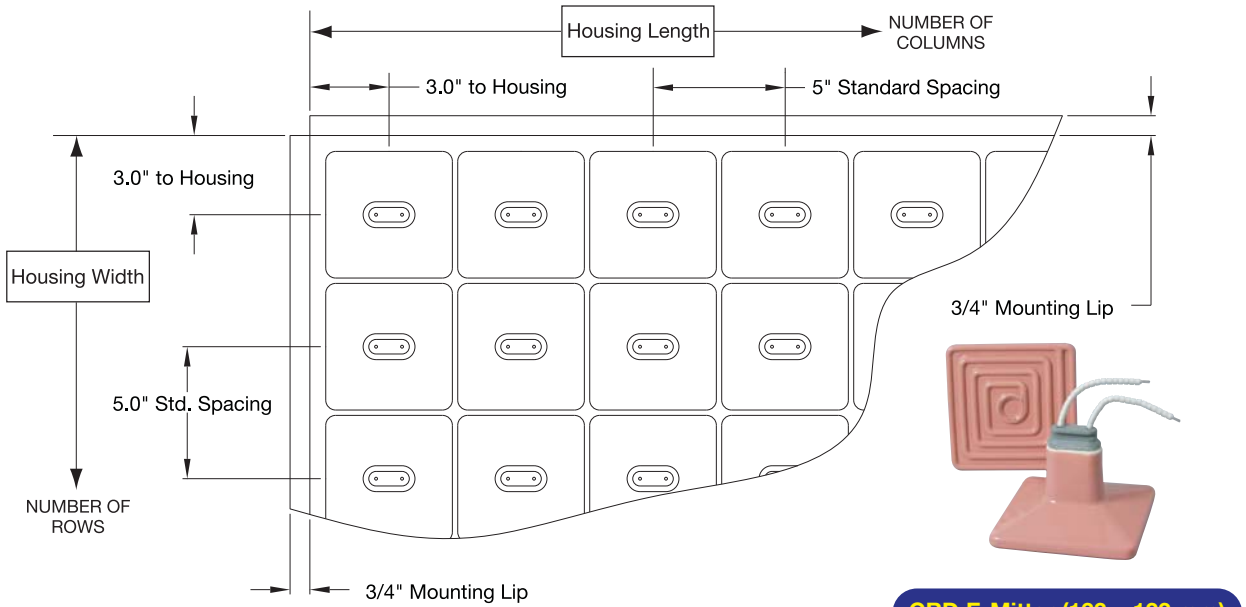
CONTINUED

Series CRD E-Mitter Panel Arrays
Standard Style ARA Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1-1/2 inches (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1-1/2 inches (for the mounting lips).

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L	6 W x L	7 W x L	8 W x L	9 W x L	10 W x L	11 W x L	12 W x L
1	6 × 6	6 × 11	6 × 16	6 × 21	6 × 26	6 × 31	6 × 36	6 × 41	6 × 46	6 × 51	6 × 56	6 × 61
2	11 × 6	11 × 11	11 × 16	11 × 21	11 × 26	11 × 31	11 × 36	11 × 41	11 × 46	11 × 51	11 × 56	11 × 61
3	16 × 6	16 × 11	16 × 16	16 × 21	16 × 26	16 × 31	16 × 36	16 × 41	16 × 46	16 × 51	16 × 56	16 × 61
4	21 × 6	21 × 11	21 × 16	21 × 21	21 × 26	21 × 31	21 × 36	21 × 41	21 × 46	21 × 51	21 × 56	21 × 61
5	26 × 6	26 × 11	26 × 16	26 × 21	26 × 26	26 × 31	26 × 36	26 × 41	26 × 46	26 × 51	26 × 56	26 × 61
6	31 × 6	31 × 11	31 × 16	31 × 21	31 × 26	31 × 31	31 × 36	31 × 41	31 × 46	31 × 51	—	—
7	36 × 6	36 × 11	36 × 16	36 × 21	36 × 26	36 × 31	36 × 36	36 × 41	36 × 46	—	—	—
8	41 × 6	41 × 11	41 × 16	41 × 21	41 × 26	41 × 31	41 × 36	41 × 41	—	—	—	—
9	46 × 6	46 × 11	46 × 16	46 × 21	46 × 26	46 × 31	46 × 36	—	—	Dimensions are in inches		
10	51 × 6	51 × 11	51 × 16	51 × 21	51 × 26	51 × 31	—	—	—			
11	56 × 6	56 × 11	56 × 16	56 × 21	56 × 26	—	—	—	—	—	—	—
12	61 × 6	61 × 11	61 × 16	61 × 21	61 × 26	—	—	—	—	—	—	—

Note: Structural Housing Dimensions (width x length) are in inches.
For overall dimensions add 3/4 inch per side for the mounting lip.



CRD E-Mitter (122 x 122 mm)

Custom Engineered/Manufactured Panels

- Multiple panels are used for larger arrays.
- Consult factory for larger panels not shown in table or custom panels with other spacings. Minimum spacing for CRD heaters is 5.0" × 5.0".
- Special narrow panels having a maximum 25 rows × 1 or 2 columns, & up to 8 rows × 9 columns can be made on special order (max. housing size 121" × 26").

We welcome your inquiries.
Take advantage of Tempco's economical approach to manufacturing panels.

ARA Array Panel Design Worksheet for Ceramic or Quartz E-Mitters®

Ordering Information

To process your order or quotation, please specify the following information.

1.) Supply panel layout or sketch showing:

- Outside panel dimensions (allow for 3/4" wide mounting lip on all sides of ARA structural array housing)
- Heater type and orientation of long (or short) heater dimension
- Layout of rows and columns with number of heaters
- Spacing of rows and columns (Tempco will use standard spacing unless specified by customer)
- Zones and/or number of heaters per zone
- Locations of input wiring
- Locations of heaters with thermocouples (if used)

2.) Electrical requirements:

- Total panel KW _____
- Zone KWs (or # of heaters in zones) _____
- Line voltage to panel, # of circuits & 1 or 3 phase operation _____
- If 480V, can series-parallel wiring and 240V heaters be used? _____
- Type of heater control to be used _____

3.) Heater specifications:

- E-Mitter Style ❒ CRB ❒ CRC ❒ CRN ❒ CRZ ❒ CRD ❒ CRH ❒ CRL ❒ CRM ❒ KRD ❒ GEM ❒ VS Glow
- Catalog Part Number _____ or Watts ____ Volts ____ Color for all heaters (T/C & non-T/C types) _____
- Standard K thermocouple or optional J _____ Quantity ____
- Heater lead configuration (Standard is 3.5" ceramic beads with straight terminals. Spade or optional ring terminals used if factory wired.) _____
- Special marking if required _____

4.) Panel wiring & control options:

❒ Standard unit wiring is heaters to terminal blocks only

❒ Factory wired per customer specs and wiring diagram

❒ Tempco Engineering to design internal wiring and determine line input requirements

❒ Tempco to supply turnkey power control panel(s)

5.) Any special features required? _____

_____

_____

6.) Application data:

- Type of application and physical properties of processed materials _____

_____

_____

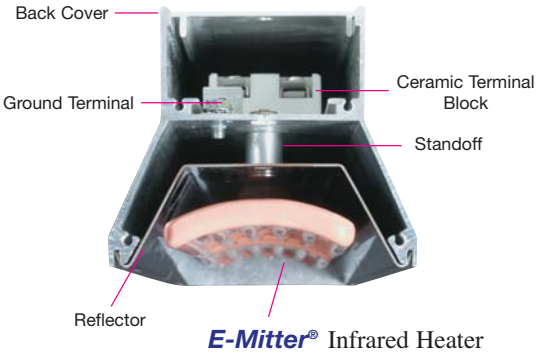
CRA Linear Structural Housings

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", 40" and 50" lengths. Other housing lengths can be made to your requirements. *(40" 1000 Watt CRA10025 Pictured)*

Easiest Replacement of Heaters in the Industry

E-Mitters are easily replaced by removing the top cover. Wiring entrance side covers are not affected. The heater lead wires are insulated with ceramic beads and connected to ceramic terminal blocks. Heaters can be wired to function individually or grouped into heating zones.



E-Mitter® Infrared Heater

Design Features

- *Designed for use with E-Mitters CRB, CRC, CRN and CRZ*
- *Lightweight extruded aluminum housing*
- *E-Mitters are easily replaced by removing the top cover*
- *Internal mounting hole pattern simplifies mixing and matching E-Mitter sizes and ratings*
- *Space between reflector and housing wall offers a good thermal barrier to protect the wiring area*
- *This CRA structural housing can be used with any manufacturer's standard 60 × 245 mm -or- 60 × 122 mm heaters*
- *Wiring entrance 7/8" Diameter at both ends, for 1/2" electrical fittings*

Ordering Information

Standard Assemblies

Order by Part Number on page 7-15. Delivery is Stock to 3 days.

Custom Engineered/Manufactured CRA Heater Assembly

Understanding that a CRA linear structural housing can be very application specific, **TEMPCO** will design and manufacture a CRA heater assembly to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ Housing Length
- ❑ E-Mitter Color
- ❑ E-Mitter Size, Electrical Ratings or Part Number
- ❑ E-Mitter with Built-In Type K T/C, Size, Electrical Ratings or Part Number

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

Product Inventory Available for Viewing and Selection @ www.tempco.com

Standard Sizes & Ratings — Type CRA Linear Heater Assemblies

Design Features

- *220/240V CRB or CRC E-Mitters*
- *Extruded aluminum housing*
- *E-Mitters pre-wired to terminal blocks*
- *METAMORPHING Rose to Grey colored E-Mitters*
- *Reflectors*
- *Fully assembled, ready to install, with mounting hardware*

Nominal Housing Length	E-Mitter Type	E-Mitter Wattage	Number of E-Mitters	Total Assembly Wattage	Assembly Part Number	Assembly Part Number with K t/c
10"	CRB	250	1	250	CRA10001	CRA10048
	CRB	400	1	400	CRA10002	CRA10049
	CRB	650	1	650	CRA10003	CRA10050
	CRB	1000	1	1000	CRA10004	CRA10051
	CRC	125	2	250	CRA10005	CRA10052
	CRC	200	2	400	CRA10006	CRA10053
	CRC	325	2	650	CRA10007	CRA10054
	CRC	500	2	1000	CRA10008	CRA10055
20"	CRB	250	2	500	CRA10009	CRA10056
	CRB	400	2	800	CRA10010	CRA10057
	CRB	650	2	1300	CRA10011	CRA10058
	CRB	1000	2	2000	CRA10012	CRA10059
	CRC	125	4	500	CRA10013	CRA10060
	CRC	200	4	800	CRA10014	CRA10061
	CRC	325	4	1300	CRA10015	CRA10062
	CRC	500	4	2000	CRA10016	CRA10063
30"	CRB	250	3	750	CRA10017	CRA10064
	CRB	400	3	1200	CRA10018	CRA10065
	CRB	650	3	1950	CRA10019	CRA10066
	CRB	1000	3	3000	CRA10020	CRA10046
	CRC	125	6	750	CRA10021	CRA10067
	CRC	200	6	1200	CRA10022	CRA10068
	CRC	325	6	1950	CRA10023	CRA10069
	CRC	500	6	3000	CRA10024	CRA10070
40"	CRB	250	4	1000	CRA10025	CRA10071
	CRB	400	4	1600	CRA10026	CRA10072
	CRB	650	4	2600	CRA10027	CRA10073
	CRB	1000	4	4000	CRA10028	CRA10047
	CRC	125	8	1000	CRA10029	CRA10074
	CRC	200	8	1600	CRA10030	CRA10075
	CRC	325	8	2600	CRA10031	CRA10076
	CRC	500	8	4000	CRA10032	CRA10077

Wiring Options

Prewired with Armor Cable or Wire Braid
(includes ground wire)

18" Stainless Steel armor cable over 24" leads

18" galvanized armor cable over 24" leads

18" Stainless Steel wire braid over 24" leads

If longer leads and/or longer armor cable is required, specify when ordering

Prewired with HPN 90°C/300V 3-conductor cable for low wattage applications
(includes ground wire)

24" HPN 16 ga cable (Max. Amps 15 @ 30°C ambient)

Specify if additional HPN cable length is required

Prewired with 450°C fiberglass leads
(includes ground wire)

12" fiberglass leads

If longer leads are required, specify when ordering

Select one of the following lead wire exit locations with any wiring option:
- Side KO connection: straight
- Side KO connection: 90°

Stock Heavy Duty Quick Disconnect Plugs and Receptacles

Reference	NEMA P or R	Max. Amps	Volts	Plug Part No.	Receptacle Part No.
P8 straight	6-15	15A	250V	EHD-102-114	EHD-103-139
P3 straight	5-15	15A	125V	EHD-102-103	EHD-103-102
P4 twist lock	L5-15	15A	125V	EHD-102-113	EHD-103-104
P5 twist lock	L6-15	15A	250V	EHD-102-121	EHD-103-107

Optional Electrical Plugs listed can be attached to armor cable, HPN cord or plain leads described under wiring Options. Receptacles listed are cable mount matching units for the plugs listed and are ordered separately.

Plugs rated 20 Amps and above are available. Consult Tempco.

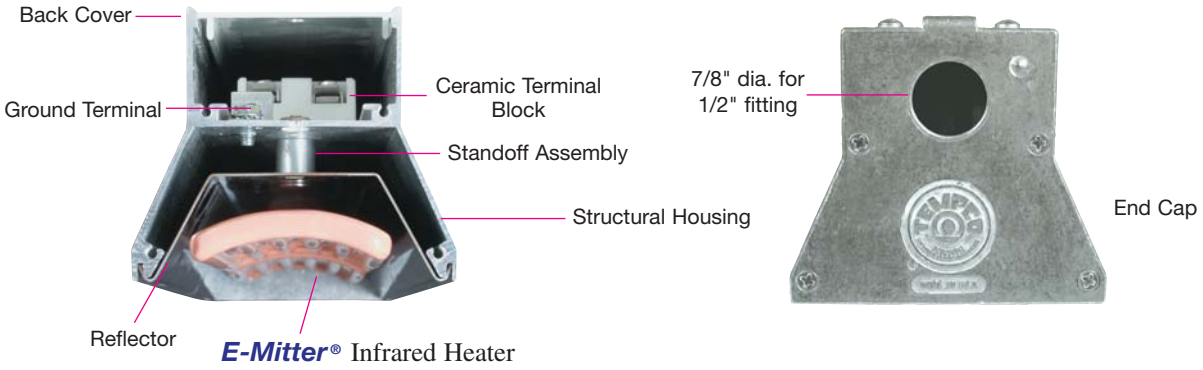
P8

P3

P4

P5

Custom CRA Linear Assembly — Components Required



E-Mitter® Infrared Heater

Steps to Design a Custom CRA E-Mitter Linear Assembly for Your Application

1.) Select a housing length from the Stock CRK Housing Lengths Table on page 7-17.

2.) Select the E-Mitters Series. The Stock CRK Housing Lengths Table gives the various possible E-Mitter configurations that will fit the housing length you selected.
Note the Maximum Power Rating of the housing when making your selection.
CRB E-Mitters can be found on pages 7-24 through 7-26.
CRC E-Mitters can be found on pages 7-27 and 7-28.
CRN E-Mitters can be found on page 7-35.
CRZ E-Mitters can be found on pages 7-36.

3.) Select E-Mitter Reflectors to match the Style and Quantity of E-Mitters you selected.
Note: Reflectors are complete with mounting hardware to attach to housing (page 7-18).

4.) Select the number of terminal blocks required for wiring. This would typically be one for each heater for the power leads and one for each thermocouple (page 7-19 and 7-20).

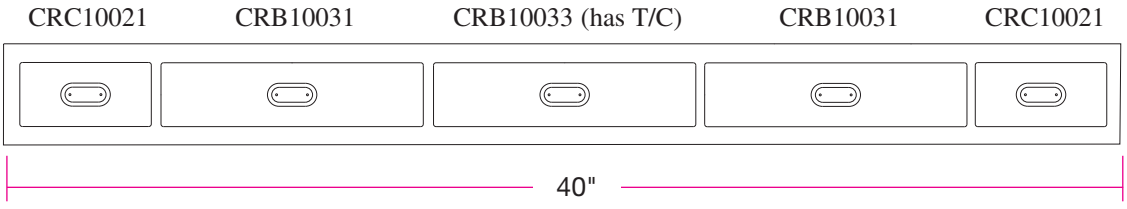
Example

A 40-inch-long CRA assembly is required for a given application.

Step 1) A combination of CRBs and CRCs will be used. CRB E-Mitters were selected for the inside three heaters to limit the number of unheated gaps that would be present if all CRC E-Mitters were used. The middle CRB E-Mitter has a thermocouple for temperature control. The outer two heaters *in this example* are CRC E-Mitters at a different w/in^2 than the CRBs because the heat required at the edges is not the same as the center. The heater color selected is Metamorphing Rose.

Step 2) Three Part Number CRK00007 Reflectors are required for the CRB E-Mitters and Two Part Number CRK00006 Reflectors are required for the CRC E-Mitters.

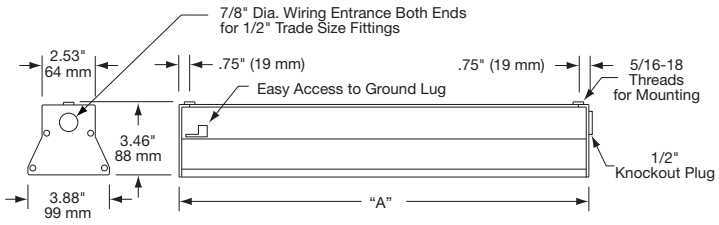
Step 3) A total of six terminal Blocks, Part Number EHD-108-101, are required. One for the power leads of each E-Mitter and one for the thermocouple on CRB10033.



Stock CRK Linear Housings

CRK housings include the following components: housing body, end plates, 5/16-18 mounting bolts, cover and ground lug.

NOTE: These housings do not include the reflectors needed for mounting the heaters (see page 7-18) or the terminal block (Part Number EHD-108-101) required for wiring each heater (see page 7-19).



Stock Housing Lengths Table

Nominal Housing Length in	Nominal Housing Length mm	"A" Dim. in	Housing Part Number	Examples of Possible E-Mitter Configurations	Maximum Power
5	127	5.1875	CRK00024	1 CRC or 1 CRZ	.5KW
10	254	10.125	CRK00001	1 CRB or 1 CRN, 2 CRCs or 2 CRZs	1KW
15	381	15.0625	CRK00023	3 CRCs or 3 CRZs (1 CRB and 1 CRC) or (1 CRN and 1 CRZ)	1.5KW
20	508	20.000	CRK00002	2 CRBs or 2 CRNs, 4 CRCs or 4 CRZs (1 CRB and 2 CRCs) or (1 CRN and 2 CRZs)	2KW
25	635	24.9375	CRK00022	5 CRCs or 5 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	2.5KW
30	762	29.875	CRK00003	3 CRBs or 3 CRNs, 6 CRCs or 6 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	3KW
35	889	34.8125	CRK00019	7 CRCs or 7 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	3.5KW
40	1016	39.750	CRK00004	4 CRBs or 4 CRNs, 8 CRCs or 8 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	4KW
50	1270	49.625	CRK00021	5 CRBs or 5 CRNs, 10 CRCs or 10 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	5KW
60	1524	59.500	CRK00027	6 CRBs or 6 CRNs, 12 CRCs or 12 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	6KW
70	1778	69.375	CRK00029	7 CRBs or 7 CRNs, 14 CRCs or 14 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	7KW

KTE and KTG E-Mitters (High Intensity Medium Wave Quartz Mini-Tube Infrared E-Mitters)

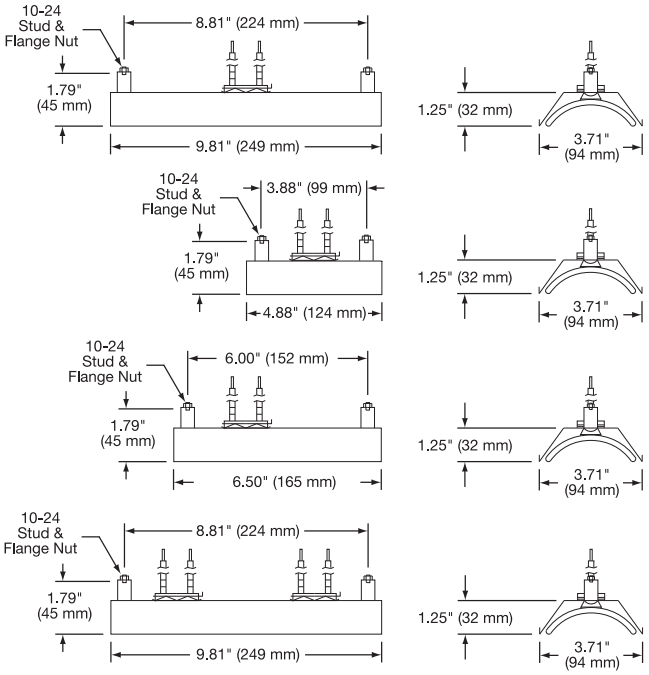
The CRK Linear Housings assembly and other components on pages 7-14 through 7-17 for Ceramic E-Mitters are also used with KTE and KTG E-Mitters found on page 7-52.

E-Mitter Reflectors

Stock Reflectors for CRB, CRN, CRC, CRZ and CRL E-Mitters

Reflectors for Ceramic E-Mitters

- *Designed to withstand bending and heat distortion*
- *Made from highly polished chrome steel or optional aluminized steel for extreme temperatures and harsh environments*
- *Will withstand high operating temperatures*
- *Available in three standard sizes; includes standoffs and hardware*
- *Easy installation into CRA linear structural housing assemblies (except CRK00032)*



For One CRB E-Mitter or One CRN E-Mitter

Part Number: CRK00007 (Chrome Steel)
Part Number: CRK00049 (Aluminized Steel)

For One CRC E-Mitter or One CRZ E-Mitter

Part Number: CRK00006 (Chrome Steel)
Part Number: CRK00035 (Aluminized Steel)

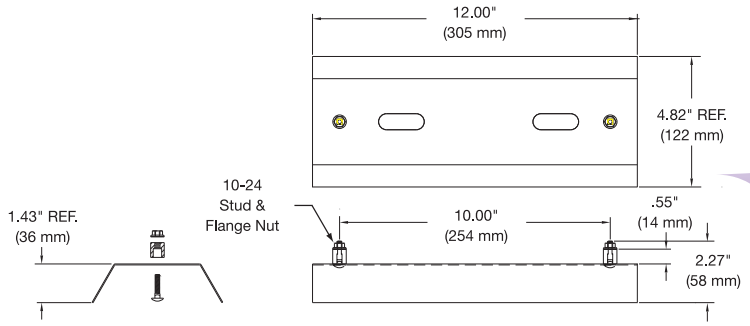
For One CRM E-Mitter

Part Number: CRK00030 (Chrome Steel)
Part Number: CRK00074 (Aluminized Steel)

For Two CRC E-Mitters or Two CRZ E-Mitters

Part Number: CRK00020 (Chrome Steel)
Part Number: CRK00043 (Aluminized Steel)

Note: Reflectors in drawings are shown with curved heater(s) for reference only.



For One CRL E-Mitter

Part Number: CRK00032 (Aluminized Steel)

All Items Available from Stock

Ceramic Twist-Loc Wire Connectors

Material: Porcelain rated 300°C, 300 Volt Max., Solid or Stranded wire

Part Number	Wire Range		Skirt Length (in)	Opening ID (in)	Outer Diameter (in)
EHD-114-102	(2) #22	(1) #18 & (1) #16	11/16	1/4	15/32
EHD-114-103	(2) #20	(2) #16	13/16	5/16	1/2
EHD-114-104	(2) #18	(2) #14	7/8	13/32	9/16
EHD-114-105	(1) #16 & (1) #14	1#14 & (2) #12	1-1/8	1/2	3/4

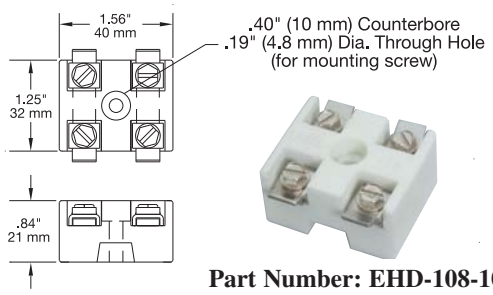
Product Inventory Available for Viewing and Selection @ www.tempco.com

Standard Ceramic Terminal Block for Internal Wiring

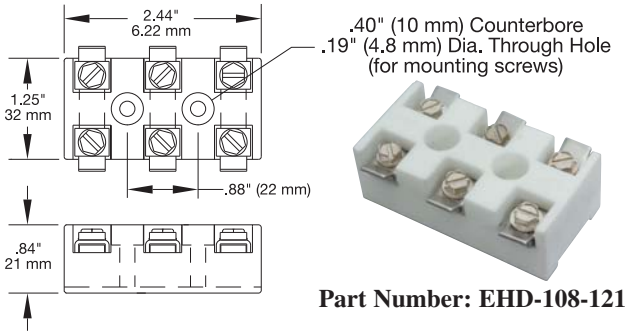
For internal connections within heater assemblies, CRA linear structural housings and ARA arrays.

Design Features

- *Maximum Voltage: 600 VAC*
- *Maximum Current: 20 Amps*
- *Maximum Temperature: 450°C/842°F*
- *AWG: 20-12 ga. wire*
- *Hardware: Stainless Steel*
- *Body Material: As Fired Steatite*



Part Number: EHD-108-101



Part Number: EHD-108-121

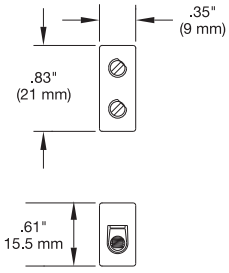
Ceramic Terminal Block (enclosed terminals)

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

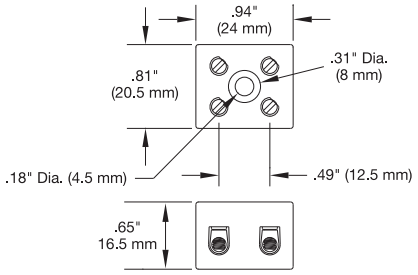
Design Features

- *Rating: CE, VDE*
- *Maximum Voltage: 380 VAC*
- *Maximum Current: 30 Amps*
- *Body Material: Porcelain*
- *AWG: 26-16 stranded, 26-14 solid*
- *Maximum Temperature: 240°C/464°F*
- *Screw: M3, zinc plated steel, yellow chromated*

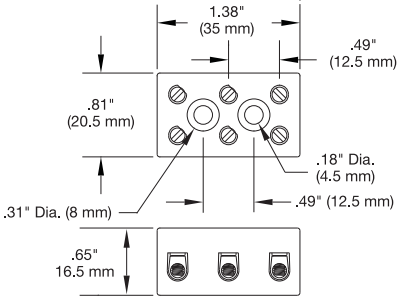
Part Number: EHD-108-116



Part Number: EHD-108-117

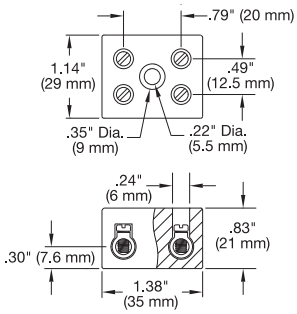


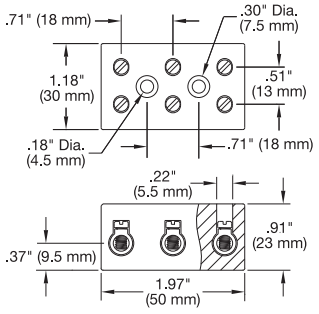
Part Number: EHD-108-118



Design Features

- *Rating: UL*
- *Maximum Voltage: 600 VAC*
- *Maximum Current: 50 Amps*
- *Body Material: Porcelain*
- *AWG: 14-8 ga wire*
- *Screw: M4, zinc plated steel, yellow chromated*
- *Maximum Temperature: 240°C/464°F*





Part Number: EHD-108-114

Part Number: EHD-108-115

CONTINUED

Stock Ceramic Terminal Blocks

Heavy Duty High Temperature Ceramic Line Wiring Blocks (Exposed Terminals)

Design Features

- **Maximum Voltage:** 500 VAC
- **Maximum Current:** 44 Amp @ 104°F ambient
- **Maximum Temperature:** 240°C/464°F
- **Wire Gauge:** 18 to 8 ga.
- **Screw:** M5 (#10), zinc-plated steel, yellow chromated
- **Body Material:** Steatite

Additional Terminal Hardware

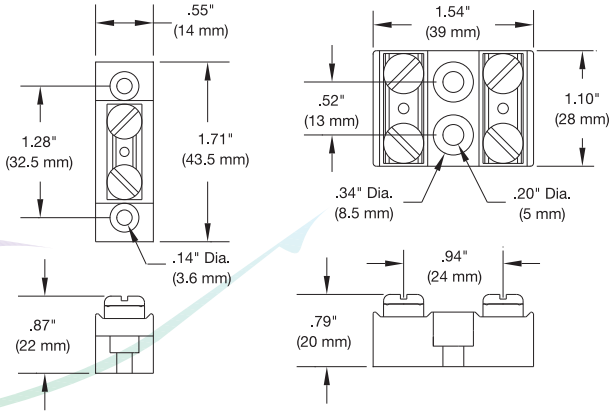
Stainless Steel Flat Washer Part Number: **WAS-118-108**

Spring Lock Washers Part Number: **WAS-109-101**

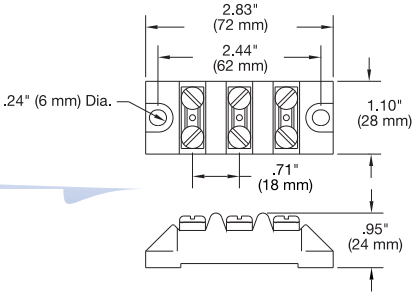
Used for interfacing heater assemblies, CRA housings and ARA arrays to external line wiring.

Part Number: EHD-108-106

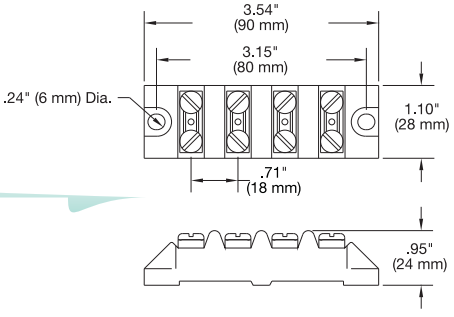
Part Number EHD-108-107



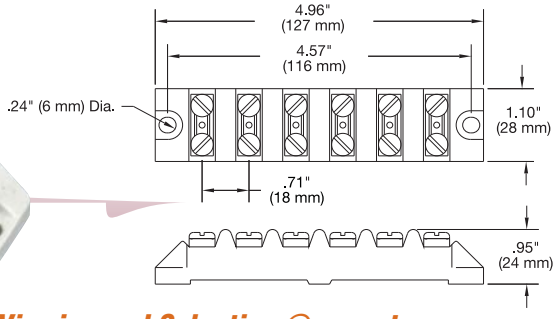
Part Number: EHD-108-108



Part Number: EHD-108-109



Part Number: EHD-108-105



All Items Available from Stock

Product Inventory Available for Viewing and Selection @ www.tempco.com

Hi-Temp (900°F) Nickel Plated Steel Uninsulated Terminals

The following optional terminals are available for use with Ceramic E-Mitter heaters and for assembly wiring. (Ceramic E-Mitters come standard with Part Number TER-115-112 #8-10 Ni-Steel spade terminals.)

Terminal Type	Description	Usage	Part Number
Ring	#10 stud, 16-14 ga. wire	Misc. (Monel material)	TER-110-104
	#10 stud, 22-18 ga. wire	Heater leads	TER-110-110
	#10 stud, 12-10 ga. wire	Line Wiring of Assy.	TER-110-111
	#8 stud, 16-14 ga. wire	Internal CRA & ARA wiring	TER-109-104
	#8 stud, 22-18 ga. wire	Heater leads	TER-109-105*
	#8 stud, 12-10 ga. wire	Line wiring of Assy.	TER-109-106
Spade	#8-10 stud, 22-18 ga. wire	Heater leads (Standard)	TER-115-112*
	#8 stud, 16-14 ga. wire	Internal CRA & ARA wiring	TER-115-113
	#10 stud, 22-18 ga. wire	Misc.	TER-115-111
Straight	1/4" long Ni 200 Barrel Crimp	T/C or Heater leads	CON-101-101

All Items Available from Stock

* Standard sizes for heater leads to internal ceramic terminal blocks used in CRA housings and ARA arrays. Must be used with EHD-108-101 (2-pole) or EHD-108-121 (3-pole) standard terminal blocks.

High Temperature Stranded Lead Wiring Material

The following insulated wiring materials are available for heater lead modifications, internal bussing and the line input wiring of CRA housings and panels.

Part Number	Rating	Size & Conductor	Maximum Amperage	Usage
LDW-105-109	450°C, 600V	18 ga. Ni Clad Cu	12.3 @ 300°C (572°F)	Heater Lead Modifications
LDW-104-104	450°C, 600V	16 ga. Nickel	8.4 @ 300°C (572°F)	Misc.
LDW-103-108	450°C, 600V	14 ga. Ni Clad Cu	21.2 @ 300°C (572°F)	Standard for internal wiring of factory wired units
LDW-103-104	450°C, 600V	14 ga. Nickel	12.6 @ 300°C (572°F)	Misc.
LDW-102-106	450°C, 600V	12 ga. Ni Clad Cu	26.2 @ 300°C (572°F)	Panel zones & line input
LDW-101-102	450°C, 600V	10 ga. Ni Clad Cu	35.6 @ 300°C (572°F)	Panel zones & line input
LDW-105-111	250°C, 300V	18 ga. Ni Plated Cu	9.0 @ 200°C (392°F)	Heater Lead Modifications
LDW-104-102	250°C, 600V	16 ga. Ni Plated Cu	14.2 @ 200°C (392°F)	Misc.
LDW-103-103	250°C, 600V	14 ga. Ni Plated Cu	21.1 @ 200°C (392°F)	Internal panel wiring
LDW-102-101	250°C, 600V	12 ga. Ni Plated Cu	29.5 @ 200°C (392°F)	Panel zones & line input
LDW-101-101	250°C, 600V	10 ga. Ni Plated Cu	37.6 @ 200°C (392°F)	Panel zones & line input
WIR-109-101	750°C, 480V	18 ga. bare, Fe/Cr	10.0 @ 700°C (1292°F)	Heater lead modifications
CER-103-108	750°C, 480V	Ceramic beads*	N/A	Bare heater lead insulation

* Six (6) per inch required for use on WIR-109-101

For 450°C (842°F) rated wires amperage is derated over 300°C (572°F). Maximum ambient is 400°C (752°F). The 250°C (482°F) wires should not be used in ambients over 225°C (437°F). See amperage tables in Engineering Section 16 for more details on current carrying capacity of general wiring materials.

See page 15-2 for additional specifications.

Standard High Temperature Thermocouple Wiring Material

The following insulated wiring materials are available for heater T/C lead extensions, internal bussing and wiring of CRA housings and panels to external controllers.

Wire Part Number	Type	Wire Style	Insulation Color Code	Insulation Sleeving Part Number	Usage
TCW-106-106	K - Chromel P	20 ga. solid, bare	Yellow (+Pos)	SLV-110-109, 18 ga.	Heater lead modifications
TCW-107-103	K - Alumel	20 ga. solid, bare	Red (-Neg)	SLV-110-108, 18 ga.	
TCW-111-102	J - Iron	20 ga. solid, bare	White (+Pos)	SLV-110-107, 18 ga.	
TCW-109-102	J - Constantan	20 ga. solid, bare	Red (-Neg)	SLV-110-108, 18 ga.	
TCW-103-104	K - paired	20 ga. Duplex, solid	Yellow/Red	n/a, Insulated 2 conductor	Panel zones & input wiring
TCW-103-101	K - paired	20 ga. Duplex, stranded	Yellow/Red	n/a, Insulated 2 conductor	
TCW-101-110	J - paired	20 ga. Duplex, solid	White/Red	n/a, Insulated 2 conductor	
TCW-101-109	J - paired	20 ga. Duplex, stranded	White/Red	n/a, Insulated 2 conductor	

Duplex wires have color coded glass braid over each conductor within an outer braided fiberglass insulation jacket. Bare conductors are supplied without sleeving. Specify sleeving by part number if required when ordering.

Additional options and sizes are listed on page 14-102.

Series CRS, CRB, CRC, CRM and CRL Curved Face Ceramic E-Mitters

Design Features

- *Universal mount designed to be dropped into existing systems regardless of manufacturer.*
- *Standard colors are metamorphing rose (cold) to grey (hot), and traditional white. Optional colors are metamorphing yellow (cold) to orange (hot), and black.*
- *Standard stocked voltage: 120 or 220/240V as noted; other voltages are available.*
- *Available with built-in type K thermocouple. Type J thermocouple is also available. Low noise options are 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.*
- *2.5 to 6µm infrared radiation wavelength*

5 ***Standard Solid Curved Face sizes to accommodate a wide range of new or existing applications***

Series CRB
60 mm × 245 mm (2.36" × 9.65")
See Pages 7-23 through 7-25

Series CRC
60 mm × 122 mm (2.36" × 4.80")
See Pages 7-26 through 7-27

Series CRM
60 mm × 163 mm (2.36" × 6.41")
See Page 7-28

Series CRL
95 mm × 295 mm (3.72" × 11.63")
See Pages 7-29 and 7-30

Series CRS
60 mm × 60 mm (2.36" × 2.36")
See Below

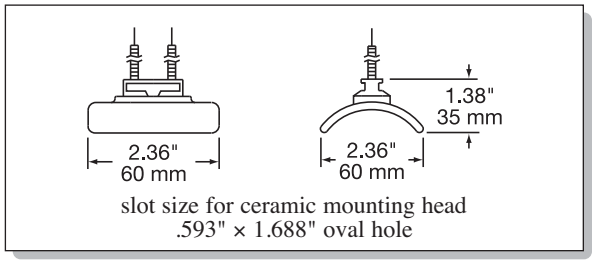
Standard (Non–Stock) CRS E-Mitters (Color — White)

E-Mitters listed have 3-1/2" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Watt Density (W/in²)	Watt Density (W/cm²)	*Heater Body Temperature (Typical) °F	°C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
162	120	28.07	4.35	1156	624	CRS00002	CRS00009
162	220/240	28.07	4.35	1156	624	CRS00005	CRS00012
162	480	28.07	4.35	1156	624	CRS00007	CRS00015
250	120	43.18	6.69	1420	771	CRS00003	CRS00010
250	220/240	43.18	6.69	1420	771	CRS00006	CRS00013
250	480	43.18	6.69	1420	771	CRS00008	CRS00016
350	120	60.43	9.20	1652	900	CRS00004	CRS00011
350	220/240	60.43	9.20	1652	900	CRS00001	CRS00014

*E-Mitter (operating in 72°F/22°C ambient) body temperature measured with internal thermocouple.

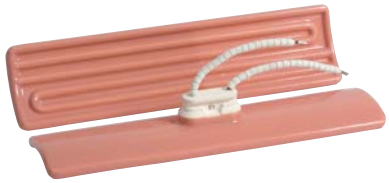
Series CRS Dimensions



slot size for ceramic mounting head
.593" × 1.688" oval hole

Product Inventory Available for Viewing and Selection @ www.tempco.com

Stock CRB E-Mitters (Color — METAMORPHING Rose to Grey)



E-Mitters listed have 3-1/2" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Watt Density (W/in²)	Watt Density (W/cm²)	*Heater Body Temperature (Typical) °F	°C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
150	220/240	6.48	1.00	560	293	CRB10216	CRB10217
250	220/240	10.80	1.67	756	402	CRB10006	CRB10008
400	220/240	17.27	2.68	942	506	CRB10014	CRB10016
650	120	28.07	4.35	1156	624	CRB10020	CRB10022
650	220/240	28.07	4.35	1156	624	CRB10023	CRB10025
650	480	28.07	4.35	1156	624	CRB10088	CRB10165
1000	120	43.18	6.69	1420	771	CRB10028	CRB10030
1000	220/240	43.18	6.69	1420	771	CRB10031	CRB10033
1000	480	43.18	6.69	1420	771	CRB10089	CRB10045

*E-Mitter (operating in 72°F/22°C ambient) body temperature measured with internal thermocouple.

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-21)*
- *Two-Piece Wave Mounting Clip (page 7-39)*
- *Reflectors and Other Accessories (pages 7-18 through 7-21)*
- *Arrays and Power/Temperature Control Panels (start on page 7-4)*

Standard (Non–Stock) CRB E-Mitters

E-Mitters listed have ceramic bead insulated leads and a one-piece spring clip for mounting. ***Standard lead time is 2 weeks.***

Wattage	Voltage	Power Leads Length in	Power Leads Length mm	Power Leads Termination	Thermocouple Type	Thermocouple Length in	Thermocouple Length mm	Thermocouple Termination	Part Number
250	120	3.5	89	Straight	—	—	—	—	CRB10003
400	120	3.5	89	Straight	—	—	—	—	CRB10011
500	230	3.5	89	Straight	—	—	—	—	CRB10128
500	480	3.5	89	Straight	—	—	—	—	CRB10132
600	230	6	152	Straight	—	—	—	—	CRB10050
600	300	3.5	89	Straight	—	—	—	—	CRB10152
600	440	3.5	89	Straight	—	—	—	—	CRB10162
650	230	9	229	Straight	—	—	—	—	CRB10174
650	240	6	152	Straight	—	—	—	—	CRB10218
650	230	6	152	Straight	—	—	—	—	CRB10060
650	288	6	152	Straight	—	—	—	—	CRB10219
650	480	6	152	#10 Ring	—	—	—	—	CRB10220
650	480	3.5	89	#8 Ring	—	—	—	—	CRB10118
650	480	6	152	#8 Spade	—	—	—	—	CRB10126
650	480	6	152	Straight	K	6	152	Straight	CRB10127
650	480	7	178	Straight	—	—	—	—	CRB10129
800	230	6	152	#8 Ring	K	6	152	Straight	CRB10221
800	230	6	152	Straight	—	—	—	—	CRB10105
800	230	6	152	#8 Ring	—	—	—	—	CRB10222
800	480	6	152	#8 Ring	—	—	—	—	CRB10223
900	480	3.5	89	Straight	—	—	—	—	CRB10116
900	480	3.5	89	Straight	K	3.5	89	Straight	CRB10121
1000	230	6	152	Straight	—	—	—	—	CRB10077
1000	230	6	152	#10 Ring	—	—	—	—	CRB10224
1000	230	3.5	89	Straight	—	—	—	—	CRB10044
1000	230	3.5	89	Straight	K	3.5	89	Straight	CRB10046
1000	240	6	152	Straight	—	—	—	—	CRB10225
1000	265	6	152	#8 Ring	—	—	—	—	CRB10226
1000	265	6	152	#8 Ring	K	6	152	Straight	CRB10227
1000	480	7	178	Straight	—	—	—	—	CRB10040

Ordering Information
See page 7-28

Curved Face Ceramic E-Mitter Specifications

Typical Thermodynamic Characteristics
Watts/Square Inch vs. Temperature Data
See Page 7-32

CONTINUED

Stock CRB E-Mitters (Color — White)

E-Mitters listed have 3-1/2" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Watt Density (W/in²)	Watt Density (W/cm²)	*Heater Body Temperature (Typical) °F	°C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
150	220/240	6.48	1.00	560	293	CRB00216	CRB00217
250	220/240	10.80	1.67	756	402	CRB00006	CRB00008
400	220/240	17.27	2.68	942	506	CRB00014	CRB00016
650	120	28.07	4.35	1156	624	CRB00020	CRB00022
650	220/240	28.07	4.35	1156	624	CRB00023	CRB00025
650	480	28.07	4.35	1156	624	CRB00088	CRB00165
1000	120	43.18	6.69	1420	771	CRB00028	CRB00030
1000	220/240	43.18	6.69	1420	771	CRB00031	CRB00033
1000	480	43.18	6.69	1420	771	CRB00089	CRB00045

*E-Mitter (operating in 72°F/22°C ambient) body temperature measured with internal thermocouple.

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-21)*
- *Two-Piece Wave Mounting Clip (page 7-39)*
- *Reflectors and Other Accessories (pages 7-18 through 7-21)*
- *Arrays and Power/Temperature Control Panels (start on page 7-4)*

Standard (Non–Stock) CRB E-Mitters (Color — White)

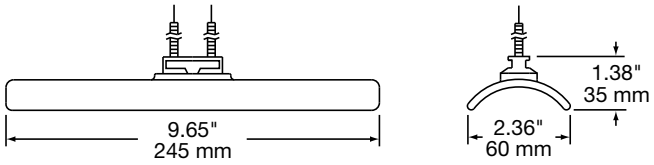
E-Mitters listed have ceramic bead insulated leads and a one-piece spring clip for mounting. ***Standard lead time is 2 weeks.***

Wattage	Voltage	Power Leads Length in	Power Leads Length mm	Power Leads Termination	Thermocouple Type	Thermocouple Length in	Thermocouple Length mm	Thermocouple Termination	Part Number
500	120	3.5	89	#8 Ring	—	—	—	—	CRB00228
500	230	9	229	#8 Ring	—	—	—	—	CRB00062
500	240	3.5	89	#8 Ring	—	—	—	—	CRB00229
600	440	3.5	89	Straight	—	—	—	—	CRB00162
650	120	3.5	89	#8 Ring	—	—	—	—	CRB00230
650	120	6	152	Straight	—	—	—	—	CRB00184
650	230	6	152	#10 Ring	K	6	152	Straight	CRB00111
650	230	9	229	#10 Ring	—	—	—	—	CRB00122
650	240	9	229	Straight	J	9.5	241	Straight	CRB00163
650	277	9	229	Straight	—	—	—	—	CRB00160
650	380	3.5	89	Straight	—	—	—	—	CRB00158
650	480	6	152	Straight	—	—	—	—	CRB00140
750	120	3.5	89	#8 Ring	—	—	—	—	CRB00231
750	240	3.5	89	#8 Ring	—	—	—	—	CRB00232
875	120	3.5	89	Straight	K	47.5	1206	Straight	CRB00071
875	120	3.5	89	Straight	—	—	—	—	CRB00072
875	240	3.5	89	Straight	K	47.5	1206	Straight	CRB00094
900	120	3.5	89	#8 Ring	—	—	—	—	CRB00233
1000	115	3.5	89	Straight	K	3.5	89	Straight	CRB00124
1000	230	3.5	89	Straight	K	47.5	1206	Straight	CRB00095
1000	230	9	229	#10 Ring	—	—	—	—	CRB00061
1000	240	6	152	Straight	—	—	—	—	CRB00225
1000	277	12	305	Straight	—	—	—	—	CRB00170
1000	480	9	229	Straight	—	—	—	—	CRB00142

Ordering Information

See page 7-28

Series CRB Dimensions



slot size for ceramic mounting head
.593" × 1.688" oval hole

Standard (Non–Stock) CRB E-Mitters (Color — METAMORPHING Yellow to Orange)

E-Mitters listed have ceramic bead insulated leads and a one-piece spring clip for mounting. ***Standard lead time is 2 weeks.***

Wattage	Voltage	Power Leads Length in	Power Leads Length mm	Power Leads Termination	Thermocouple Type	Thermocouple Length in	Thermocouple Length mm	Thermocouple Termination	Part Number
163	115	3.5	89	Straight	—	—	—	—	CRB20234
163	120	3.5	89	Straight	—	—	—	—	CRB20235
163	240	5	127	Straight	—	—	—	—	CRB20236
600	230	6	152	Straight	—	—	—	—	CRB20050
650	230	6	152	Straight	—	—	—	—	CRB20060
650	230	6	152	Straight	K	6	152	Straight	CRB20237
650	240	6	152	Straight	—	—	—	—	CRB20218
650	288	6	152	#8 Spade	—	—	—	—	CRB20154
650	440	6	152	Straight	—	—	—	—	CRB20238
650	480	6	152	Straight	—	—	—	—	CRB20140
900	480	3.5	89	Straight	—	—	—	—	CRB20116
1000	240	6	152	Straight	—	—	—	—	CRB20225
1000	480	6	152	Straight	—	—	—	—	CRB20239

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-21)*
- *Two-Piece Wave Mounting Clip (page 7-39)*
- *Reflectors and Other Accessories (pages 7-18 through 7-21)*
- *Arrays and Power/Temperature Control Panels (start on page 7-4)*

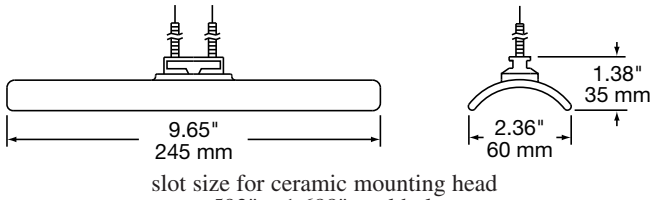
Standard (Non–Stock) CRB E-Mitters (Color — Black)

E-Mitters listed have Teflon insulated leads, one-piece spring clip for mounting, and insulated female quick disconnect termination. ***Standard lead time is 2 weeks.***

Wattage	Voltage	Power Leads Length in	Power Leads Length mm	Power Leads Termination	Thermocouple Type	Thermocouple Length in	Thermocouple Length mm	Thermocouple Termination	Part Number
100	110	10	254	1/4" Spade	—	—	—	—	CRB30240
200	110	10	254	1/4" Spade	—	—	—	—	CRB30241
200	230	10	254	1/4" Spade	—	—	—	—	CRB30242
300	110	10	254	1/4" Spade	—	—	—	—	CRB30243
300	230	10	254	1/4" Spade	—	—	—	—	CRB30244

Ordering Information
See page 7-28

Series CRB Dimensions



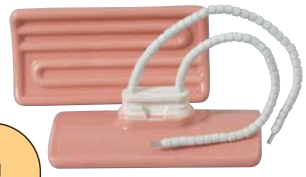
slot size for ceramic mounting head
.593" × 1.688" oval hole

Optimizing Repeatability in the Process of the Ceramic Slip Ensures Quality Ceramic E-Mitters

Curved Face Ceramic E-Mitter Specifications

Typical Thermodynamic Characteristics
Watts/Square Inch vs. Temperature Data
See Page 7-32

Stock CRC E-Mitters (Color — METAMORPHING Rose to Grey)



E-Mitters listed have 3-1/2" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Watt Density (W/in²)	Watt Density (W/cm²)	*Heater Body Temperature (Typical) °F	°C	Part Number Without Thermocouple	With Type K Thermocouple	With Type J Thermocouple
125	220/240	10.80	1.67	756	402	CRC10005	CRC10007	—
200	220/240	17.27	2.68	942	506	CRC10013	CRC10015	—
325	120	28.07	4.35	1156	624	CRC10018	CRC10020	—
325	220/240	28.07	4.35	1156	624	CRC10021	CRC10023	—
325	480	28.07	4.35	1156	624	CRC10064	—	CRC10014
500	120	43.18	6.69	1420	771	CRC10024	CRC10026	—
500	220/240	43.18	6.69	1420	771	CRC10027	CRC10029	—
500	480	43.18	6.69	1420	771	CRC10066	CRC10141	—

*E-Mitter (operating in 72°F/22°C ambient) body temperature measured with internal thermocouple.

Standard (Non–Stock) CRC E-Mitters (Color — METAMORPHING Rose to Grey)

E-Mitters listed have ceramic bead insulated leads and a one-piece spring clip for mounting. ***Standard lead time is 2 weeks.***

Wattage	Voltage	Power Leads Length in	Power Leads Length mm	Power Leads Termination	Thermocouple Type	Thermocouple Length in	Thermocouple Length mm	Thermocouple Termination	Part Number
200	230	7	178	Straight	—	—		—	CRC10079
250	240	3.5	89	Straight	K low noise	24	607	Straight	CRC10106
325	120	3.5	89	Straight	J	3.5	89	Straight	CRC10019
325	230	7	178	Straight	—	—		—	CRC10078
325	480	6	152	Straight	—	—		—	CRC10088
500	230	7	178	Straight	—	—		—	CRC10080

Optional Features

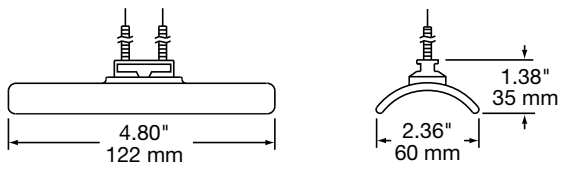
- *Additional Power or Thermocouple Lead Lengths (page 7-21)*
- *Two-Piece Wave Mounting Clip (page 7-39)*
- *Reflectors and Other Accessories (pages 7-18 through 7-21)*
- *Arrays and Power/Temperature Control Panels (start on page 7-4)*

Standard (Non–Stock) CRC E-Mitters (Color — METAMORPHING Yellow to Orange)

E-Mitters listed have ceramic bead insulated leads and a one-piece spring clip for mounting. ***Standard lead time is 2 weeks.***

Wattage	Voltage	Power Leads Length in	Power Leads Length mm	Power Leads Termination	Thermocouple Type	Thermocouple Length in	Thermocouple Length mm	Thermocouple Termination	Part Number
200	230	6	152	Straight	—	—	—	—	CRC20147
250	230	6	152	Straight	—	—	—	—	CRC20148
300	230	6	152	Straight	—	—	—	—	CRC20149
325	230	6	152	Straight	—	—	—	—	CRC20150
325	230	6	152	Straight	K	6	152	Straight	CRC20110
325	240	6	152	Straight	—	—	—	—	CRC20151
325	480	6	152	Straight	—	—	—	—	CRC20152
400	230	6	152	Straight	—	—	—	—	CRC20153
500	480	6	152	Straight	—	—	—	—	CRC20154

Series CRC Dimensions



slot size for ceramic mounting head
.593" × 1.688" oval hole

Ordering Information
See page 7-28

Stock CRC E-Mitters (Color — White)

E-Mitters listed have 3-1/2" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Watt Density (W/in²)	Watt Density (W/cm²)	*Heater Body Temperature (Typical) °F	°C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
125	220/240	10.80	1.67	756	402	CRC00005	CRC00007
200	220/240	17.27	2.68	942	506	CRC00013	CRC00015
325	120	28.07	4.35	1156	624	CRC00018	CRC00020
325	220/240	28.07	4.35	1156	624	CRC00021	CRC00023
325	480	28.07	4.35	1156	624	CRC00064	CRC00140
500	120	43.18	6.69	1420	771	CRC00024	CRC00026
500	220/240	43.18	6.69	1420	771	CRC00027	CRC00029
500	480	43.18	6.69	1420	771	CRC00066	CRC00141

*E-Mitter (operating in 72°F/22°C ambient) body temperature measured with internal thermocouple.

Optional Features

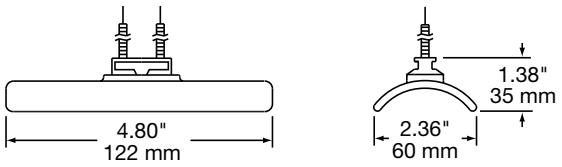
- *Additional Power or Thermocouple Lead Lengths (page 7-21)*
- *Two-Piece Wave Mounting Clip (page 7-39)*
- *Reflectors and Other Accessories (pages 7-18 through 7-21)*
- *Arrays and Power/Temperature Control Panels (start on page 7-4)*

Standard (Non–Stock) CRC E-Mitters (Color — White)

E-Mitters listed have ceramic bead insulated leads and a one-piece spring clip for mounting. ***Standard lead time is 2 weeks.***

Wattage	Voltage	Power Leads Length in	Power Leads Length mm	Power Leads Termination	Thermocouple Type	Thermocouple Length in	Thermocouple Length mm	Thermocouple Termination	Part Number
250	120	3.5	89	#8 Ring	—	—	—	—	CRC00142
325	230	9	229	#10 Ring	—	—	—	—	CRC00073
375	120	3.5	89	#8 Ring	—	—	—	—	CRC00143
375	240	3.5	89	#8 Ring	—	—	—	—	CRC00144
500	120	3.5	89	Straight	—	—	—	—	CRC00024
500	120	3.5	89	Straight	K	48	1219	Straight	CRC00060
500	120	3.5	89	#8 Ring	—	—	—	—	CRC00145
500	230	3.5	89	Straight	K	48	1219	Straight	CRC00070
500	240	3.5	89	#8 Ring	—	—	—	—	CRC00146
550	480	9	229	Straight	—	—	—	—	CRC00107

Series CRC Dimensions



slot size for ceramic mounting head
.593" × 1.688" oval hole

Curved Face Ceramic E-Mitter Specifications

Typical Thermodynamic Characteristics

Watts/Square Inch vs. Temperature Data

See Page 7-32

Ordering Information

Standard Heaters

Order by Part Number for Stock and Standard heaters.

Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** can manufacture a CRB or CRC Ceramic E-Mitter to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ **Colors:** Standard are metamorphing rose and straight white, optional are metamorphing yellow and straight black
- ❑ **Wattage:** Up to 43w/in² (6.7w/cm²)
- ❑ **Voltage:** 120, 208, 240, 277, 480 and others (dependent on design)
- ❑ **Thermocouple:** Standard Type K (Type J optional) or Low Noise Type K (Type J optional)
- ❑ **Additional Options:** Start on page 7-18

Stock CRM E-Mitters (Color — METAMORPHING Rose to Grey)

E-Mitters listed have 3-1/2" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Watt Density (W/in²)	Watt Density (W/cm²)	*Heater Body Temperature (Typical) °F	*Heater Body Temperature (Typical) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
425	120	27.44	4.25	1144	618	CRM10008	CRM10011
500	120	32.28	5.00	1239	671	CRM10009	CRM10012
600	220/240	38.74	6.00	1360	738	CRM10010	CRM10013

*E-Mitter (operating in 72°F/22°C ambient) body temperature measured with internal thermocouple.

Stock CRM E-Mitters (Color — White)

E-Mitters listed have 3-1/2" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Watt Density (W/in²)	Watt Density (W/cm²)	*Heater Body Temperature (Typical) °F	*Heater Body Temperature (Typical) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
425	120	27.44	4.25	1144	618	CRM00008	CRM00011
500	120	32.28	5.00	1239	671	CRM00009	CRM00012
600	220/240	38.74	6.00	1360	738	CRM00010	CRM00013

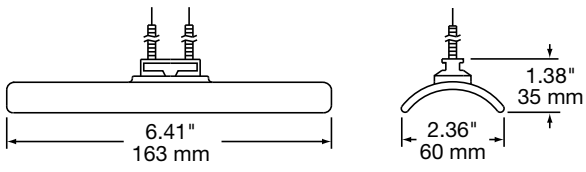
*E-Mitter (operating in 72°F/22°C ambient) body temperature measured with internal thermocouple.

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-21)*
- *Two-Piece Wave Mounting Clip (page 7-39)*
- *Reflectors and Other Accessories (pages 7-18 through 7-21)*
- *Arrays and Power/Temperature Control Panels (start on page 7-4)*

All Items Available from Stock

Series CRM Dimensions



slot size for ceramic mounting head
.593" × 1.688" oval hole

Curved Face Ceramic E-Mitter Specifications

Typical Thermodynamic Characteristics

Watts/Square Inch vs. Temperature Data

See Page 7-32

Ordering Information

Standard Heaters

Order by Part Number for Stock and Standard heaters.

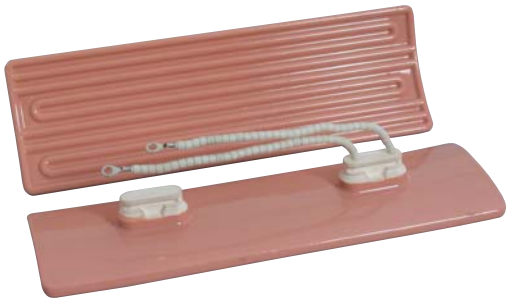
Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** can manufacture a CRM or CRG Ceramic E-Mitter to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ **Colors:** Standard are metamorphing rose and straight white, optional are metamorphing yellow and straight black
- ❑ **Wattage:** Up to 43w/in² (6.7w/cm²)
- ❑ **Voltage:** 120, 208, 240, 277, 480 and others (dependent on design)
- ❑ **Thermocouple:** Standard Type K (Type J optional) or Low Noise Type K (Type J optional)
- ❑ **Additional Options:** Start on page 7-18

Stock CRL E-Mitters (Color — METAMORPHING Rose to Grey)



E-Mitters listed have 6" ceramic bead insulated leads, #8-10 spade terminals, and one-piece spring clips for mounting in 20 or 22 gauge sheet metal.

Wattage	Voltage	Watt Density* (W/in²)	Watt Density* (W/cm²)	Heater Body Temp.** (Typical Operating) °F	Heater Body Temp.** (Typical Operating) °C	Primary Emitted Wavelength***	Part Number Without Thermocouple	Part Number With Type K Thermocouple
500	220/240	11.9	1.9	796	424	4.15	CRL10009	CRL10010
750	220/240	17.9	2.8	956	513	3.68	CRL10011	CRL10012
950	220/240	22.7	3.5	1053	567	3.45	CRL10001	CRL10002
1000	220/240	23.9	3.7	1076	580	3.40	CRL10013	CRL10014
1150	220/240	27.5	4.3	1145	618	3.25	CRL10003	CRL10004
1400	480	33.5	5.2	1262	683	3.03	CRL10015	CRL10016
1600	480	38.2	5.9	1351	733	2.88	CRL10017	CRL10018
1800	480	43.0	6.7	1418	770	2.78	CRL10019	CRL10020

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-21)*
- *Two-Piece Wave Mounting Clip (page 7-39)*
- *Reflectors and Other Accessories (pages 7-18 through 7-21)*
- *Arrays and Power/Temperature Control Panels (start on page 7-4)*

All Items Available from Stock

*** Watt density** calculated using heater face surface area.

**** E-Mitter heater body temperature** as measured with internal thermocouple when mounted facedown in stock CRK reflector and operating in 72°F (22°C) room ambient.

***** Peak infrared radiation wavelength** as calculated from Wien's Law, for operating temperature shown. Expressed in microns (μm).

Operating temperature based on room ambient testing @ 72°F

Stock CRL E-Mitters (Color — White)

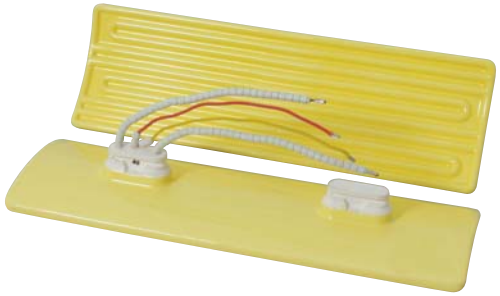
E-Mitters listed have 6" ceramic bead insulated leads, #8-10 spade terminals, and one-piece spring clips for mounting in 20 or 22 gauge sheet metal.

Wattage	Voltage	Watt Density* (W/in²)	Watt Density* (W/cm²)	Heater Body Temp.** (Typical Operating) °F	Heater Body Temp.** (Typical Operating) °C	Primary Emitted Wavelength***	Part Number Without Thermocouple	Part Number With Type K Thermocouple
500	220/240	11.9	1.9	796	424	4.15	CRL00009	CRL00010
750	220/240	17.9	2.8	956	513	3.68	CRL00011	CRL00012
950	220/240	22.7	3.5	1053	567	3.45	CRL00001	CRL00002
1000	220/240	23.9	3.7	1076	580	3.40	CRL00013	CRL00014
1150	220/240	27.5	4.3	1145	618	3.25	CRL00003	CRL00004
1400	480	33.5	5.2	1262	683	3.03	CRL00015	CRL00016
1600	480	38.2	5.9	1351	733	2.88	CRL00017	CRL00018
1800	480	43.0	6.7	1418	770	2.78	CRL00019	CRL00020

CONTINUED

Stock CRL E-Mitters (Color — METAMORPHING Yellow to Orange)

These Heaters are exact replacements for CRP Modular 12 × 12 CRP Radiant Panels on page 7-40



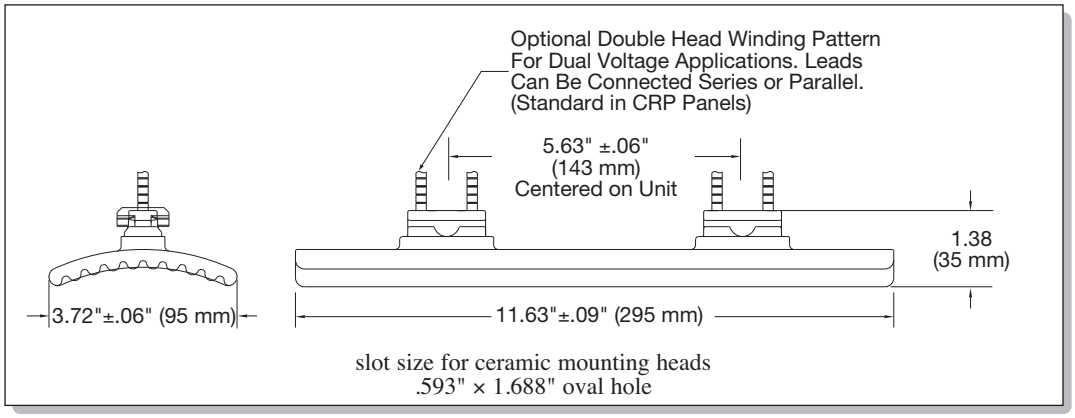
E-Mitters listed have 6" ceramic bead insulated leads, #8-10 spade terminals, and one-piece spring clips for mounting in 20 or 22 gauge sheet metal.

Wattage	Voltage	Watt Density* (W/in²)	Watt Density* (W/cm²)	Heater Body Temp.** (Typical Operating) °F	Heater Body Temp.** (Typical Operating) °C	Primary Emitted Wavelength***	Part Number Without Thermocouple	Part Number With Type K Thermocouple
500	120	11.9	1.9	796	424	4.15	CRL20021	CRL20022
500	240/480	11.9	1.9	796	424	4.15	CRL20023	CRL20024
750	120	17.9	2.8	956	513	3.68	CRL20025	CRL20026
750	240/480	17.9	2.8	956	513	3.68	CRL20027	CRL20028
1000	240/480	23.9	3.7	1076	580	3.40	CRL20029	CRL20030
1250	240/480	29.9	4.6	1191	644	3.16	CRL20031	CRL20032
1500	240/480	35.9	5.6	1308	709	2.95	CRL20033	CRL20034

Note: All 240/480V heaters have two windings for dual voltage use. (Parallel connected for 240V & series connected for 480V.) 120V heaters are single winding designs.

K T/C units in this series have an internal "low noise" style thermocouple with 12" leads (see page 7-39). Standard type "K" T/C units also available. Part Number will be assigned when ordering.

Series CRL Dimensions



Ordering Information

Standard Heaters

Order by Part Number for Stock and Standard heaters.

Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** can manufacture a CRL Ceramic E-Mitter to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ **Colors:** Standard are metamorphing rose and straight white, optional are metamorphing yellow and straight black
- ❑ **Voltage:** 120, 208, 240, 277, 480 or others (dependent on design) Specify if Dual Voltage required
- ❑ **Wattage:** Up to 43w/in² (6.7w/cm²)
- ❑ **Thermocouple:** Standard Type K (Type J optional) or Low Noise Type K (Type J optional)
- ❑ **Additional Options:** Start on page 7-18
- ❑ **Description of Process & Temperature**

Stock CRG E-Mitters (Color — METAMORPHING Rose to Grey)

E-Mitters listed have 6" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting in 20 or 22 gauge sheet metal.

Wattage	Voltage	Watt Density (W/in²)	Watt Density (W/cm²)	Heater Body Temp.** (Typical Operating) °F	Heater Body Temp.** (Typical Operating) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
250	220/240	10.9	1.7	758	403	CRG10026	CRG10027
325	220/240	14.1	2.2	862	461	CRG10028	CRG10029
400	220/240	17.4	2.7	944	507	CRG10030	CRG10031
650	220/240	28.2	4.4	1159	626	CRG10032	CRG10033
800	220/240	34.7	5.4	1287	697	CRG10034	CRG10035
1000	220/240	43.4	6.7	1422	772	CRG10036	CRG10037

All Items Available from Stock

Stock CRG E-Mitters (Color — White)

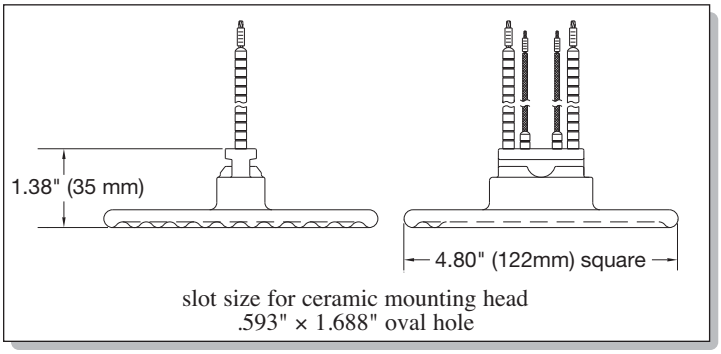
E-Mitters listed have 6" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting in 20 or 22 gauge sheet metal.

Wattage	Voltage	Watt Density (W/in²)	Watt Density (W/cm²)	Heater Body Temp.** (Typical Operating) °F	Heater Body Temp.** (Typical Operating) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
250	220/240	10.9	1.7	758	403	CRG00026	CRG00027
325	220/240	14.1	2.2	862	461	CRG00028	CRG00029
400	220/240	17.4	2.7	944	507	CRG00030	CRG00031
650	220/240	28.2	4.4	1159	626	CRG00032	CRG00033
800	220/240	34.7	5.4	1287	697	CRG00034	CRG00035
1000	220/240	43.4	6.7	1422	772	CRG00036	CRG00037

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-21)*
- *Two-Piece Wave Mounting Clip (page 7-39)*
- *Reflectors and Other Accessories (pages 7-18 through 7-21)*
- *Arrays and Power/Temperature Control Panels (start on page 7-4)*

Series CRG Dimensions



slot size for ceramic mounting head
.593" × 1.688" oval hole

Ordering Information
See page 7-29

* **Watt density** calculated using heater face surface area.

** **E-Mitter heater body temperature** as measured with internal thermocouple when mounted facedown in stock CRK reflector and operating in 72°F (22°C) room ambient.

*** **Peak infrared radiation wavelength** as calculated from Wien's Law, for operating temperature shown. Expressed in microns (μm).

Operating temperature based on room ambient testing @ 72°F

Series CRG
Watts/Square Inch vs. Temperature Data

Watts	Surface W/in²*	Heater Body °F Rise	Heater Body Temp @ 72°F**	Primary Emitted Wavelength*** (μ)
250	10.9	686	758	4.28
325	14.1	790	862	3.95
400	17.4	872	944	3.72
650	28.2	1087	1159	3.22
800	34.7	1215	1287	2.99
1000	43.4	1350	1422	2.77

Curved Face Ceramic E-Mitter Specifications

Series CRB 60 mm × 245 mm (2.36" × 9.65")

Watts/Square Inch vs. Temperature Data

Watts	Surface W/in²*	Heater Body °F Rise	Heater Body Temp @ 72°F**	Primary Emitted Wavelength*** (µm)
100	4.32	357	429	5.87
125	5.40	426	498	5.45
150	6.48	488	560	5.11
163	7.04	518	590	4.97
200	8.64	596	668	4.63
250	10.80	684	756	4.29
300	12.95	756	828	4.05
325	14.03	788	860	3.95
350	15.11	817	889	3.87
400	17.27	870	942	3.72
500	21.59	960	1032	3.50
600	25.91	1043	1115	3.31
650	28.07	1084	1156	3.23
700	30.23	1126	1198	3.15
750	32.39	1169	1241	3.07
800	34.55	1211	1283	2.99
875	37.78	1271	1343	2.89
900	38.86	1290	1362	2.86
1000	43.18	1348	1420	2.78

Series CRC 60 mm × 122 mm (2.36" × 4.80")

Watts/Square Inch vs. Temperature Data

Watts	Surface W/in²*	Heater Body °F Rise	Heater Body Temp @ 72°F**	Primary Emitted Wavelength*** (µm)
100	8.64	596	668	4.63
125	10.80	684	756	4.29
150	12.95	756	828	4.05
163	14.08	789	861	3.95
200	17.27	870	942	3.72
250	21.59	960	1032	3.50
300	25.91	1043	1115	3.31
325	28.07	1084	1156	3.23
350	30.23	1126	1198	3.15
375	32.39	1169	1241	3.07
400	34.55	1211	1283	2.99
500	43.18	1348	1420	2.78

Series CRM 60 mm × 163 mm (2.36" × 6.41")

Watts/Square Inch vs. Temperature Data

Watts	Surface W/in²*	Heater Body °F Rise	Heater Body Temp @ 72°F**	Primary Emitted Wavelength*** (µm)
100	6.46	487	559	5.12
150	9.68	641	713	4.45
200	12.91	755	827	4.05
250	16.14	843	915	3.79
300	19.37	915	987	3.60
350	22.60	979	1051	3.45
400	25.82	1041	1113	3.32
450	29.05	1103	1175	3.19
500	32.28	1167	1239	3.07
550	35.51	1230	1302	2.96
600	38.74	1288	1360	2.87
650	41.96	1335	1407	2.79

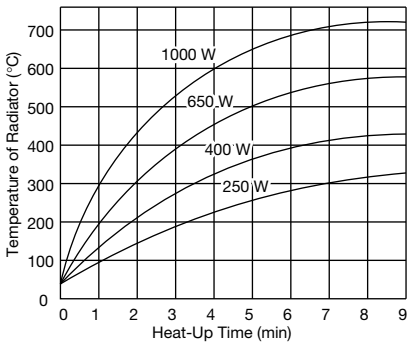
*** Watt density** calculated using heater face surface area.

**** E-Mitter heater body temperature** as measured with internal thermocouple when mounted facedown in stock CRK reflector and operating in 72°F (22°C) room ambient.

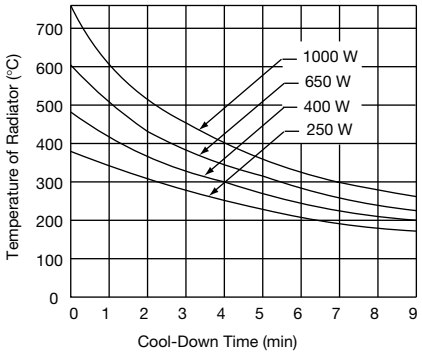
***** Peak infrared radiation wavelength** as calculated from Wien's Law, for operating temperature shown. Expressed in microns (µm).

Typical Thermodynamic Characteristics of Ceramic E-Mitters

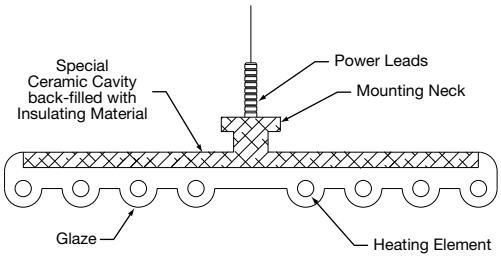
Warm-Up Time Graph



Cool-Down Time Graph



Series CRH, CRN and CRZ Ceramic E-Mitters



Design Features

- *Three standard sizes to retrofit any existing application*
- *Universal mount designed to be dropped into existing systems regardless of manufacturer*
- *Standard colors are metamorphing rose (cold) to grey (hot), and traditional white. Optional colors are metamorphing yellow (cold) to orange (hot), and black*
- *Standard stocked voltage: 120 or 220/240V as noted; other voltages are available*
- *Available with built-in 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*
- *2.5 to 7µm infrared radiation wavelength*

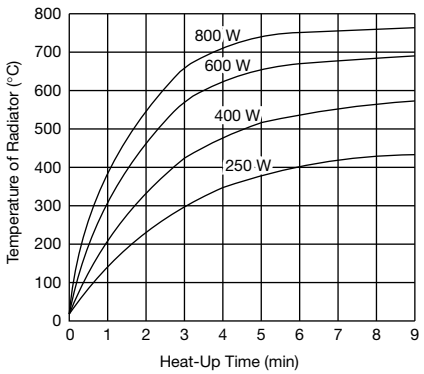
CRH, CRN, CRZ E-Mitter Construction

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.

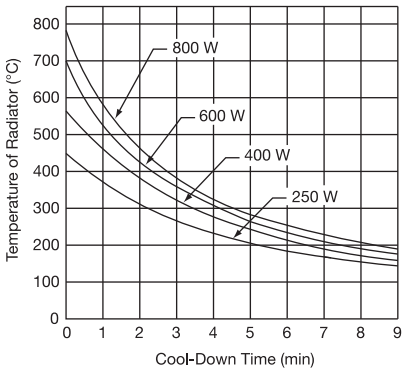
2. **SUPERIOR INSULATING MATERIAL.** The hollow inner area is filled with low-mass ceramic fiber to further insulate the contact region from the emitter surface, resulting in an improved operating life.

Typical Thermodynamic Characteristics of Ceramic Short Shaft CRH E-Mitters

Warm-up Curve Short Shaft



Cool-Down Curve Short Shaft



Ordering Information

Standard Heaters

Order by Part Number for Stock and Standard heaters.

Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** can manufacture a CRH, CRN or CRZ E-Mitter to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

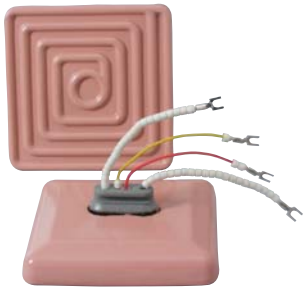
- ❑ **Size**
- ❑ **Colors:** Standard are metamorphing rose and straight white, optional are metamorphing yellow and straight black
- ❑ **Wattage:** Up to 35w/in^2 (5.4w/cm^2)
- ❑ **Voltage:** 120, 208, 240, 277, 480 and others (dependent on design)
- ❑ **Thermocouple:** Standard Type K or optional Type J
- ❑ **Additional Options:** Start on page 7-18
- ❑ **Description of Process & Temperature**

Stock CRH E-Mitters (Color — METAMORPHING Rose to Grey)

E-Mitters listed have 3-1/2" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Watt Density (W/in²)	Watt Density (W/cm²)	*Face Temperature (Typical) °F	*Face Temperature (Typical) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
250	220/240	10.84	1.68	757	403	CRH10029	CRH10030
400	220/240	17.34	2.69	943	506	CRH10018	CRH10005
600	220/240	26.01	4.03	1117	603	CRH10010	CRH10011
800	220/240	34.68	5.38	1286	697	CRH10001	CRH10019

*E-Mitter (operating in 72°F/22°C ambient) face temperature measured with internal thermocouple.



Stock CRH E-Mitters (Color — White)

E-Mitters listed have 3-1/2" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

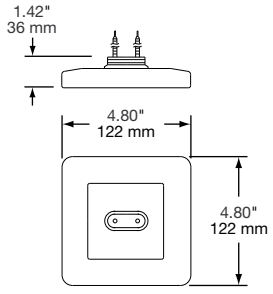
Wattage	Voltage	Watt Density (W/in²)	Watt Density (W/cm²)	*Face Temperature (Typical) °F	*Face Temperature (Typical) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
250	220/240	10.84	1.68	757	403	CRH00029	CRH00030
400	220/240	17.34	2.69	943	506	CRH00018	CRH00005
600	220/240	26.01	4.03	1117	603	CRH00010	CRH00011
800	220/240	34.68	5.38	1286	697	CRH00001	CRH00019

*E-Mitter (operating in 72°F/22°C ambient) face temperature measured with internal thermocouple.

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-21)*
- *Two-Piece Wave Mounting Clip (page 7-39)*
- *Reflectors and Other Accessories (pages 7-18 through 7-21)*
- *Arrays and Power/Temperature Control Panels (start on page 7-4)*

Series CRH Dimensions



slot size for ceramic mounting heads
.593" × 1.688" oval hole

All Items Available from Stock

Ordering Information

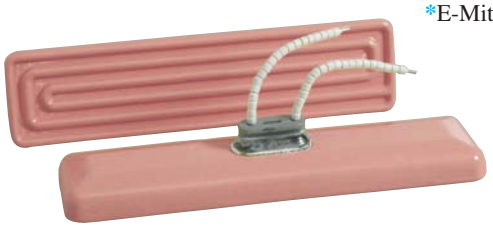
See page 7-33

Stock CRN E-Mitters (Color — METAMORPHING Rose to Grey)

E-Mitters listed have 3-1/2" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Watt Density (W/in²)	Watt Density (W/cm²)	*Face Temperature (Typical) °F	*Face Temperature (Typical) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
250	220/240	10.97	1.70	762	406	CRN10001	CRN10005
400	220/240	17.56	2.72	948	509	CRN10002	CRN10006
600	220/240	26.33	4.08	1123	606	CRN10003	CRN10007
800	220/240	35.11	5.44	1294	701	CRN10004	CRN10008

*E-Mitter (operating in 72°F/22°C ambient) face temperature measured with internal thermocouple.



All Items Available from Stock

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-21)*
- *Two-Piece Wave Mounting Clip (page 7-39)*
- *Other Accessories (pages 7-18 through 7-21)*
- *Arrays and Power/Temperature Control Panels (start on page 7-4)*

Ordering Information
See page 7-33

Stock CRN E-Mitters (Color — White)

E-Mitters listed have 3-1/2" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

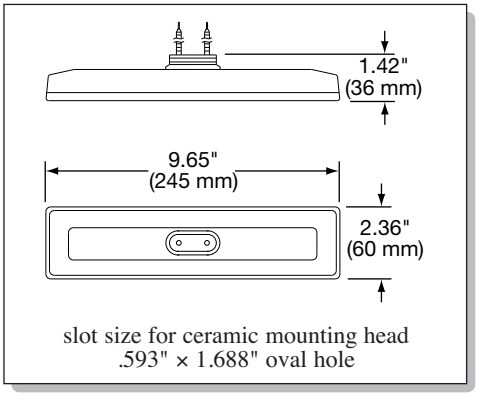
Wattage	Voltage	Watt Density (W/in²)	Watt Density (W/cm²)	*Face Temperature (Typical) °F	*Face Temperature (Typical) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
250	220/240	10.97	1.70	762	406	CRN00001	CRN00005
400	220/240	17.56	2.72	948	509	CRN00002	CRN00006
600	220/240	26.33	4.08	1123	606	CRN00003	CRN00007
800	220/240	35.11	5.44	1294	701	CRN00004	CRN00008

*E-Mitter (operating in 72°F/22°C ambient) face temperature measured with internal thermocouple.

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-21)*
- *Two-Piece Wave Mounting Clip (page 7-39)*
- *Other Accessories (pages 7-18 through 7-21)*
- *Arrays and Power/Temperature Control Panels (start on page 7-4)*

Series CRN Dimensions



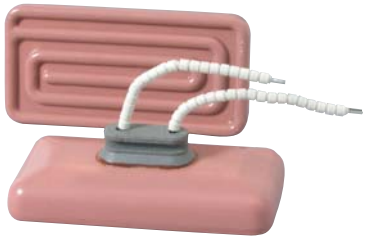
slot size for ceramic mounting head
.593" × 1.688" oval hole

Stock CRZ E-Mitters (Color — METAMORPHING Rose to Grey)

E-Mitters listed have 3-1/2" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Watt Density (W/in²)	Watt Density (W/cm²)	*Face Temperature (Typical) °F	*Face Temperature (Typical) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
125	220/240	10.93	1.69	761	405	CRZ10001	CRZ10005
200	220/240	17.48	2.71	947	508	CRZ10002	CRZ10006
300	220/240	26.23	4.07	1121	605	CRZ10003	CRZ10007
400	220/240	34.97	5.42	1291	699	CRZ10004	CRZ10008

*E-Mitter (operating in 72°F/22°C ambient) face temperature measured with internal thermocouple.



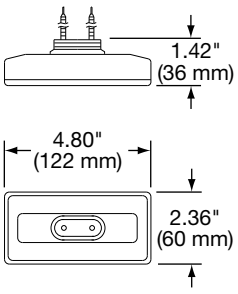
Stock CRZ E-Mitters (Color — White)

E-Mitters listed have 3-1/2" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Watt Density (W/in²)	Watt Density (W/cm²)	*Face Temperature (Typical) °F	*Face Temperature (Typical) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
125	220/240	10.93	1.69	761	405	CRZ00001	CRZ00005
200	220/240	17.48	2.71	947	508	CRZ00002	CRZ00006
300	220/240	26.23	4.07	1121	605	CRZ00003	CRZ00007
400	220/240	34.97	5.42	1291	699	CRZ00004	CRZ00008
400	480	34.97	5.42	1291	699	CRZ00013	CRZ00014

*E-Mitter (operating in 72°F/22°C ambient) face temperature measured with internal thermocouple.

Series CRZ Dimensions



slot size for ceramic mounting head
.593" × 1.688" oval hole

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-21)*
- *Two-Piece Wave Mounting Clip (page 7-39)*
- *Other Accessories (pages 7-18 through 7-21)*
- *Arrays and Power/Temperature Control Panels (start on page 7-4)*

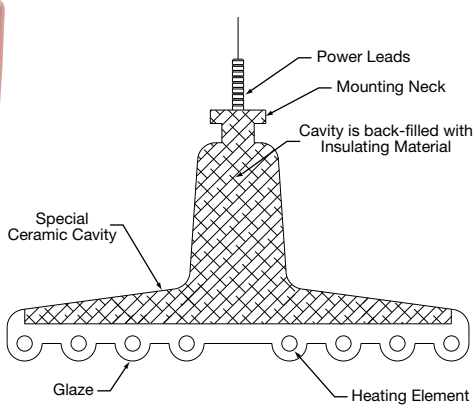
Slip Casting Process of Ceramic E-Mitters

Ordering Information

See page 7-33

All Items Available from Stock

Series CRD E-Mitters



CRD E-Mitter Construction

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.

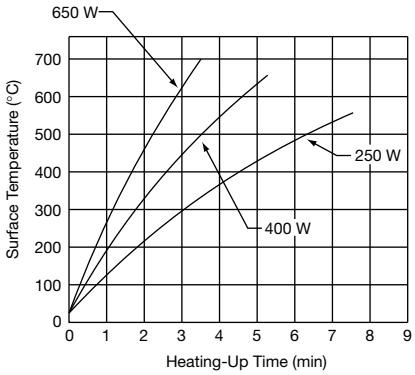
2. **SUPERIOR INSULATING MATERIAL.** The hollow inner area is filled with low-mass ceramic fiber to further insulate the contact region from the E-mitter surface, resulting in an improvement of operating life.

Design Features

- *Universal mount designed to be dropped into existing systems regardless of manufacturer.*
- *Standard colors are metamorphing rose (cold) to grey (hot), and traditional white. Optional colors are metamorphing yellow (cold) to orange (hot), and black.*
- *Standard stocked voltage: 120 or 220/240V as noted; other voltages are available.*
- *Available with built-in 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.*
- *2.5 to 7μm infrared radiation wavelength*

Typical Thermodynamic Characteristics of Ceramic CRD E-Mitters

Warm-up Curve CRD Long Shaft



Ordering Information

Standard Heaters

Order by Part Number for Stock and Standard heaters.

Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** can manufacture a CRD E-Mitter to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ **Size**
- ❑ **Colors:** Standard are metamorphing rose and straight white, optional are metamorphing yellow and straight black
- ❑ **Wattage:** Up to 35w/in^2 (5.4w/cm^2)
- ❑ **Voltage:** 120, 208, 240, 277, 480 and others (dependent on design)
- ❑ **Thermocouple:** Standard Type K or optional Type J
- ❑ **Additional Options:** Start on page 7-18
- ❑ **Description of process & temperature**

Stock CRD E-Mitters (Color — METAMORPHING Rose to Grey)

E-Mitters listed have 3-1/2" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Watt Density (W/in²)	Watt Density (W/cm²)	*Face Temperature (Typical) °F	*Face Temperature (Typical) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
250	220/240	10.84	1.68	757	403	CRD10001	CRD10005
400	220/240	17.34	2.69	943	506	CRD10002	CRD10006
650	220/240	28.18	4.37	1158	626	CRD10004	CRD10008

*E-Mitter (operating in 72°F/22°C ambient) face temperature measured with internal thermocouple.

Stock CRD E-Mitters (Color — White)

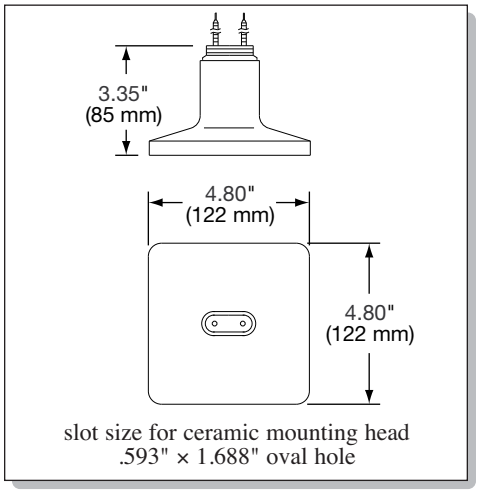
E-Mitters listed have 3-1/2" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Watt Density (W/in²)	Watt Density (W/cm²)	*Face Temperature (Typical) °F	*Face Temperature (Typical) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
250	220/240	10.84	1.68	757	403	CRD00001	CRD00005
400	220/240	17.34	2.69	943	506	CRD00002	CRD00006
650	220/240	28.18	4.37	1158	626	CRD00004	CRD00008

*E-Mitter (operating in 72°F/22°C ambient) face temperature measured with internal thermocouple.

All Items Available from Stock

Series CRD Dimensions



slot size for ceramic mounting head
.593" × 1.688" oval hole

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-21)*
- *Two-Piece Wave Mounting Clip (page 7-39)*
- *Other Accessories (pages 7-18 through 7-21)*
- *Arrays and Power/Temperature Control Panels (start on page 7-4)*

Ordering Information

See page 7-37

Mounting Accessories and Low Noise Thermocouple Option

One-Piece Mounting Clip (Standard)

Designed for heater mounting with 22 ga (.028) to 20 ga (.037) sheet metal.

Part Number SPR-103-102

Thinner or thicker materials require the Two-Piece Mounting Clip.

Standard mounting spring clip shipped with heaters

Two-Piece Wave Mounting Clip (Optional)

The two-piece wave spring clip and holding clip assembly is used for mounting heaters in materials thicker than 20 ga (.037) or thinner than 22 ga (.028)

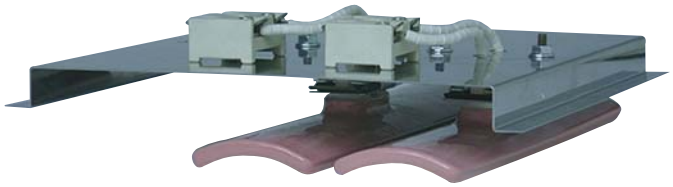
Part Number: CRK00008

All Items Available from Stock

Single Element Mounting Bracket

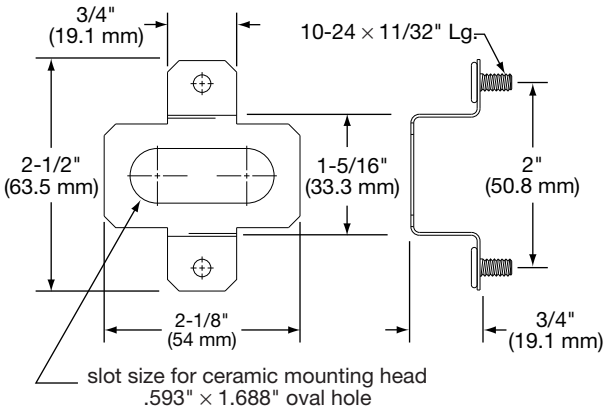
A convenient method for mounting individual E-Mitters to a flat surface or panel for spot heating applications

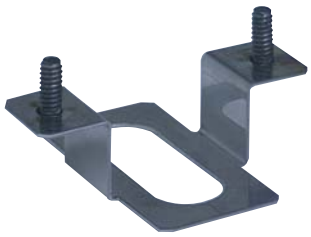
Part Number: CRK00018



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

Note the use of Part Number EHD-108-101 High Temperature Ceramic Terminal Blocks to connect the heater leads to the power leads and the thermocouples. High Temperature Ceramic Terminal Blocks can also be used for making thermocouple connections.





Part Number: CRK00018

Designed for use in the CRB, CRC, CRL, CRG and CRM solid curved and flat face style heaters. Low noise thermocouples can only be factory installed and must be specified at time of ordering.

Low Noise Thermocouple Option

Generally the standard thermocouple is acceptable for the majority of applications. Most instrumentation inputs have noise rejection sufficient to filter out unwanted 60 hz AC noise that the thermocouple picks up from being mounted close to the coil element for ideal temperature sensing.

For those applications where emf generated noise is a problem for the instrument, Tempco offers a low noise thermocouple solution. The low noise thermocouple option is designed to minimize the induced AC noise by using stainless steel overbraid on the high temperature fiberglass color-coded 24 GA solid leads as a ground shield and a ceramic insulator at the thermocouple junction.

Thermocouple Type	Termination	Lead Length (in)	Part Number
K	Straight Pigtails	8	TCP90342
K	Straight Pigtails	12	TCP90386
K	Straight Pigtails	24	TCP90336
K	Straight Pigtails	48	TCP90362
J	Straight Pigtails	12	TCP90422
J	Straight Pigtails	48	TCP90395

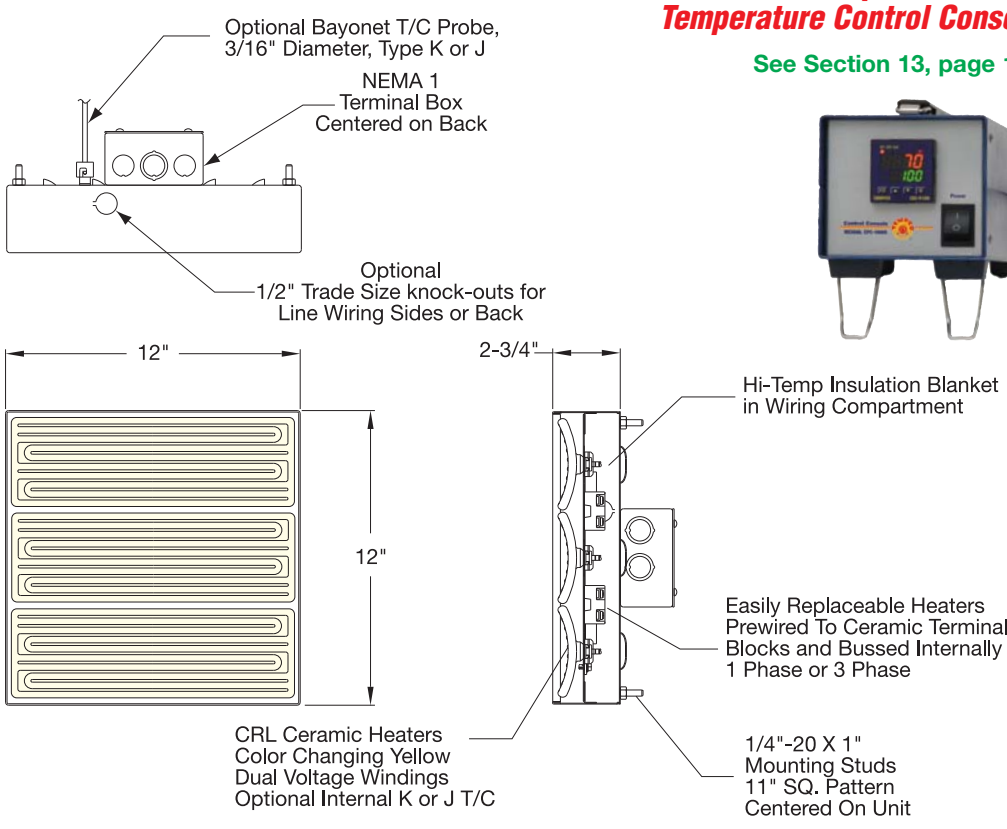
CRP 12" × 12" Modular Panels — METAMORPHING Yellow to Orange

New Cost Effective and Self-Contained Ceramic Infrared Panel Heater Offers Ease of Installation and Trouble-Free Performance

Three CRL E-Mitter heaters in one panel.
See page 7-42 for CRP Modular Panel with an additional emitting glass face.

Design Features

- *Standard colors are metamorphing yellow (cold) to orange (hot), and traditional white. Optional colors are metamorphing rose (cold) to grey (hot), white and black.*
- *Low profile 20 ga. aluminized steel or stainless steel housing*
- *Standard stocked voltage: 120, 220/240V or 480V as noted; other voltages are available.*
- *Low noise type K thermocouple mounted internally in center heater. Optional type J thermocouple is also available.*
- *Watt density range: from 11w/in² to 35w/in²*
- *Standard operating temp range; 750°F to 1300°F*
- *Best when used at radiation distances of 4"-10" from application*
- *Performance is unaffected by vibration or adverse atmospheric conditions.*
- *3 to 6µm infrared radiation wavelength*
- *Made to order*



Tabletop Point-of-Use Temperature Control Console Systems

See Section 13, page 13-40

Standard Ratings of Modular 12" × 12" CRP Radiant Panels (Color — METAMORPHING Yellow to Orange)

Aluminized Steel Housing with NEMA 1 Terminal Box *(4" square by 2-1/8" deep)*

KW	Watt Density (W/in²)	Part Number 120V No T/C	120V K T/C	240V-1Ph No T/C	240V-1Ph K T/C	240V-3Ph No T/C	240V-3Ph K T/C	480V-1Ph No T/C	480V-1Ph K T/C	480V-3Ph No T/C	480V-3Ph K T/C
1.50	11.6	CRP20001	CRP20002	CRP20003	CRP20004	CRP20005	CRP20006	CRP20007	CRP20008	CRP20009	CRP20010
2.25	17.4	CRP20011	CRP20012	CRP20013	CRP20014	CRP20015	CRP20016	CRP20017	CRP20018	CRP20019	CRP20020
3.00	23.0	—	—	CRP20021	CRP20022	CRP20023	CRP20024	CRP20025	CRP20026	CRP20027	CRP20028
3.75	29.0	—	—	CRP20029	CRP20030	CRP20031	CRP20032	CRP20033	CRP20034	CRP20035	CRP20036
4.50	35.0	—	—	CRP20037	CRP20038	CRP20039	CRP20040	CRP20041	CRP20042	CRP20043	CRP20044

Note: K T/C panels have one low noise internal T/C in center heater with extension wires routed into rear terminal box.

Stainless Steel Housing with NEMA 1 Terminal Box (Medical or Food Applications)

KW	Watt Density (W/in²)	Part Number 120V No T/C	120V K T/C	240V-1Ph No T/C	240V-1Ph K T/C	240V-3Ph No T/C	240V-3Ph K T/C	480V-1Ph No T/C	480V-1Ph K T/C	480V-3Ph No T/C	480V-3Ph K T/C
1.50	11.6	CRP20045	CRP20046	CRP20047	CRP20048	CRP20049	CRP20050	CRP20051	CRP20052	CRP20053	CRP20054
2.25	17.4	CRP20055	CRP20056	CRP20057	CRP20058	CRP20059	CRP20060	CRP20061	CRP20062	CRP20063	CRP20064
3.00	23.0	—	—	CRP20065	CRP20066	CRP20067	CRP20068	CRP20069	CRP20070	CRP20071	CRP20072
3.75	29.0	—	—	CRP20073	CRP20074	CRP20075	CRP20076	CRP20077	CRP20078	CRP20079	CRP20080
4.50	35.0	—	—	CRP20081	CRP20082	CRP20083	CRP20084	CRP20085	CRP20086	CRP20087	CRP20088

Note: K T/C panels have one low noise internal T/C in center heater with extension wires routed into rear terminal box.

Replacement Heaters for Standard Modular 12" × 12" CRP Radiant Panels

Panel KW	Heater Watts	Part Number 120V No T/C	120V K T/C	240V-480V No T/C	240V-480V K T/C
1.50	500	CRL20021	CRL20022	CRL20023	CRL20024
2.25	750	CRL20025	CRL20026	CRL20027	CRL20028
3.00	1000	—	—	CRL20029	CRL20030
3.75	1250	—	—	CRL20031	CRL20032
4.50	1500	—	—	CRL20033	CRL20034

Note: All 240/480V heaters have two windings for dual voltage use. (Parallel connected for 240V & series connected for 480V.) 120V heaters are single winding designs.

K T/C units have an internal "low noise" style thermocouple with 12" leads.

Standard Panel Specifications

KW	Panel Watt Density***	Typical Operating Temperature** °F	°C	Primary Emitted Wavelength*
1.50	12.0	796	424	4.2
2.25	18.0	956	513	3.7
3.00	24.0	1076	580	3.4
3.75	30.0	1191	644	3.2
4.50	36.0	1308	709	3.0

*Peak infrared radiation wavelength as calculated from Wien's Law, for operating temperature shown. Expressed in microns (μm). Operating temperature based on room ambient testing @ 72°F.

**E-Mitter heater body temperature as measured with internal thermocouple when mounted facedown in stock CRK reflector and operating in 72°F/22°C room ambient.

***Watt density calculated using total heater face surface area within panel.

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.

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

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.

Installation: ***Do not mount CRP Panel Heaters closer than 6 inches to any structural material that does not have at least a 200°C (392°F) continuous temperature rating.***

CONTINUED

CRP Panel Heater with Glass Face

CRP 12" × 12" Modular Glass Face Panels Standard Ratings

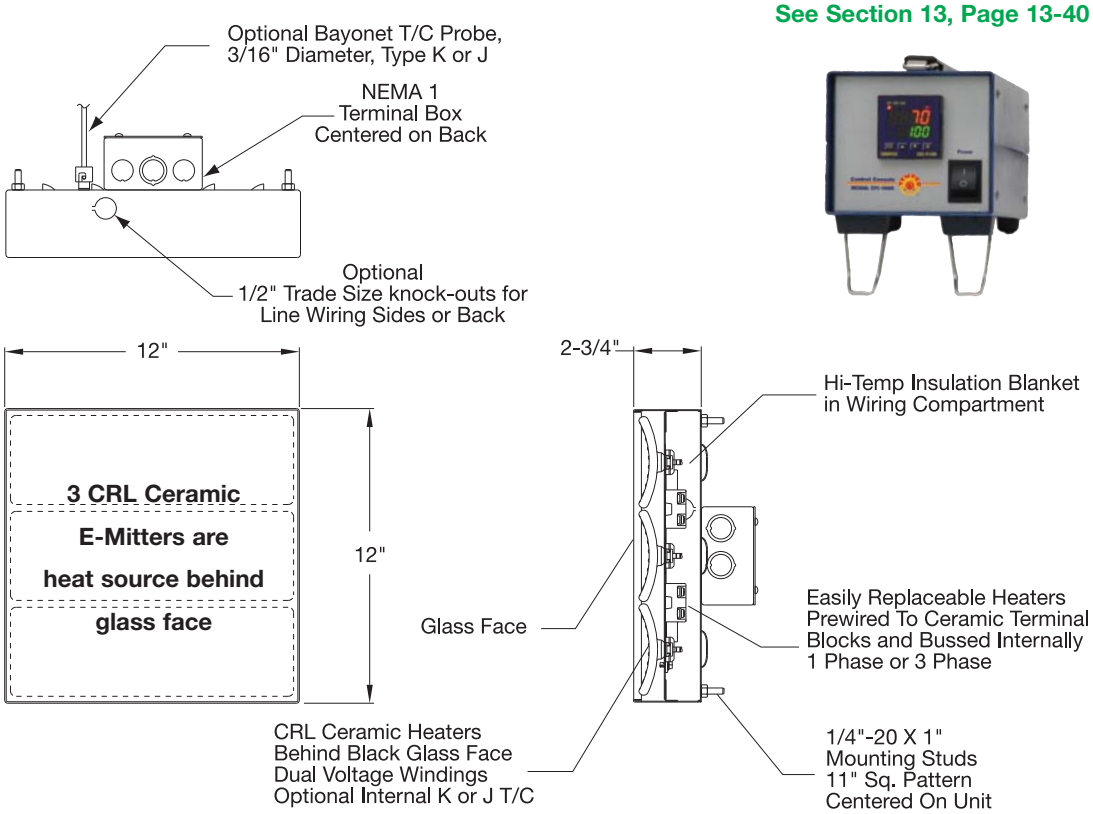
Three CRL E-Mitter heaters behind an emitting dark red glass face

Design Features

- *Dark red face glass is standard. Glass provides for ease of cleaning.*
- *Low profile 20 gauge aluminized steel or stainless steel housing*
- *Standard stocked voltage: 120, 220/240V or 480V as noted; other voltages are available.*
- *Low noise type K thermocouple mounted internally in center heater. Optional type J thermocouple is also available.*
- *Watt density range: from 11w/in² to 35w/in²*
- *Standard operating temp range: 750°F to 1300°F*
- *Best when used at radiation distances of 4"-10" from application*
- *Performance is unaffected by vibration or adverse atmospheric conditions.*
- *3 to 6µm infrared radiation wavelength*
- *Optional clear face glass is available. If required please specify when ordering.*
- *Made to order*

Tabletop Point-of-Use Temperature Control Console Systems

See Section 13, Page 13-40



Standard Ratings of Modular 12" × 12" CRP Glass Faced Radiant Panels

Aluminized Steel Housing with NEMA 1 Terminal Box *(4" square by 2-1/8" deep)*

KW	Watt Density (W/in²)	Part Number 120V No T/C	120V K T/C	240V-1Ph No T/C	240V-1Ph K T/C	240V-3Ph No T/C	240V-3Ph K T/C	480V-1Ph No T/C	480V-1Ph K T/C	480V-3Ph No T/C	480V-3Ph K T/C
1.50	11.6	CRP20089	CRP20090	CRP20091	CRP20092	CRP20093	CRP20094	CRP20095	CRP20096	CRP20097	CRP20098
2.25	17.4	CRP20099	CRP20100	CRP20101	CRP20102	CRP20103	CRP20104	CRP20105	CRP20106	CRP20107	CRP20108
3.00	23.0	—	—	CRP20109	CRP20110	CRP20111	CRP20112	CRP20113	CRP20114	CRP20115	CRP20116
3.75	29.0	—	—	CRP20117	CRP20118	CRP20119	CRP20120	CRP20121	CRP20122	CRP20123	CRP20124
4.50	35.0	—	—	CRP20125	CRP20126	CRP20127	CRP20128	CRP20129	CRP20130	CRP20131	CRP20132

Note: K T/C panels have one low noise internal T/C in center heater with extension wires routed into rear terminal box.

Stainless Steel Housing with NEMA 1 Terminal Box *(4" square by 2-1/8" deep)*

KW	Watt Density (W/in²)	Part Number 120V No T/C	120V K T/C	240V-1Ph No T/C	240V-1Ph K T/C	240V-3Ph No T/C	240V-3Ph K T/C	480V-1Ph No T/C	480V-1Ph K T/C	480V-3Ph No T/C	480V-3Ph K T/C
1.50	11.6	CRP20133	CRP20134	CRP20135	CRP20136	CRP20137	CRP20138	CRP20139	CRP20140	CRP20141	CRP20142
2.25	17.4	CRP20143	CRP20144	CRP20145	CRP20146	CRP20147	CRP20148	CRP20149	CRP20150	CRP20151	CRP20152
3.00	23.0	—	—	CRP20153	CRP20154	CRP20155	CRP20156	CRP20157	CRP20158	CRP20159	CRP20160
3.75	29.0	—	—	CRP20161	CRP20162	CRP20163	CRP20164	CRP20165	CRP20166	CRP20167	CRP20168
4.50	35.0	—	—	CRP20169	CRP20170	CRP20171	CRP20172	CRP20173	CRP2074	CRP20175	CRP20176

Note: K T/C panels have one low noise internal T/C in center heater with extension wires routed into rear terminal box.

Replacement Heaters for Standard Modular 12" × 12" CRP Radiant Panels

Panel KW	Heater Watts	Part Number 120V No T/C	120V K T/C	240V-480V No T/C	240V-480V K T/C
1.50	500	CRL20021	CRL20022	CRL20023	CRL20024
2.25	750	CRL20025	CRL20026	CRL20027	CRL20028
3.00	1000	—	—	CRL20029	CRL20030
3.75	1250	—	—	CRL20031	CRL20032
4.50	1500	—	—	CRL20033	CRL20034

Note: All 240/480V heaters have two windings for dual voltage use. Parallel connected for 240V & series connected for 480V.

120V heaters are single winding designs.

K T/C units have an internal "low noise" style thermocouple with 12" leads.

CRP Replacement Glass

Color	Part Number
Dark Red	GLS-101-101
Clear	GLS-101-102

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.

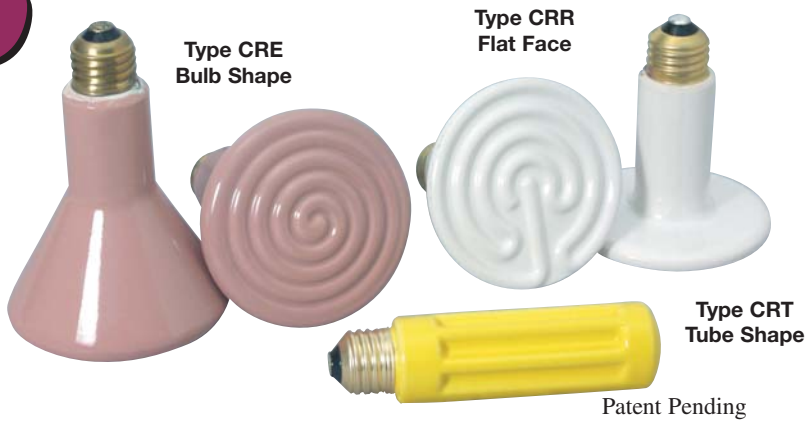
WARNING: Hazard of Electric Shock. Installation must be grounded to earth to avoid shock hazard. Disconnect power to installation before servicing or installing heater.

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.

Installation: ***Do not mount CRP Panel Heaters closer than 6 inches to any structural material that does not have at least a 200°C (392°F) continuous temperature rating.***

Edison Screw-In Bulb E-Mitters

3 STANDARD TYPES



Patent Pending

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*
- *Prevent moisture accumulation and freezing in electrical control boxes*
- *Prevent moisture accumulation, mildew and freezing in clothes lockers*
- *Resistor Banks*
- *Agricultural*

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*
- *3.5 to 7µm infrared radiation wavelength*

Screw-In Base

Ceramic receptacle for use with screw-in bulb E-Mitters

Part Number: CRK00016

Type CRE E-Mitters

CRE— Edison Screw-In Bulb E-Mitters

Tempco's CRE Style E-Mitter is a hollow, mushroom-shaped ceramic heater with a unique thin wall construction and geometrical shape to facilitate fast heating and cooling rates.

The resistance coil is embedded into the specially designed circular ceramic E-mitter surface, providing extremely uniform heat transmission with low element surface temperatures.

Because of the convenient Edison Screw-In style termination, CRE E-Mitters are recognized as a tremendously versatile source for localized spot heating. 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!

All Items Available from Stock

Stock CRE E-Mitters (Color — METAMORPHING Rose to Grey)

120V heaters with Edison Screw-In base

Diameter	Wattage	Watt Density (W/in²)	Watt Density (W/cm²)	*Surface Temperature (Typical) °F	°C	Part Number
60mm	60	13.26	6.45	842	450	CRE10014
	100	22.60	10.76	887	477	CRE10015
75mm	60	8.49	1.32	662	350	CRE10012
	100	14.15	2.19	788	420	CRE10013
90mm	150	15.59	2.41	842	450	CRE10008
	200	20.79	3.22	986	530	CRE10002

*E-Mitter (operating in 72°F/22°C ambient) face temperature measured with internal thermocouple.

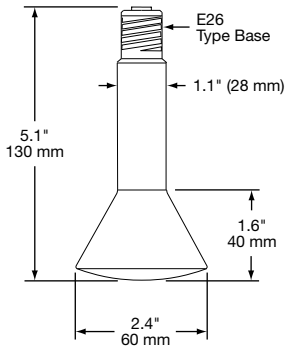
Product Inventory Available for Viewing and Selection @ www.tempco.com

Stock CRE E-Mitters (Color — White)

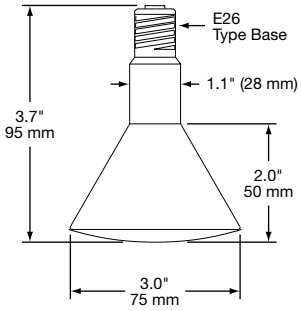
120V heaters with Edison Screw-In base

Diameter	Wattage	Watt Density (W/in²)	Watt Density (W/cm²)	*Surface Temperature (Typical) °F	*Surface Temperature (Typical) °C	Part Number
60mm	60	13.26	6.45	842	450	CRE00014
	100	22.60	10.76	887	477	CRE00015
75mm	60	8.49	1.32	662	350	CRE00012
	100	14.15	2.19	788	420	CRE00013
90mm	150	15.59	2.41	842	450	CRE00008
	200	20.79	3.22	986	530	CRE00002

*E-Mitter (operating in 72°F/22°C ambient) face temperature measured with internal thermocouple.

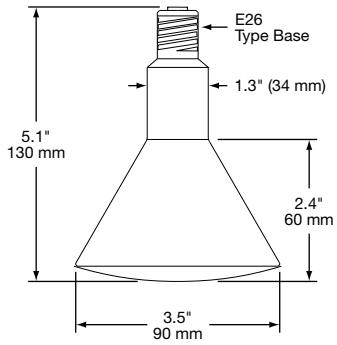


CRE 60 mm



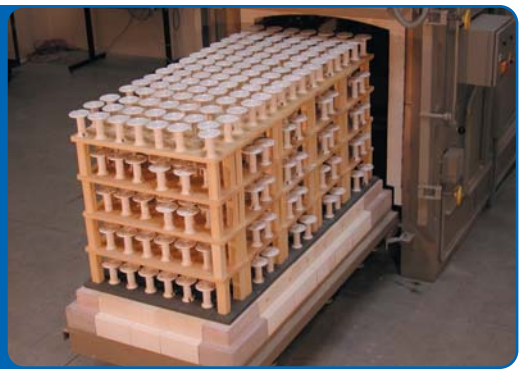
CRE 75 mm

All Items Available from Stock



CRE 90 mm

CRR E-Mitters being loaded into firing furnace.



Ordering Information

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
- ❑ **Colors:** Standard colors are color changing rose and white; optional colors are color changing yellow and black
- ❑ **Wattage:** Description of process and temperature required

Type CRR E-Mitters

Typical Applications

- *Heating laboratory samples and specimens*
- *Comfort heat for agricultural, zoological and reptilian pet applications*

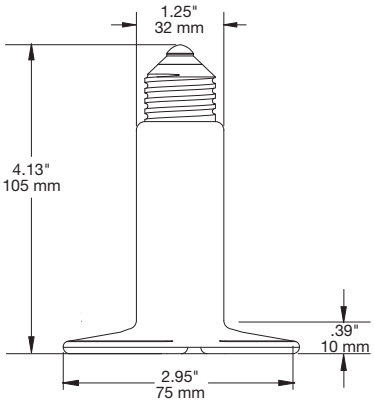
Series CRR–Edison Screw-In Bulb E-Mitters

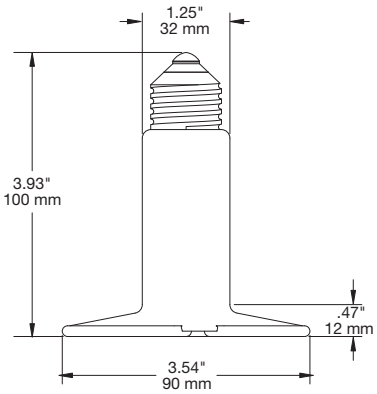
Tempco's Edison Screw-In Bulb Style E-Mitter is a hollow, tube-shaped ceramic heater. The unique thin wall construction and geometrical shape of the CRR style heaters facilitate very fast heating and cooling rates.

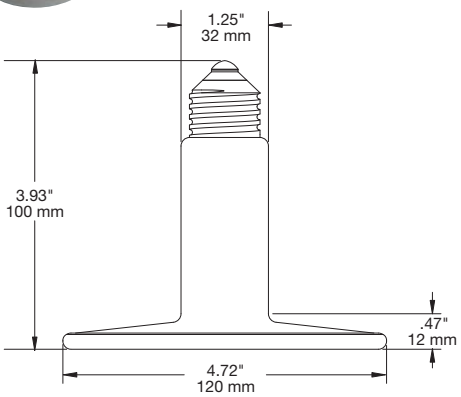
Screw-In Base

Ceramic receptacle for use with screw-in bulb E-Mitters

Part Number: CRK00016







Stock CRR E-Mitters (Color — White)

120V heaters with Edison Screw-In base

Diameter	Wattage	Watt Density (W/in²)	Watt Density (W/cm²)	*Surface Temperature (Typical) °F	°C	Part Number
75mm	60	8.77	1.36	640	338	CRR00005
	100	14.62	2.26	710	377	CRR00006
90mm	100	10.16	1.57	655	346	CRR00003
	150	15.24	2.36	760	404	CRR00004
	200	20.32	3.14	950	510	CRR00007
120mm	100	5.71	0.88	400	204	CRR00008
	150	8.57	1.33	485	252	CRR00009
	200	14.29	2.21	670	354	CRR00010

*E-Mitter (operating in 72°F/22°C ambient) face temperature measured with internal thermocouple.

Ordering Information

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 CRR 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
- ❑ **Colors:** Standard colors are color changing rose and white; optional colors are color changing yellow and black
- ❑ **Wattage:** Description of process and temperature required

Stock CRT E-Mitters (Color — METAMORPHING Rose to Grey)

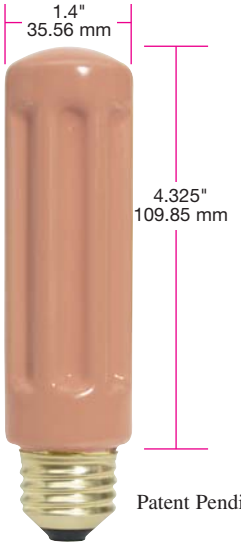
Series CRT — Tube Shaped E-Mitter

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

Standard colors are metamorphing rose and straight white; optional are metamorphing yellow and straight black.

Typical Applications

- *Prevent moisture accumulation and freezing in electrical control boxes*
- *Prevent moisture accumulation, mildew and freezing in clothes lockers*
- *Resistor Banks*
- *Incubators*



Patent Pending

Stock Sizes

Wattage	Part Number 120V	240V
50	CRT10100	—
75	CRT10101	CRT10106
100	CRT10102	CRT10107
150	CRT10103	CRT10108
200	CRT10104	CRT10109
250	CRT10105	CRT10110

Screw-In Base

Ceramic receptacle for use with screw-in bulb E-Mitters

Part Number: CRK00016

Housing Mounted Receptacles for CRT Ceramic E-Mitters

NEMA 1 CRT Housing

Shown in optional metamorphing yellow and without optional guard

NEMA 4 CRT Housing

Cabinet Enclosure EHC Heater Assemblies are found in Section 11, page 11-67

Housings are available without heater bulbs.

NEMA 1 Housing without heater is Part Number CRK00037.

NEMA 4 Housing without heater is Part Number CRK00038.

Ordering Information

Standard Heaters

Order by Part Number for Stock heaters.

Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** can manufacture a CRT E-Mitter to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ **Colors:** Standard are metamorphing rose and straight white, optional are metamorphing yellow and straight black
- ❑ **Housing:** NEMA 1 or NEMA 4 (if required)
- ❑ **Voltage:** 120 or 240
- ❑ **Wattage:** 250W maximum

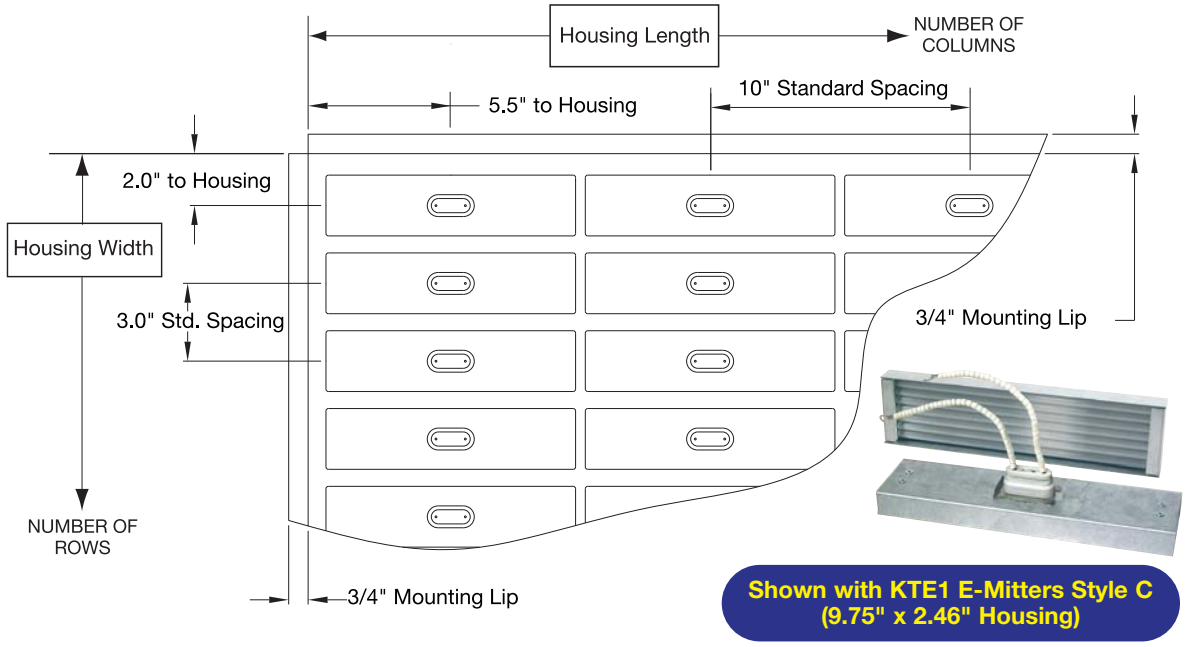
Series KTE1 E-Mitter Panel Arrays
Standard Style ARA Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1-1/2 inches (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1-1/2 inches (for the mounting lips).

Note: Structural Housing Dimensions (width x length) are in inches. For overall dimensions add 3/4 inch per side for the mounting lip.

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L	6 W x L
1	4 × 11	4 × 21	4 × 31	4 × 41	4 × 51	4 × 61
1	4 × 11	4 × 21	4 × 31	4 × 41	4 × 51	4 × 61
2	7 × 11	7 × 21	7 × 31	7 × 41	7 × 51	7 × 61
3	10 × 11	10 × 21	10 × 31	10 × 41	10 × 51	10 × 61
4	13 × 11	13 × 21	13 × 31	13 × 41	13 × 51	13 × 61
5	16 × 11	16 × 21	16 × 31	16 × 41	16 × 51	16 × 61
6	19 × 11	19 × 21	19 × 31	19 × 41	19 × 51	19 × 61
7	22 × 11	22 × 21	22 × 31	22 × 41	22 × 51	22 × 61
8	25 × 11	25 × 21	25 × 31	25 × 41	25 × 51	25 × 61
9	28 × 11	28 × 21	28 × 31	28 × 41	28 × 51	—
10	31 × 11	31 × 21	31 × 31	31 × 41	—	—
11	34 × 11	34 × 21	34 × 31	34 × 41	—	—
12	37 × 11	37 × 21	37 × 31	37 × 41	—	—
13	40 × 11	40 × 21	40 × 31			
14	43 × 11	43 × 21	43 × 31			
15	46 × 11	46 × 21	46 × 31	—	—	—
16	49 × 11	49 × 21	—	—	—	—
17	52 × 11	52 × 21	—	—	—	—
18	55 × 11	55 × 21	—	—	—	—

Dimensions are in inches



Shown with KTE1 E-Mitters Style C (9.75" x 2.46" Housing)

Custom Engineered/Manufactured Panels

- Multiple panels are used for larger arrays. Custom panels with other spacings are available.
- Minimum spacing for KTE1 heaters is 2.5" × 10.0". Special narrow panels having a maximum 40 rows × 1 or 2 columns, and up to 8 rows × 12 columns can be made on special order (max. housing size 121" × 25").
- Consult factory for larger panels not shown in table. Array panels can be adapted for either the 10-32 stud mount or ceramic heater style heaters. Specify heater mounting type when ordering (C or S style).

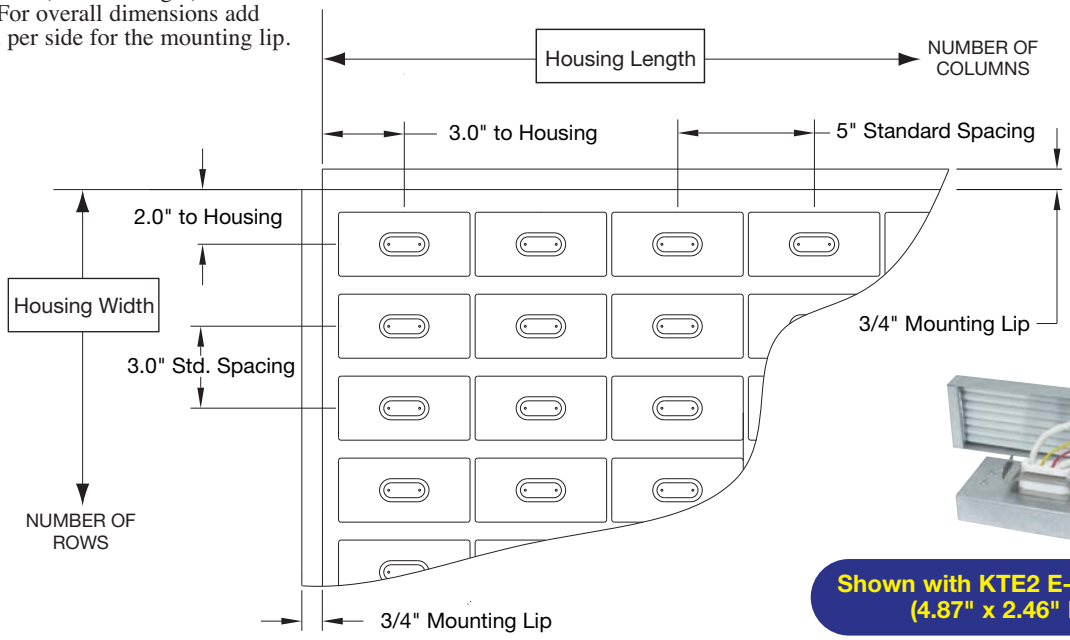
Consult us with your requirements.
There is no substitute for experience.

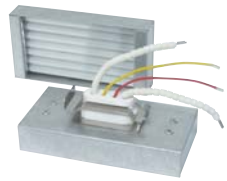
Series KTE2 E-Mitter Panel Arrays
Standard Style ARA Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1-1/2 inches (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1-1/2 inches (for the mounting lips).

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L	6 W x L	7 W x L	8 W x L	9 W x L	10 W x L	11 W x L	12 W x L
1	4 × 6	4 × 11	4 × 16	4 × 21	4 × 26	4 × 31	4 × 36	4 × 41	4 × 46	4 × 51	4 × 56	4 × 61
2	7 × 6	7 × 11	7 × 16	7 × 21	7 × 26	7 × 31	7 × 36	7 × 41	7 × 46	7 × 51	7 × 56	7 × 61
3	10 × 6	10 × 11	10 × 16	10 × 21	10 × 26	10 × 31	10 × 36	10 × 41	10 × 46	10 × 51	10 × 56	10 × 61
4	13 × 6	13 × 11	13 × 16	13 × 21	13 × 26	13 × 31	13 × 36	13 × 41	13 × 46	13 × 51	13 × 56	13 × 61
5	16 × 6	16 × 11	16 × 16	16 × 21	16 × 26	16 × 31	16 × 36	16 × 41	16 × 46	16 × 51	16 × 56	16 × 61
6	19 × 6	19 × 11	19 × 16	19 × 21	19 × 26	19 × 31	19 × 36	19 × 41	19 × 46	19 × 51	19 × 56	19 × 61
7	22 × 6	22 × 11	22 × 16	22 × 21	22 × 26	22 × 31	22 × 36	22 × 41	22 × 46	22 × 51	22 × 56	22 × 61
8	25 × 6	25 × 11	25 × 16	25 × 21	25 × 26	25 × 31	25 × 36	25 × 41	25 × 46	25 × 51	25 × 56	25 × 61
9	28 × 6	28 × 11	28 × 16	28 × 21	28 × 26	28 × 31	28 × 36	28 × 41	28 × 46	28 × 51	—	—
10	31 × 6	31 × 11	31 × 16	31 × 21	31 × 26	31 × 31	31 × 36	31 × 41	—	—	—	—
11	34 × 6	34 × 11	34 × 16	34 × 21	34 × 26	34 × 31	34 × 36	34 × 41	—	—	—	—
12	37 × 6	37 × 11	37 × 16	37 × 21	37 × 26	37 × 31	37 × 36	37 × 41	—	—	—	—
13	40 × 6	40 × 11	40 × 16	40 × 21	40 × 26	40 × 31	—	—	—	—	—	—
14	43 × 6	43 × 11	43 × 16	43 × 21	43 × 26	43 × 31	—	—	—	—	—	—
15	46 × 6	46 × 11	46 × 16	46 × 21	46 × 26	46 × 31	—	—	Dimensions are in inches			—
16	49 × 6	49 × 11	49 × 16	49 × 21	—	—	—	—				—
17	52 × 6	52 × 11	52 × 16	52 × 21	—	—	—	—	—	—	—	—
18	55 × 6	55 × 11	55 × 16	55 × 21	—	—	—	—	—	—	—	—

Note: Structural Housing Dimensions (width x length) are in inches. For overall dimensions add 3/4 inch per side for the mounting lip.





Shown with KTE2 E-Mitters Style C (4.87" x 2.46" Housing)

Custom Engineered/Manufactured Panels

- Multiple panels are used for larger arrays. Standard single panel construction is not offered beyond limits shown. Custom panels with other spacings are available.
- Minimum spacing for KTE2 heaters is 2.5" × 5.0". Special narrow panels having a maximum 40 rows × 1, 2, 3, or 4 columns, and up to 8 rows × 24 columns can be made on special order (max. housing size 121" × 25").
- Consult factory for larger panels not shown in table. Array panels can be adapted for either the 10-32 stud mount or ceramic heater style heaters. Specify heater mounting type when ordering (C or S style).

Consult us with your requirements.
There is no substitute for experience.

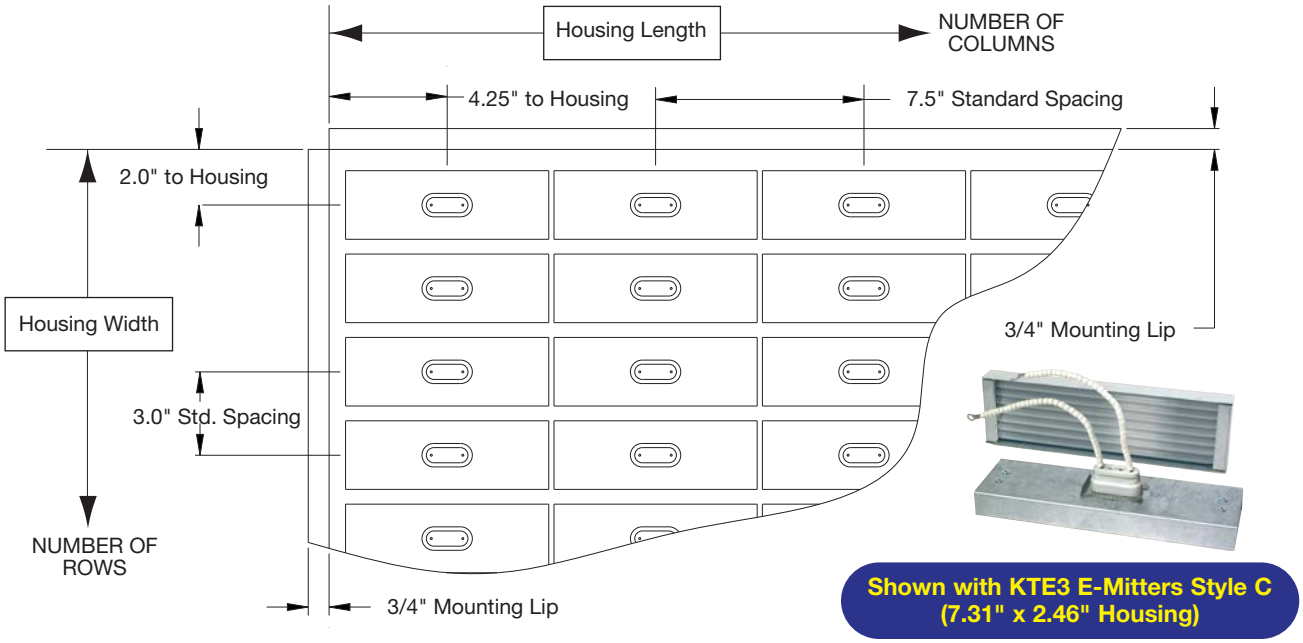
Series KTE3 E-Mitter Panel Arrays
Standard Style ARA Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1-1/2 inches (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1-1/2 inches (for the mounting lips).

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L	6 W x L	7 W x L	8 W x L
1	4 × 8.5	4 × 16	4 × 23.5	4 × 31	4 × 38.5	4 × 46	4 × 53.5	4 × 61
2	7 × 8.5	7 × 16	7 × 23.5	7 × 31	7 × 38.5	7 × 46	7 × 53.5	7 × 61
3	10 × 8.5	10 × 16	10 × 23.5	10 × 31	10 × 38.5	10 × 46	10 × 53.5	10 × 61
4	13 × 8.5	13 × 16	13 × 23.5	13 × 31	13 × 38.5	13 × 46	13 × 53.5	13 × 61
5	16 × 8.5	16 × 16	16 × 23.5	16 × 31	16 × 38.5	16 × 46	16 × 53.5	16 × 61
6	19 × 8.5	19 × 16	19 × 23.5	19 × 31	19 × 38.5	19 × 46	19 × 53.5	19 × 61
7	22 × 8.5	22 × 16	22 × 23.5	22 × 31	22 × 38.5	22 × 46	22 × 53.5	22 × 61
8	25 × 8.5	25 × 16	25 × 23.5	25 × 31	25 × 38.5	25 × 46	25 × 53.5	25 × 61
9	28 × 8.5	28 × 16	28 × 23.5	28 × 31	28 × 38.5	28 × 46	28 × 53.5	—
10	31 × 8.5	31 × 16	31 × 23.5	31 × 31	31 × 38.5	31 × 46	31 × 53.5	—
11	34 × 8.5	34 × 16	34 × 23.5	34 × 31	34 × 38.5	34 × 46	—	—
12	37 × 8.5	37 × 16	37 × 23.5	37 × 31	37 × 38.5	37 × 46	—	—
13	40 × 8.5	40 × 16	40 × 23.5	40 × 31	40 × 38.5	—	—	—
14	43 × 8.5	43 × 16	43 × 23.5	43 × 31	—	—	—	—
15	46 × 8.5	46 × 16	46 × 23.5	46 × 31	—	—	—	—
16	49 × 8.5	49 × 16	49 × 23.5	—	—	—	—	—
17	52 × 8.5	52 × 16	52 × 23.5	—	—	—	—	—
18	55 × 8.5	55 × 16	55 × 23.5	—	—	—	—	—

Dimensions are in inches

Note: Structural Housing Dimensions (width x length) are in inches. For overall dimensions add 3/4 inch per side for the mounting lip.



Shown with KTE3 E-Mitters Style C (7.31" x 2.46" Housing)

Custom Engineered/Manufactured Panels

- Multiple panels are used for larger arrays. Standard single panel construction is not offered beyond limits shown. Custom panels with other spacings are available.
- Minimum spacing for KTE3 heaters is 2.5" × 7.50". Special narrow panels having a maximum 40 rows × 1, 2, or 3 columns, and up to 8 rows × 15 columns can be made on special order (max. housing size 121" × 25").
- Consult factory for larger panels not shown in table. Array panels can be adapted for either the 10-32 stud mount or ceramic heater style heaters. Specify heater mounting type when ordering (C or S style).

Consult us with your requirements.
There is no substitute for experience.

ARA Array Panel Design Worksheet for Quartz Mini-Tube E-Mitters

Ordering Information

To process your order
please specify the following information.

1.) Supply panel layout or sketch showing:

- Outside panel dimensions (allow for 3/4" wide mounting lip on all sides of ARA structural array housing)
- Heater type and orientation of long (or short) heater dimension
- Layout of rows and columns with number of heaters
- Spacing of rows and columns (Tempco will use standard spacing unless specified by customer)
- Zones and/or number of heaters per zone
- Locations of input wiring
- Locations of heaters with thermocouples (if used)

2.) Electrical requirements:

- Total panel KW _____
- Zone KWs (or # of heaters in zones) _____
- Line voltage to panel, # of circuits, & 1 or 3 phase operation _____
- If 480V, can series-parallel wiring and 240V heaters be used? _____
- Type of heater control to be used _____

3.) Heater Specifications:

- Heater Type ❒ KTE ❒ KTG
- Heater Size ❒ KTE1 (9-3/4"L) ❒ KTE2 (4-7/8"L) ❒ KTE3 (7-5/16"L) ❒ KTE4 (14-5/8"L) ❒ KTE5 (19-1/2"L)
- Heater Mounting Style ❒ C ❒ S ❒ T
- Catalog Part Number _____ or Watts _____ Volts _____
- Standard K thermocouple or optional J _____ Quantity _____
- Heater lead configuration — Standard is 3.5" or 6" with straight terminal
  Standard or spade terminals used if factory wired (ring terminals optional) _____
- Special marking if required _____

4.) Panel wiring & control options:

❒ Standard unit wiring is heaters to terminal blocks only
❒ Factory wired per customer specs & wiring diagram
❒ Tempco Engineering to design internal wiring & determine line input requirements
❒ Tempco to supply turnkey power control panel(s)

5.) Any special features required? _____

_____

6.) Application Data:

- Type of application and physical properties of processed materials _____

_____

_____

KTE & KTG E-Mitters — High Intensity Medium Wave Quartz Mini-Tube Infrared Heaters

5 Standard KTE & KTG Housing Sizes Available and Three Universal Mounting Styles (C, S & T)

Series KTE1 & KTG1

9.75" × 2.46" (248 × 62.5 mm)
Available in Two Constructions
— Translucent Tubes (KTE1)
— Clear Tubes with Hi-Efficiency Gold Coated Ceramic Backing (KTG1)

Series KTE2 & KTG2

4.88" × 2.46" (124 × 62.5 mm)
Available in Two Constructions
— Translucent Tubes (KTE2)
— Clear Tubes with Hi-Efficiency Gold Coated Ceramic Backing (KTG2)

Series KTE3 & KTG3

7.31" × 2.46" (186 × 62.5 mm)
Available in Two Constructions
— Translucent Tubes (KTE3)
— Clear Tubes with Hi-Efficiency Gold Coated Ceramic Backing (KTG3)

Series KTE4 & KTG4

14.63" × 2.46" (372 × 62.5 mm)
Available in Two Constructions
— Translucent Tubes (KTE4)
— Clear Tubes with Hi-Efficiency Gold Coated Ceramic Backing (KTG4)

Series KTE5

19.50" × 2.46" (495 × 62.5 mm)
Available with Translucent Tubes only

Universal Mounting Styles

Style C – Ceramic Header(s) with Leads
(shown with Translucent Tubes and T/C)

Style S – Studs
(shown with Translucent Tubes and T/C)

Style T – Ceramic Header(s) with Screw-On Terminal Lugs
(shown with Clear Tubes with Hi-Efficiency Gold Coated Ceramic Backing)

Design Features

- *Standard industry sizes and ratings up to 60 w/in² (interchangeable with CRC, CRB, CRN and CRZ ceramic heaters)*
- *Highly reflective rugged aluminized steel housing construction*
- *Rapid response — 2.5 to 7.5 deg F / sec. heat-up / cool-down rates, depending on unit watt density.*
- *Medium wavelength output (2.5 – 6 microns)*
- *Three mounting styles available: Styles C and T have ceramic headers with clip(s) and Style S has two 10-32 × 1" studs on centerline*
- *Standard winding pattern gives uniform heating over entire face of heater. (Consult factory for custom winding patterns and/or sizes)*
- *Up to 95% reflectance efficiency using gold coated ceramic backing*
- *Optional built-in type K or J T/C available in center of unit face*
- *Ideal for systems requiring small area zoning and close control of process*
- *Best when used at radiation distances of 4" – 10" from work*
- *Suitable for horizontal or vertical operation with tubes in horizontal plane*
- *Designed for use in CRA linear structural housings and ARA array assemblies. See pages 7-48 through 7-51*
- *120, 208, 240, 277 or 480V design (consult factory for 575V units)*

Typical Applications

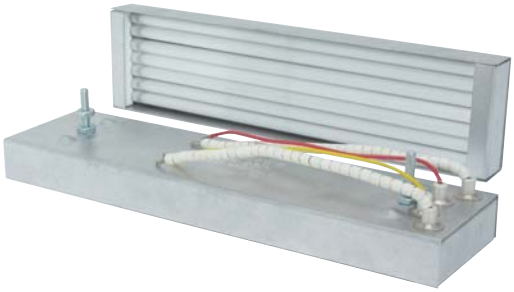
- *Ideal for drying, adhesive and epoxy bonding/curing*
- *Laminating*
- *Shrink packaging*
- *Thermoforming plastics*
- *Other processes requiring fast penetration of heat into metals, wood, synthetic fabrics, and plastics.*

KTE E-Mitters Style S— High Intensity Quartz Mini-Tube Infrared Heaters (Translucent Tubes)

Standard (Non-Stock) Sizes and Ratings

Wattage	Volts	"A" Dim. in	"A" Dim. mm	"B" Dim. in	"B" Dim. mm	Part Number without Thermocouple	Part Number with Optional Type K Thermocouple
125	220/240					KTE20001	KTE20002
200	220/240					KTE20003	KTE20004
250	220/240	4⅞	124	2½	64	KTE20005	KTE20006
325	220/240					KTE20007	KTE20008
500	220/240					KTE20009	KTE20010
185	220/240					KTE30001	KTE30002
300	220/240					KTE30003	KTE30004
375	220/240	7 5/16	186	4 15/16	125	KTE30005	KTE30006
500	220/240					KTE30007	KTE30008
750	220/240					KTE30009	KTE30010
250	220/240					KTE10001	KTE10002
400	220/240					KTE10003	KTE10004
500	220/240	9¾	248	7⅜	187	KTE10005	KTE10006
650	220/240					KTE10007	KTE10008
1000	220/240					KTE10009	KTE10010
375	220/240					KTE40001	KTE40002
600	220/240					KTE40003	KTE40004
750	220/240	14⅝	372	12¼	311	KTE40005	KTE40006
1000	220/240					KTE40007	KTE40008
1500	220/240					KTE40009	KTE40010
500	220/240					KTE50001	KTE50002
800	220/240					KTE50003	KTE50004
1000	220/240	19½	495	17⅛	435	KTE50005	KTE50006
1500	220/240					KTE50007	KTE50008
2000	220/240					KTE50009	KTE50010

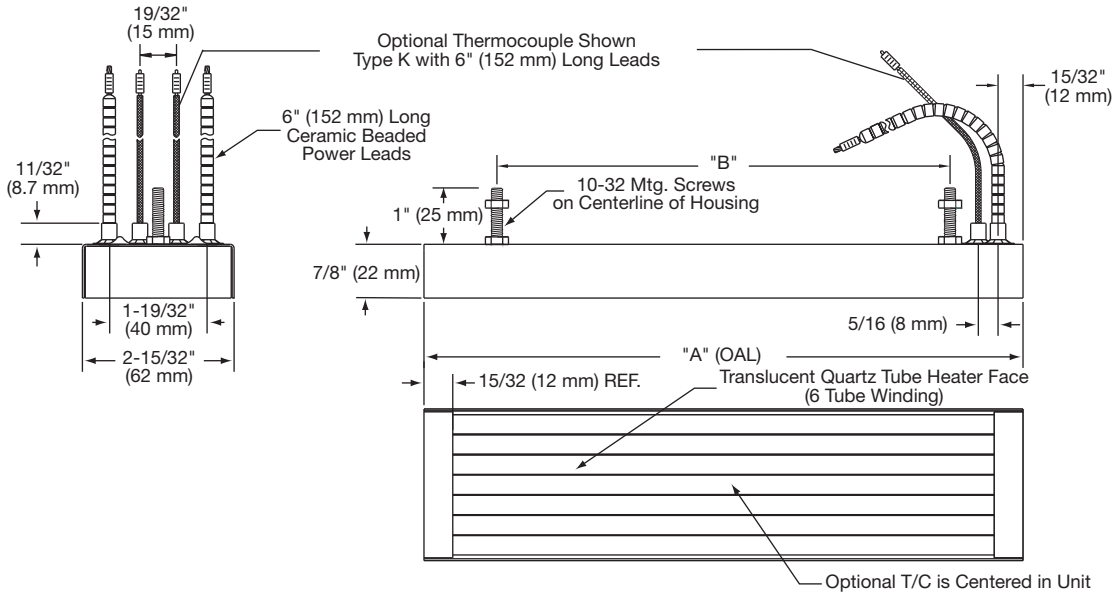
KTE1, KTE2, KTE3, KTE4 and KTE5 Series Style S have twin mounting studs.



Design Features

- *10-32 Mounting Studs*
- *6" Beaded Leads with #8-10 spade terminals*
- *Optional Thermocouple with 6" leads*
- *See pages 7-14 through 7-21 for Accessories & Options*
- *Tempco can custom engineer/manufacture for your application*

Ordering Information
See page 7-57



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KTG E-Mitters Style S— High Intensity Quartz Mini-Tube Infrared Heaters with Hi-Efficiency Gold Coated Ceramic Backing (Clear Tubes)

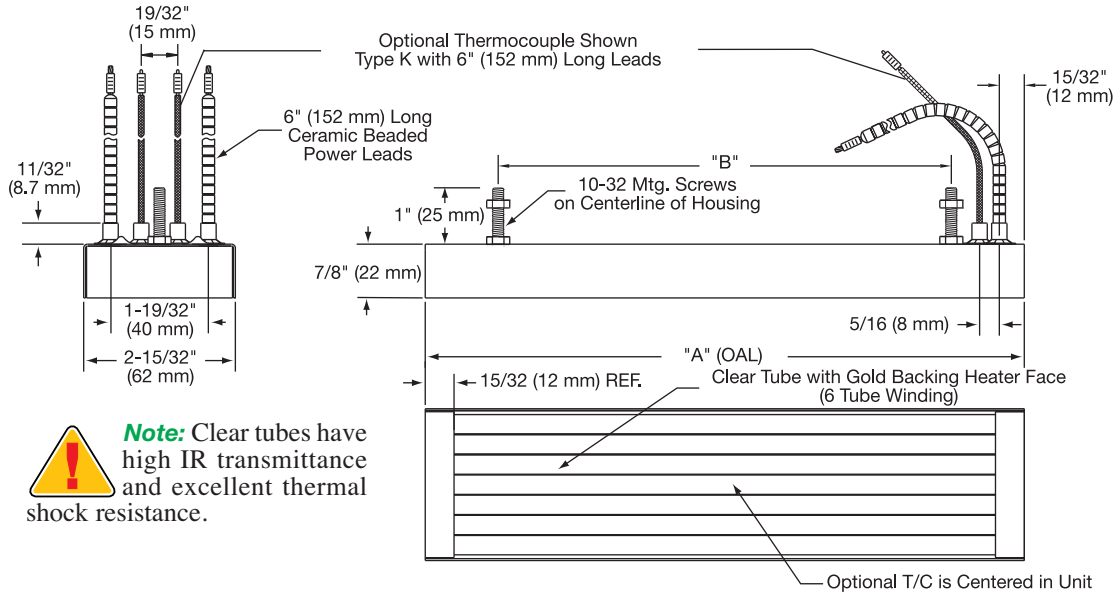
Design Features

- *10-32 Mounting Studs*
- *6" Beaded Leads with #8-10 spade terminals*
- *Optional Thermocouple with 6" leads*
- *See pages 7-14 through 7-21 for Accessories & Options*
- *Tempco can custom engineer/manufacture for your application*

Standard (Non-Stock) Sizes and Ratings

Wattage	Volts	"A" Dim. in	"A" Dim. mm	"B" Dim. in	"B" Dim. mm	Part Number without Thermocouple	Part Number with Optional Type K Thermocouple
125	220/240					KTG20001	KTG20002
200	220/240					KTG20003	KTG20004
250	220/240	4⅞	124	2½	64	KTG20005	KTG20006
325	220/240					KTG20007	KTG20008
500	220/240					KTG20009	KTG20010
185	220/240					KTG30001	KTG30002
300	220/240					KTG30003	KTG30004
375	220/240	7 5/16	186	4 15/16	125	KTG30005	KTG30006
500	220/240					KTG30007	KTG30008
750	220/240					KTG30009	KTG30010
250	220/240					KTG10002	KTG10003
400	220/240					KTG10004	KTG10005
500	220/240	9¾	248	7⅜	187	KTG10006	KTG10007
650	220/240					KTG10008	KTG10009
1000	220/240					KTG10010	KTG10011
375	220/240					KTG40001	KTG40002
600	220/240					KTG40003	KTG40004
750	220/240	14⅝	372	12¼	311	KTG40005	KTG40006
1000	220/240					KTG40007	KTG40008
1500	220/240					KTG40009	KTG40010

KTG1, KTG2, KTG3 and KTG4 Series Style S have twin mounting studs.



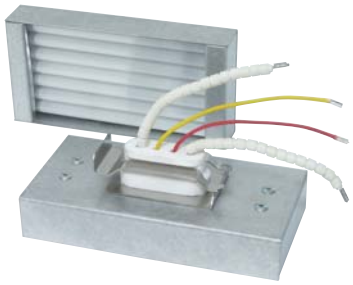
Note: Clear tubes have high IR transmittance and excellent thermal shock resistance.

KTE Series Style C— High Intensity Quartz Mini-Tube Infrared Heaters (Translucent Tubes)

Standard (Non-Stock) Sizes and Ratings

Wattage	Volts	"A" Dim. in	"A" Dim. mm	Part Number without Thermocouple	Part Number with Optional Type K Thermocouple
125	220/240			KTE20015	KTE20016
200	220/240			KTE20017	KTE20018
250	220/240	4⅞	124	KTE20019	KTE20020
325	220/240			KTE20021	KTE20022
500	220/240			KTE20023	KTE20024
185	220/240			KTE30011	KTE30012
300	220/240			KTE30013	KTE30014
375	220/240	7⅜16	186	KTE30015	KTE30016
500	220/240			KTE30017	KTE30018
750	220/240			KTE30019	KTE30020
250	220/240			KTE10023	KTE10024
400	220/240			KTE10025	KTE10026
500	220/240	9¾	248	KTE10027	KTE10028
650	220/240			KTE10029	KTE10030
1000	220/240			KTE10031	KTE10032

KTE1, KTE2, KTE3 Series Style C have single ceramic mounting head.



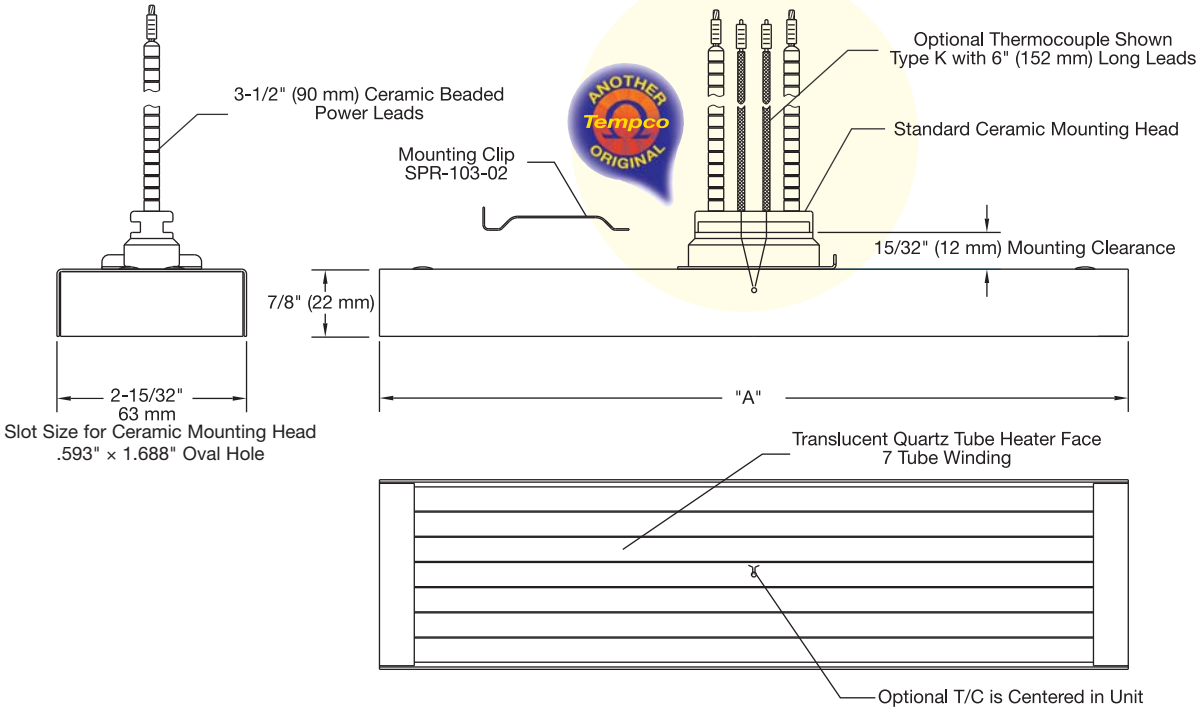
Design Features

- *One Ceramic Mounting Head*
- *3-1/2" Beaded Leads with #8-10 spade terminals*
- *One-Piece Mounting Clip Standard Two-Piece Wave Mounting Clip Optional (page 7-39)*
- *Optional Thermocouple with 6" leads*
- *See pages 7-14 through 7-21 for Accessories & Options*
- *Tempco can custom engineer/ manufacture for your application*

NEW DESIGN

Style C KTE E-Mitters have a Standard Ceramic Mounting Head and are interchangeable with CRC, CRB, CRN and CRZ Ceramic E-Mitters.

Ordering Information
See page 7-57



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KTG Series Style C— High Intensity Quartz Mini-Tube Infrared Heaters with Hi-Efficiency Gold Coated Ceramic Backing (Clear Tubes)

Design Features

- *One Ceramic Mounting Head*
- *3-1/2" Beaded Leads with #8-10 spade terminals*
- *One-Piece Mounting Clip Standard*
  Two-Piece Wave Mounting Clip Optional
  (page 7-39)
- *Optional Thermocouple with 6" leads*
- *See pages 7-14 through 7-21 for Accessories & Options*
- *Tempco can custom engineer/ manufacture for your application*

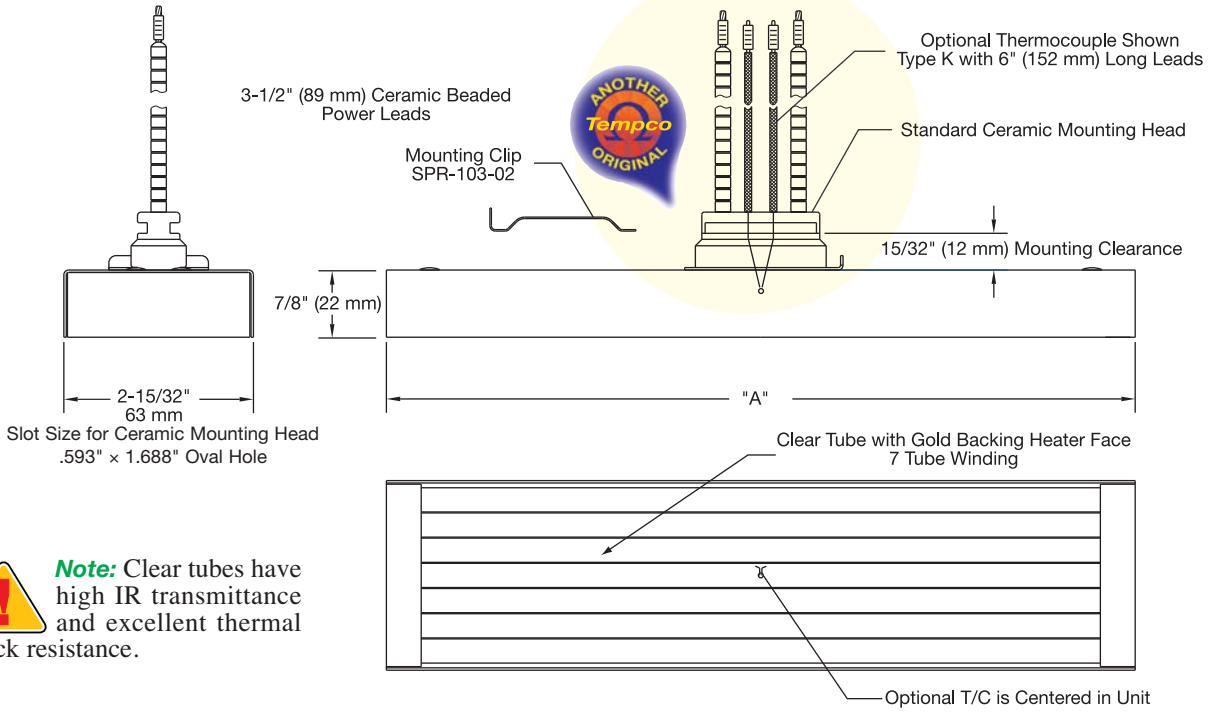
Standard (Non-Stock) Sizes and Ratings

Wattage	Volts	"A" Dim. in	"A" Dim. mm	Part Number without Thermocouple	Part Number with Optional Type K Thermocouple
125	220/240			KTG20011	KTG20012
200	220/240			KTG20013	KTG20014
250	220/240	4⅞	124	KTG20015	KTG20016
325	220/240			KTG20017	KTG20018
500	220/240			KTG20019	KTG20020
185	220/240			KTG30011	KTG30012
300	220/240			KTG30013	KTG30014
375	220/240	7⅝16	186	KTG30015	KTG30016
500	220/240			KTG30017	KTG30018
750	220/240			KTG30019	KTG30020
250	220/240			KTG10012	KTG10013
400	220/240			KTG10014	KTG10015
500	220/240	9¾	248	KTG10016	KTG10017
650	220/240			KTG10018	KTG10019
1000	220/240			KTG10020	KTG10021

KTG1, KTG2, KTG3 Series Style C have single ceramic mounting head.

NEW DESIGN

Style C KTG E-Mitters have a Standard Ceramic Mounting Head and are interchangeable with CRC, CRB, CRN and CRZ Ceramic E-Mitters.



Note: Clear tubes have high IR transmittance and excellent thermal shock resistance.

Ordering Information

Standard Heaters

Order by Part Number for Standard heaters.

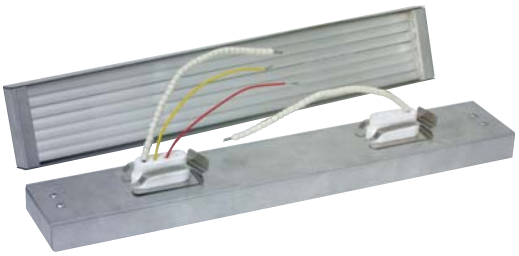
Custom Engineered/Manufactured KTG Heaters

Understanding that an electric heater can be very application specific, for sizes not listed, **TEMPCO** will design and manufacture a KTG E-Mitter or complete system to meet your requirements.
Standard lead time is 3 weeks.

Please Specify the following:

- ❑ **Length**
- ❑ **Width**
- ❑ **KTG Style (S, C, T)**
- ❑ **Wattage:**
- ❑ **Voltage**
- ❑ **Beaded Lead Length:** Standard 3-1/2"
- ❑ **Thermocouple:** Optional Type K (Standard 6")
- ❑ **Options and Accessories:** See pages 7-14 through 7-21

KTE Series Style C— High Intensity Quartz Mini-Tube Infrared Heaters (Translucent Tubes)



Design Features

- *Two Ceramic Mounting Heads*
- *6" Beaded Leads with #8-10 spade terminals*
- *One-Piece Mounting Clip Standard Two-Piece Wave Mounting Clip Optional (page 7-39)*
- *Optional Thermocouple with 6" leads*
- *See pages 7-14 through 7-21 for Accessories & Options*
- *Tempco can custom engineer/manufacture for your application*

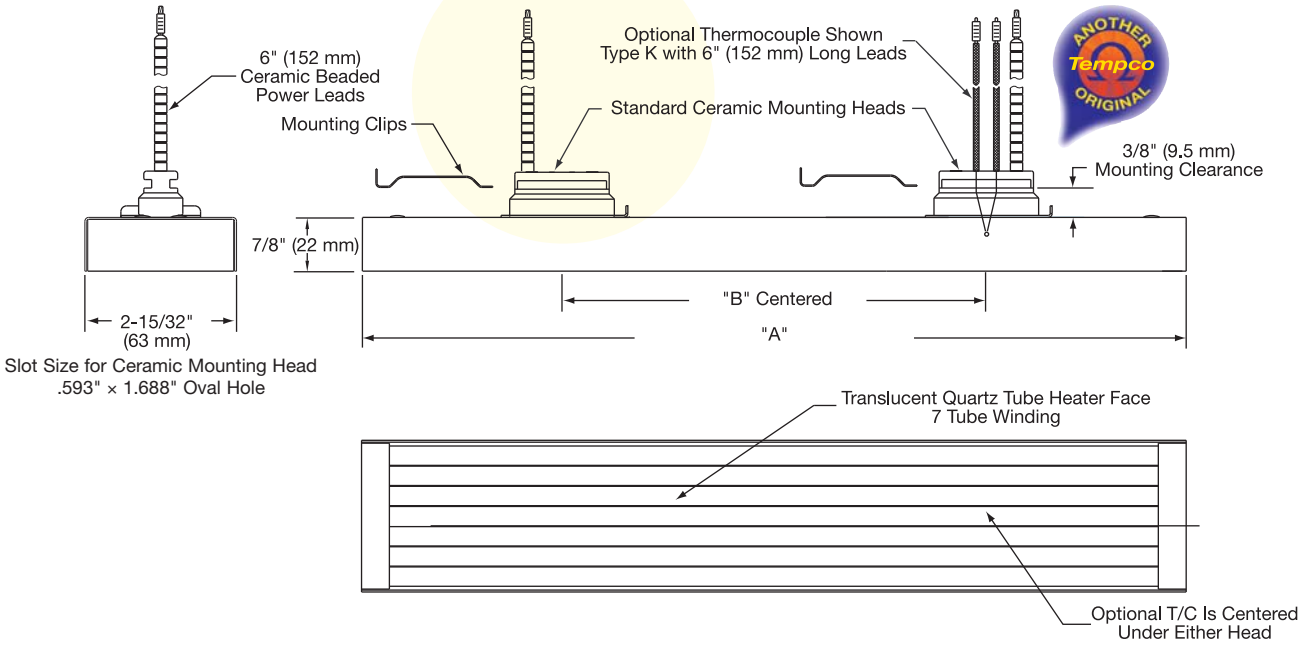
Standard (Non-Stock) Sizes and Ratings

Wattage	Volts	"A" Dim. in	"A" Dim. mm	"B" Dim. in	"B" Dim. mm	Part Number without Thermocouple	Part Number with Optional Type K Thermocouple
375	220/240					KTE40011	KTE40012
600	220/240					KTE40013	KTE40014
750	220/240	14⅝	372	7 13/32	190	KTE40015	KTE40016
1000	220/240					KTE40017	KTE40018
1500	220/240					KTE40019	KTE40020
500	220/240					KTE50011	KTE50012
800	220/240					KTE50013	KTE50014
1000	220/240	19½	495	9⅞	251	KTE50015	KTE50016
1500	220/240					KTE50017	KTE50018
2000	220/240					KTE50019	KTE50020

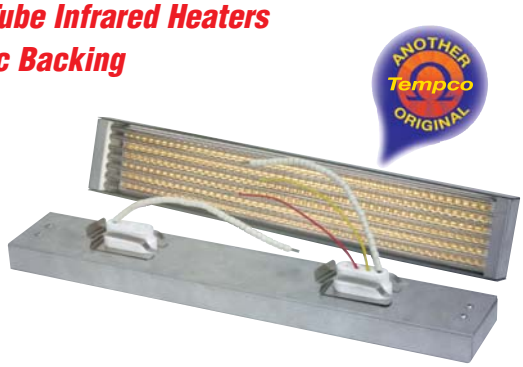
KTE4 and KTE5 Series Style C have twin ceramic mounting heads.

NEW DESIGN

Style C KTE E-Mitters have a Standard Ceramic Mounting Head and are interchangeable with CRC, CRB, CRN and CRZ Ceramic E-Mitters.



KTG Series Style C— High Intensity Quartz Mini-Tube Infrared Heaters with Hi-Efficiency Gold Coated Ceramic Backing (Clear Tubes)



Standard (Non-Stock) Sizes and Ratings

Wattage	Volts	"A" Dim. in	"A" Dim. mm	"B" Dim. in	"B" Dim. mm	Part Number without Thermocouple	Part Number with Optional Type K Thermocouple
375	220/240					KTG40011	KTG40012
600	220/240					KTG40013	KTG40014
750	220/240	14⅝	372	7 13/32	190	KTG40015	KTG40016
1000	220/240					KTG40017	KTG40018
1500	220/240					KTG40019	KTG40020

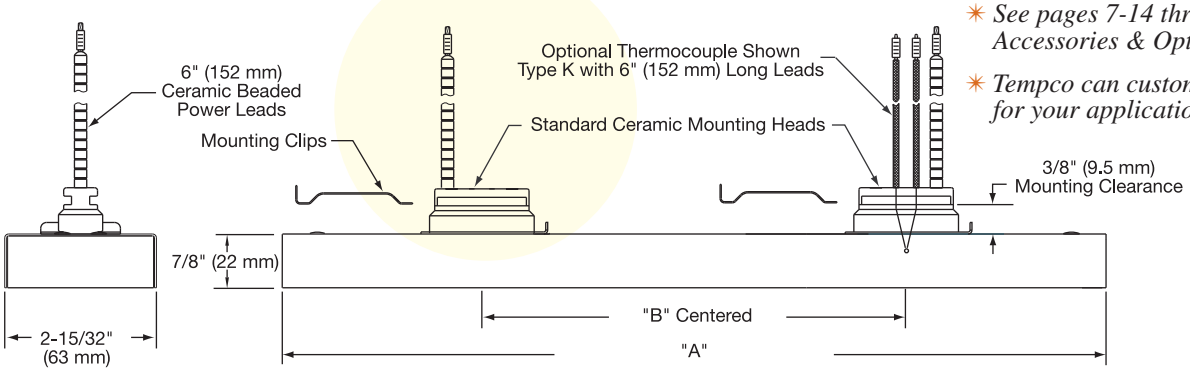
KTG4 Series Style C has twin ceramic mounting heads.

Design Features

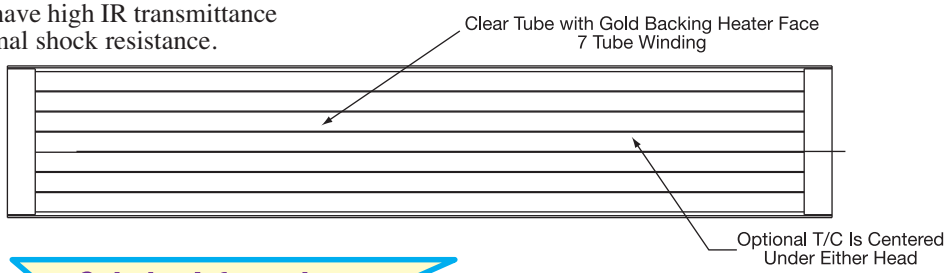
- *Two Ceramic Mounting Heads*
- *6" Beaded Leads with #8-10 spade terminals*
- *One-Piece Mounting Clip Standard Two-Piece Wave Mounting Clip Optional (page 7-39)*
- *Optional Thermocouple with 6" leads*
- *See pages 7-14 through 7-21 for Accessories & Options*
- *Tempco can custom engineer/manufacture for your application*

NEW DESIGN

Style C KTG E-Mitters have a Standard Ceramic Mounting Head and are interchangeable with CRC, CRB, CRN and CRZ Ceramic E-Mitters.



Note: Clear tubes have high IR transmittance and excellent thermal shock resistance.



Ordering Information

Standard Heaters

Order by Part Number for Standard heaters.

Custom Engineered/Manufactured KTE Heaters

Understanding that an electric heater can be very application specific, for sizes not listed, **TEMPCO** will design and manufacture a KTE and KTG E-Mitter or complete system to meet your requirements.
Standard lead time is 3 weeks.

Please Specify the following:

- ❑ **Length**
- ❑ **Width**
- ❑ **KTE Style (S, C, T)**
- ❑ **Wattage:**
- ❑ **Voltage**
- ❑ **KTE Translucent Quartz or KTG Clear Tubes with Gold Coated Ceramic Backing**
- ❑ **Beaded Lead Length:** Standard 6"
- ❑ **Thermocouple:** Optional Type K (Standard 6")
- ❑ **Options and Accessories:** See pages 7-14 through 7-21

KTE Heater Specifications

KTE1 Series – 9.75" x 2.46" Housing

Watts/Square Inch vs. Temperature Data

Heater Wattage	Heater Face Watt Density*		Heater Body Temp @ 72°F**		Peak Emitted Wavelength*** (microns)	
	Style S	Style C	Style S	Style C	Style S	Style C
150	8.30	7.12	608	554	4.89	5.14
163	9.02	7.73	638	583	4.75	5.00
200	11.07	9.49	714	656	4.44	4.67
250	13.84	11.86	798	740	4.15	4.35
300	16.60	14.23	868	809	3.93	4.11
325	17.99	15.42	898	839	3.84	4.01
350	19.37	16.60	926	868	3.76	3.93
400	22.14	18.98	978	918	3.63	3.78
500	27.67	23.72	1070	1006	3.41	3.56
600	33.20	28.46	1154	1083	3.23	3.38
650	35.97	30.83	1194	1119	3.15	3.30
700	38.74	33.21	1232	1154	3.08	3.23
750	41.51	35.58	1269	1188	3.02	3.16
800	44.27	37.95	1303	1222	2.96	3.10
875	48.42	41.51	1349	1269	2.88	3.02
900	49.81	42.69	1363	1284	2.86	2.99
1000	55.34	47.44	1411	1339	2.79	2.90
1100	60.87	52.18	1448	1385	2.73	2.83
1200	66.41	56.93	1476	1422	2.69	2.77
1350	—	64.04	—	1465	—	2.71

KTE2 Series – 4.88" x 2.46" Housing

Watts/Square Inch vs. Temperature Data

Heater Wattage	Heater Face Watt Density*		Heater Body Temp @ 72°F**		Peak Emitted Wavelength*** (microns)	
	Style S	Style C	Style S	Style C	Style S	Style C
100	12.29	10.53	753	695	4.30	4.52
125	15.36	13.16	838	779	4.02	4.21
150	18.43	15.79	907	848	3.82	3.99
163	20.02	17.16	939	880	3.73	3.89
200	24.57	21.05	1020	959	3.52	3.68
250	30.71	26.32	1117	1049	3.31	3.46
300	36.86	31.58	1206	1130	3.13	3.28
325	39.93	34.21	1248	1169	3.05	3.20
350	43.00	36.84	1287	1206	2.99	3.13
400	49.14	42.11	1356	1276	2.87	3.00
500	61.43	52.63	1451	1389	2.73	2.82
540	66.34	56.84	1476	1422	2.69	2.77
600	—	63.16	—	1460	—	2.72

***Heater Face Watt Density**

Watt density calculation is based on heater face surface area, which is a relative constant value used to relate different sizes of heaters. The 6 tube KTE (Style S) has a surface area 85.7% of a 7 tube unit and will operate at a temperature 16.6% higher than the 7 tube (Style C) unit. This relationship has been confirmed through laboratory testing on various sizes of KTE heaters.

****Heater Body Temp @ 72°F**

Heater face temperature as measured with a type K thermocouple mounted directly on the heater face. Temperatures are for a single heater facing down with target re-radiation from an oxidized SS surface 3" from heater face. Operating temperatures (and emitted wavelength) will vary with application conditions such as higher ambient, target absorption properties, moving/stationary systems, and distance to target. The tabulated temperatures are averages complied from standardized lab tests on different ratings and sizes of KTE heaters. Translucent tube testing showed that for various reflector materials and surface conditions (bright, oxidized, etc.) were examined with little or no effect on test results. Lower heater temperatures will occur if radiation is allowed to dissipate freely from the surface without target re-radiation (about 20-25% lower when facing up in open air).

*****Peak Emitted Wavelength**

Peak infrared radiation wavelength as calculated from Wien's Displacement Law, for the operating temperature shown, expressed in microns (μm). The emissivity of KTE quartz heaters is close to the ideal blackbody value of 1.0 (range is from .88 to .92). This has been confirmed by testing using a thermal infrared camera.

KTE3 Series – 7.31" x 2.46" Housing

Watts/Square Inch vs. Temperature Data

Heater Wattage	Heater Face Watt Density*		Heater Body Temp @ 72°F**		Peak Emitted Wavelength*** (microns)	
	Style S	Style C	Style S	Style C	Style S	Style C
100	7.63	6.54	578	526	5.02	5.29
125	9.54	8.18	658	602	4.66	4.91
150	11.45	9.81	726	669	4.40	4.62
163	12.44	10.66	758	700	4.28	4.50
200	15.27	13.08	836	777	4.03	4.22
250	19.08	16.35	921	862	3.78	3.95
300	22.90	19.62	992	931	3.59	3.75
325	24.81	21.26	1024	962	3.51	3.67
350	26.72	22.89	1055	992	3.44	3.59
400	30.53	26.16	1114	1046	3.31	3.46
500	38.17	32.70	1224	1147	3.10	3.25
600	45.80	39.24	1321	1239	2.93	3.07
650	49.62	42.51	1361	1281	2.86	3.00
700	53.44	45.78	1396	1320	2.81	2.93
750	57.25	49.05	1425	1355	2.77	2.87
800	61.07	52.32	1449	1386	2.73	2.83
875	66.79	57.23	1478	1425	2.69	2.77
900	--	58.86	--	1435	--	2.75
1000	--	65.40	--	1471	--	2.70

KTE4 Series – 14.63" x 2.46" Housing

Watts/Square Inch vs. Temperature Data

Heater Wattage	Heater Face Watt Density*		Heater Body Temp @ 72°F**		Peak Emitted Wavelength*** (microns)	
	Style S	Style C	Style S	Style C	Style S	Style C
200	7.63	6.54	578	526	5.02	5.29
250	9.54	8.18	658	602	4.66	4.91
300	11.45	9.81	726	669	4.40	4.62
375	14.31	12.26	811	752	4.10	4.30
400	15.27	13.08	836	777	4.03	4.22
500	19.08	16.35	921	862	3.78	3.95
600	22.90	19.62	992	931	3.59	3.75
750	28.63	24.53	1085	1019	3.38	3.53
800	30.53	26.16	1114	1046	3.31	3.46
900	34.35	29.43	1171	1098	3.20	3.35
1000	38.17	32.70	1224	1147	3.10	3.25
1250	47.71	40.88	1341	1261	2.90	3.03
1500	57.25	49.05	1425	1355	2.77	2.87
1650	62.98	53.96	1459	1400	2.72	2.80
1700	64.89	55.59	1469	1413	2.70	2.79
1750	66.79	57.23	1478	1425	2.69	2.77
1800	--	58.86	--	1435	--	2.75
1850	--	60.50	--	1445	--	2.74
1900	--	62.13	--	1455	--	2.72
2000	--	65.40	--	1471	--	2.70

KTE5 Series – 19.50" x 2.46" Housing

Watts/Square Inch vs. Temperature Data

Heater Wattage	Heater Face Watt Density*		Heater Body Temp @ 72°F**		Peak Emitted Wavelength*** (microns)	
	Style S	Style C	Style S	Style C	Style S	Style C
250	7.16	6.13	556	505	5.14	5.41
300	8.59	7.36	620	565	4.83	5.09
375	10.73	9.20	702	645	4.49	4.72
400	11.45	9.81	726	669	4.40	4.62
500	14.31	12.26	811	752	4.10	4.30
600	17.17	14.71	880	822	3.89	4.07
750	21.47	18.39	966	907	3.66	3.82
800	22.90	19.62	992	931	3.59	3.75
900	25.76	22.07	1040	977	3.48	3.63
1000	28.62	24.52	1085	1019	3.38	3.53
1250	35.78	30.65	1191	1116	3.16	3.31
1500	42.93	36.78	1287	1205	2.99	3.13
1650	47.22	40.46	1336	1255	2.90	3.04
1700	48.65	41.69	1351	1271	2.88	3.01
1750	50.09	42.91	1366	1286	2.86	2.99
1800	51.52	44.14	1379	1301	2.84	2.96
1900	54.38	46.59	1403	1329	2.80	2.92
2000	57.24	49.04	1425	1355	2.77	2.87
2200	62.97	53.95	1459	1400	2.72	2.80
2300	65.83	56.40	1473	1419	2.70	2.78
2400	—	58.85	—	1435	—	2.75
2500	—	61.30	—	1450	—	2.73
2600	—	63.76	—	1463	—	2.71
2700	—	66.21	—	1475	—	2.70

* **Watt density** calculated using heater face surface area.

** **E-Mitter heater body temperature** as measured with internal thermocouple when mounted facedown in stock CRK reflector and operating in 72°F (22°C) room ambient.

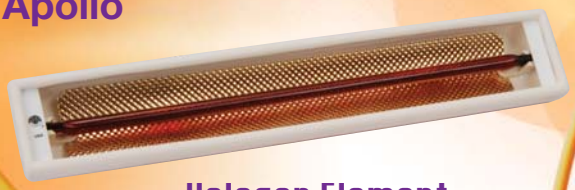
*** **Peak infrared radiation wavelength** as calculated from Wien's Law, for operating temperature shown. Expressed in microns (µm).

Operating temperature based on room ambient testing @ 72°F

VIRTUAL SOLAR VS GLOW® Infrared Heaters

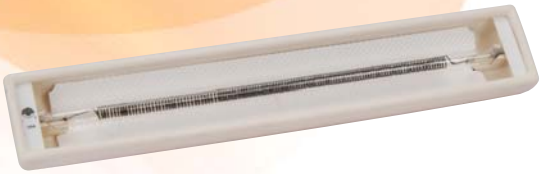
Near-Zero Thermal Expansion Ceramic Housing with a Ceramic Gold or White Coated Reflector, providing Superior Energy Efficiency and Maximum Heat Transfer

Apollo™



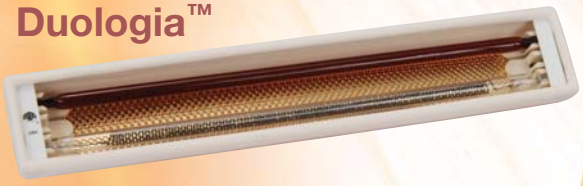
Halogen Element - Short Wave

Carbono™



Carbon Element - Medium Wave

Duologia™

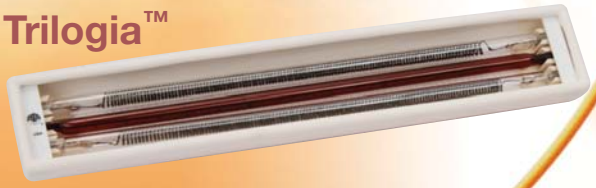


Halogen/Carbon Elements - Short-Medium Wave

Orion™

Resistance Wire Element - Medium-Long Wave

Trilogia™



Universal Mounting Heads

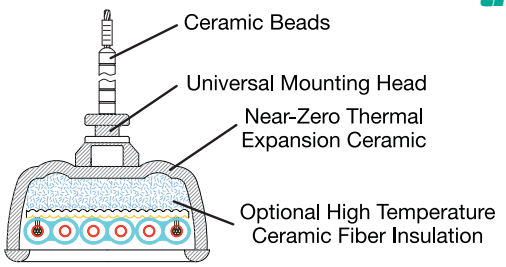
One-Piece Mounting Clips

See page 7-39 for details.

ANOTHER Tempco ORIGINAL

VS Glow Is the Newest and Most Technically Advanced Infrared Heater that Generates Instantaneous Heat

Liquid or Air Cooling Not Required to Protect the Ceramic Housing from Overheating

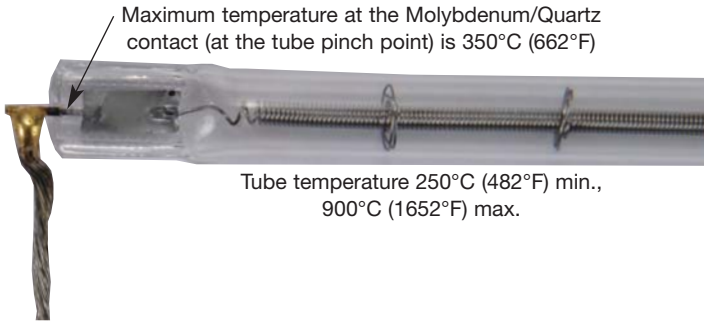


Truly Efficient Infrared Heating Systems

The small amount of energy that is not reflected by the gold or white layer is conducted through the ceramic body to an optional insulated layer of ceramic fiber. This highly efficient system of insulating layers guarantees that very little heat energy is wasted to the surrounding environment.

At 0.8μm the temperature of the tungsten element on a halogen IR lamp is ~2600°C (4712°F). The temperature in the outer surface of a VS Apollo Glow is less than 600°C (1112°F) with a ΔT of 2000°C (3632°F) at a distance of 0.75 inches.

Important Temperature Restrictions for VS Glow IR Heaters



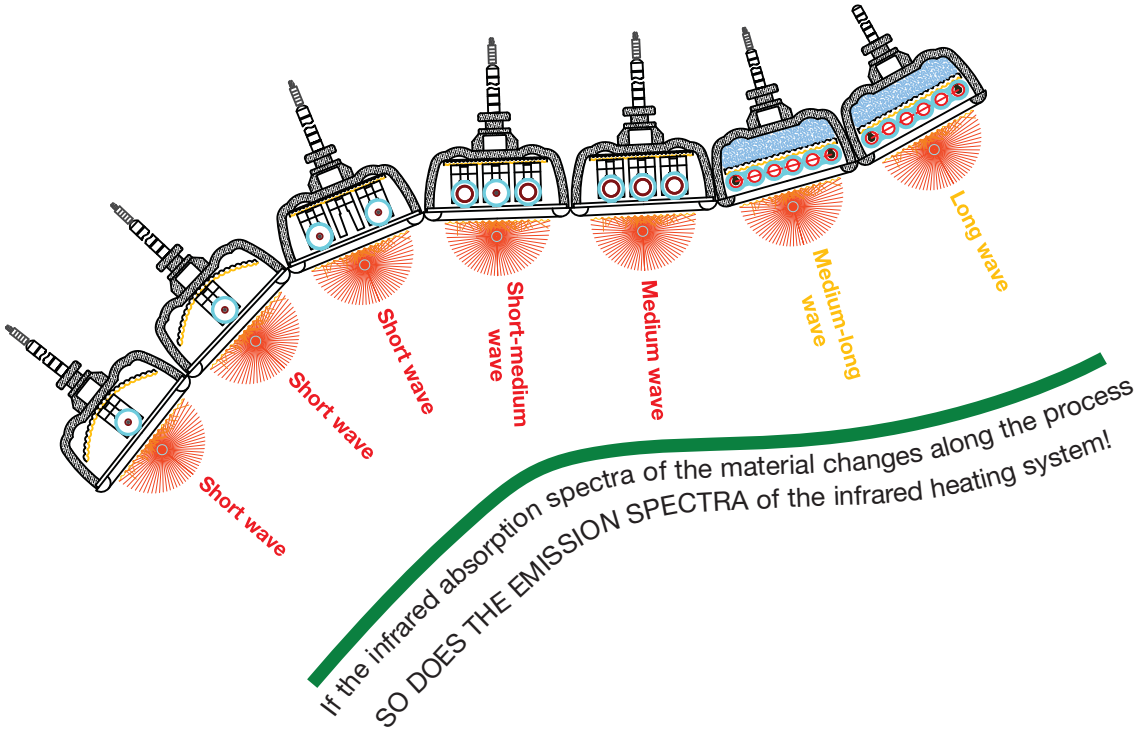
Standard Constructions

VS Glow Series	Element Type Options	Reflector Style	Electrical
Apollo™  ***Short Wave***	***Halogen Lamp*** **Clear Quartz** – 95% IR Transmission **Ruby Quartz** – Easy on the Eye	***Parabolic Shaped*** ***Surface:*** 24-K Gold or White	***Max. Wattage:*** 2500 W (Single IR Lamp) ***Watt Density:*** Up to 222 watts per linear inch ***Volts:*** 120, 208, 240
Duologia/Trilogia™  ***Short-Medium Wave Dual or Triple Wavelengths***	***Halogen Lamp*** **Clear Quartz** – 95% IR Transmission **Ruby Quartz** – Easy on the Eye ***Carbon Lamp*** **Clear Quartz** – 95% IR Transmission	***Flat Shaped*** ***Surface:*** 24-K Gold or White	***Max. Wattage:*** 1500 W (Halogen) 750 W (Carbon) ***Watt Density:*** Up to 244 watts per linear inch ***Volts:*** 120, 208, 240
Carbono™  ***Medium Wave***	***Carbon Lamp*** **Clear Quartz** – 95% IR Transmission	***Parabolic Shaped*** ***Surface:*** 24-K Gold or White	***Max. Wattage:*** 1500 W ***Watt Density:*** Up to 222 watts per linear inch ***Volts:*** 120, 208, 240
Orion™  ***Medium-Long Wave***	***Nickel-Chromium Resistance Wire*** **Gemini Quartz** – Twin Bore Tubing	***Flat Shaped*** ***Surface:*** 24-K Gold or White	***Max. Wattage:*** 2000 W ***Watt Density:*** Up to 186 watts per linear inch ***Volts:*** 120, 208, 220/240, 480

Precision Varying Wavelength Infrared Technology

VS Glow Infrared Heaters Are a Clean Operating Heat Source Suitable for Many Applications

Superior Energy Efficiency with Minimum Heat Losses Projected through the Ceramic Housing



CONVEYOR SYSTEM HEATING EXAMPLE

Infrared radiation is absorbed by organic molecules and converted into energy of molecular vibration. An efficient infrared heating system would be comprised of a set of infrared heaters with their emissive wavelengths finely tuned to match the absorption wavelengths for a given application at its various stages in the heating process.

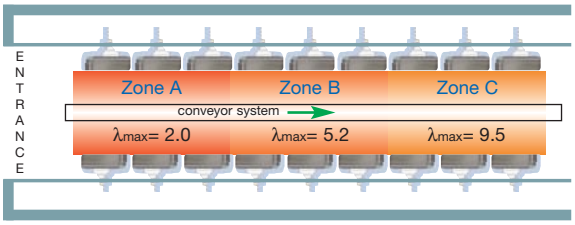
In the example:

Zone A, near the entrance of the conveyor system, may contain short wave heaters operating at near 2 µm to match the first peak of the absorption spectra for water (around 95%); see Figure 1.

Zone B, in the middle of the heating application, may employ medium wave heaters to match the second highest absorption peak (around 94%).

Zone C, near the exit, may use long wave heaters to match the final high absorption peak (around 78%) and to prevent a strong thermal shock to the application material.

Conveyor System Installation



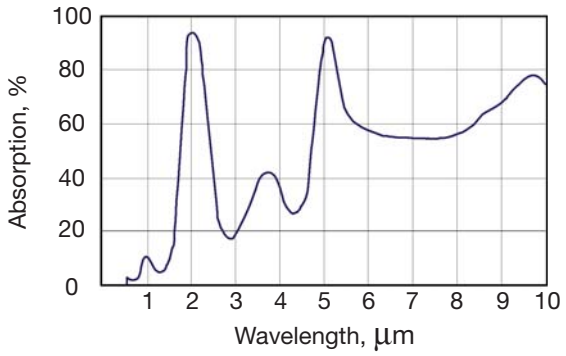
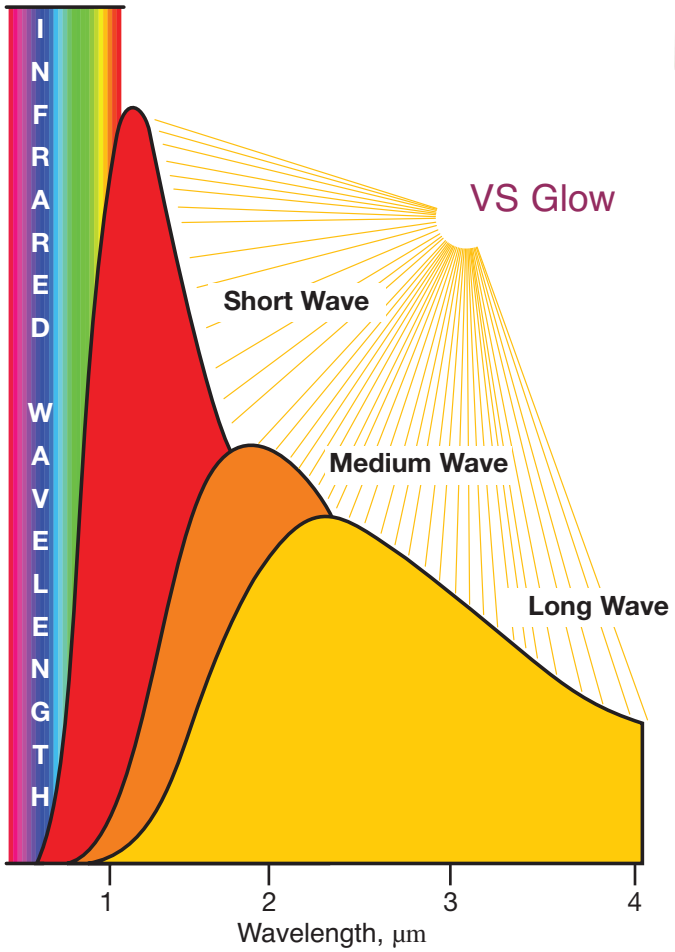


Figure 1. Absorption spectra for water

VS Glow Infrared Heaters Cover the Full Infrared Spectrum of Electromagnetic Radiation



Apollo	Short Wave, 0.8 - 2.0 µm
Duo/Trilogia	Short-Medium Wave, 0.8 - 3.5µm
Carbono	Medium Wave, 2.0 - 3.5 µm
Orion	Medium-Long Wave, 2.0 - > 3.5 µm
Orion	Long Wave, > 3.5 µm

Unique Reflector Technology

Single Infrared Elements — Directional heat is easily achieved by positioning the coil in one focus of a parabolic shaped ceramic reflector. The surface of the reflector can be made of a highly reflective surface, i.e. 24-K gold.

Multiple Infrared Elements — To spread the heat more evenly inside the ceramic housing and send it to the application, the flat reflector has a domic surface. Surfaces covered with gold domes will have more specular reflection while white and black domes will have more mixed and diffuse reflections, respectively. Thus, the choice of the reflecting surface depends on the characteristics of the striking IR energy that comes from the surface of the heated material.

Also Available: Twin Halogen IR Lamps and Carbon IR Lamps
Complete Listings at www.tempco.com

Gemini*Hyb*

Gemini*Hal*

	Gemini*Hal* Short Wave Halogen-Tungsten Element	Gemini*Car* Medium Wave Carbon Element	Gemini*Hyb* Short-Medium Wave Halogen-Tungsten & Carbon Elements
Power Density watts/in (max.)	180	110	140
Main Wavelength µm	1.2-2.0	2.0-2.6	1.4-2.6
Twin Bore Tube Size B: 23 × 11 mm	X	—	—
Twin Bore Tube Size C: 33 × 14 mm	—	X	X
Tube Length	Variable	Variable	Variable
Reaction Time (seconds)	1-2	1-2	1-2
Gold Reflective Coating	X	X	X
White Reflective Coating	X	X	X

Apollo Series High Density Shortwave Single IR Lamp

Shown with Clear Halogen-Tungsten IR Lamp and Ceramic Gold Reflector.

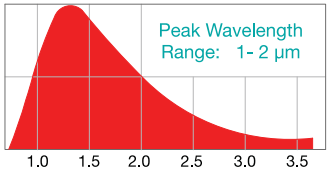
Typical Semiconductor Industry Applications

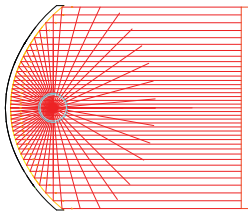
- *Etching*
- *Rapid Thermal Process*
- *Strip Removal*
- *Epitaxy*
- *Chemical Vapor Deposit*

Design Features

- *True Parabolic Ceramic Reflector*
- *High Density Ceramic Shortwave Infrared Radiation up to 222 watts per linear inch*
- *Very Fast ON/OFF Time: 1-2 seconds*
- *All Ceramic Housing Construction*
- *Standard Lamp Voltages: 120 & 240*
- *All units are double-ended construction.*

Spectral Radiation Distribution





Single Shortwave Element with *Parabolic* Reflector

Style	IR Reflective Surface	Quartz Color
1	White	Clear
2	Gold	Clear
3	White	Ruby
4	Gold	Ruby

Apollo 367 Series – 14.48" (367 mm) Overall Length

Single Element One Wavelength

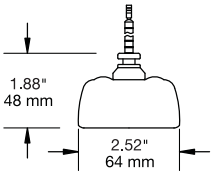
Unit Linear Watts/in.	Wattage	Voltage	Part Number Style 1 White Reflector Clear Lamp	Style 2 Gold Reflector Clear Lamp	Style 3 White Reflector Ruby Lamp	Style 4 Gold Reflector Ruby Lamp
58	650	120 240	VSA00042 VSA00018	VSA00041 VSA00017	VSA00044 VSA00020	VSA00043 VSA00019
67	750	120 240	VSA00046 VSA00022	VSA00045 VSA00021	VSA00048 VSA00024	VSA00047 VSA00023
89	1000	120 240	VSA00034 VSA00002	VSA00033 VSA00001	VSA00036 VSA00004	VSA00035 VSA00003
116	1300	120 240	VSA00050 VSA00026	VSA00049 VSA00025	VSA00052 VSA00028	VSA00051 VSA00027
133	1500	120 240	VSA00038 VSA00006	VSA00037 VSA00005	VSA00040 VSA00008	VSA00039 VSA00007
151	1700	120 240	N/A VSA00030	N/A VSA00029	N/A VSA00032	N/A VSA00031
178	2000	120 240	N/A VSA00010	N/A VSA00009	N/A VSA00012	VN/A VSA00011
222	2500	120 240	N/A VSA00014	N/A VSA00013	N/A VSA00016	N/A VSA00015

Apollo 245 Series – 9.65" (245 mm) Overall Length

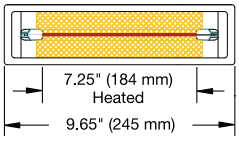
Single Element One Wavelength

Unit Linear Watts/in.	Wattage	Voltage	Part Number Style 1 White Reflector Clear Lamp	Style 2 Gold Reflector Clear Lamp	Style 3 White Reflector Ruby Lamp	Style 4 Gold Reflector Ruby Lamp
90	650	120 240	VSA00066 VSA00054	VSA00065 VSA00053	VSA00068 VSA00056	VSA00067 VSA00055
103	750	120 240	VSA00070 VSA00058	VSA00069 VSA00057	VSA00072 VSA00060	VSA00071 VSA00059
117	850	120 240	VSA00074 VSA00062	VSA00073 VSA00061	VSA00076 VSA00064	VSA00075 VSA00063

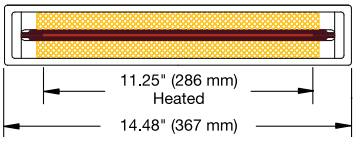
VS Glow heaters listed have 6" ceramic bead insulated leads and a one-piece spring clip for mounting.



Series 245



Series 367



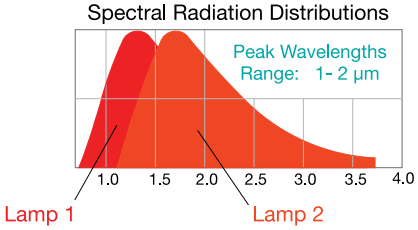
Product Inventory Available for Viewing and Selection @ www.tempco.com

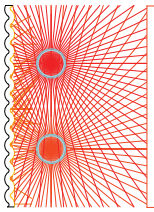
Apollo Series High Density Shortwave Dual IR Lamps

Design Features

- *Flat Ceramic Reflector*
- *High Density Ceramic Shortwave Infrared Radiation up to 222 watts per linear inch*
- *Very Fast ON/OFF Time: 1-2 seconds*
- *All Ceramic Housing Construction*
- *Standard lamp voltages: 120 & 240*
- *All units are double-ended construction.*

Shown with Ruby Quartz Halogen Lamps.





Dual Shortwave Element with *Flat* Reflector

Style	IR Reflective Surface	Quartz Color
1	White	Clear
2	Gold	Clear
3	White	Ruby
4	Gold	Ruby

Apollo 367 Series – 14.48" (367 mm) Overall Length

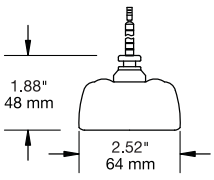
Dual Elements = Dual Wavelengths

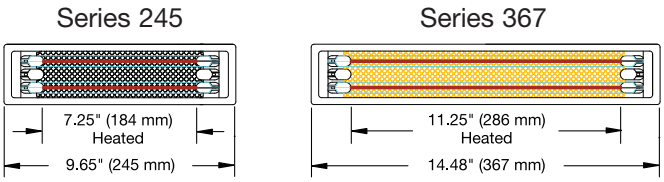
Unit Linear Watts/in.	Unit Total Wattage	Lamp 1 Wattage	Lamp 2 Wattage	Voltage	Part Number Style 1 White Reflector Clear Lamp	Style 2 Gold Reflector Clear Lamp	Style 3 White Reflector Ruby Lamp	Style 4 Gold Reflector Ruby Lamp
187	2100	1000	1100	120	VSA00094	VSA00093	VSA00096	VSA00095
				240	VSA00078	VSA00077	VSA00080	VSA00079
196	2200	1100	1100	120	VSA00098	VSA00097	VSA00100	VSA00099
				240	VSA00082	VSA00081	VSA00084	VSA00083
204	2300	1000	1300	120	VSA00102	VSA00101	VSA00104	VSA00103
				240	VSA00086	VSA00085	VSA00088	VSA00087
222	2500	1000	1500	120	N/A	N/A	N/A	N/A
				240	VSA00090	VSA00089	VSA00092	VSA00091

Apollo 245 Series – 9.65" (245 mm) Overall Length

Dual Elements = Dual Wavelengths

Unit Linear Watts/in.	Unit Total Wattage	Lamp 1 Wattage	Lamp 2 Wattage	Voltage	Part Number Style 1 White Reflector Clear Lamp	Style 2 Gold Reflector Clear Lamp	Style 3 White Reflector Ruby Lamp	Style 4 Gold Reflector Ruby Lamp
193	1400	650	750	120	VSA00114	VSA00113	VSA00116	VSA00115
				240	VSA00106	VSA00105	VSA00108	VSA00107
207	1500	650	850	120	VSA00118	VSA00117	VSA00120	VSA00119
				240	VSA00110	VSA00109	VSA00112	VSA00111





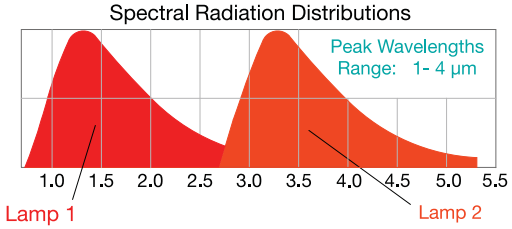
VS Glow heaters listed have 6" ceramic bead insulated leads and a one-piece spring clip for mounting.

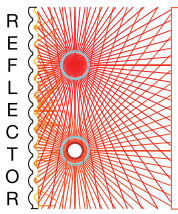
Duologia Series Short-Medium Wave Double IR Lamps

Shown with Carbon Lamp (top), Halogen Lamp (bottom).

Design Features

- *High Short-Medium Wave Infrared Radiation Density up to 244 watts per linear inch*
- *Very Fast ON/OFF Time: 1-2 seconds*
- *All Ceramic Housing Construction*
- *Standard lamp voltages: 120 & 240*
- *All units are double-ended construction.*





Dual Short/Medium Wave Elements with *Flat* Reflector

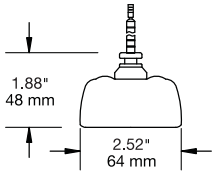
Style	IR Reflective Surface	Quartz Color
1	White	Clear
2	Gold	Clear
3	White	Ruby
4	Gold	Ruby

Duologia 367 Series – 14.48" (367 mm) Overall Length

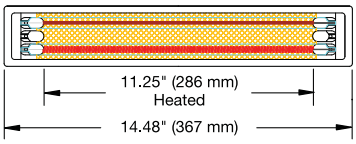
Dual Elements = Dual Wavelengths

Unit Linear Watts/in.	Unit Total Wattage	Lamp 1 Wattage	Lamp 2 Wattage	Voltage	Part Number Style 1 White Reflector Clear Lamp	Style 2 Gold Reflector Clear Lamp	Style 3 White Reflector Ruby Lamp	Style 4 Gold Reflector Ruby Lamp
147	1650	1000	650	120 240	VSD00074 VSD00034	VSD00073 VSD00033	VSD00076 VSD00036	VSD00075 VSD00035
156	1750	1000	750	120 240	VSD00070 VSD00030	VSD00069 VSD00029	VSD00072 VSD00032	VSD00071 VSD00031
178	2000	1000	1000	120 240	VSD00066 VSD00026	VSD00065 VSD00025	VSD00068 VSA00028	VSD00067 VSD00027
191	2150	1500	650	120 240	VSD00062 VSD00022	VSD00061 VSD00021	VSD00064 VSD00024	VSD00063 VSD00023
200	2250	1500	750	120 240	VSD00058 VSD00018	VSD00057 VSD00017	VSD00060 VSD00020	VSD00059 VSD00019
222	2500	1500	1000	120 240	VSD00078 VSD00038	VSD00077 VSD00037	VSD00080 VSD00040	VSD00079 VSD00039
209	2350	1700	650	120 240	N/A VSD00042	N/A VSA00041	N/A VSD00044	N/A VSD00043
218	2450	1700	750	120 240	N/A VSD00046	N/A VSD00045	N/A VSD00048	N/A VSD00047
236	2650	2000	650	120 240	N/A VSD00050	N/A VSD00049	N/A VSD00052	N/A VSD00051
244	2750	2000	750	120 240	N/A VSD00054	N/A VSD00053	N/A VSD00056	N/A VSD00055

VS Glow heaters listed have 6" ceramic bead insulated leads and a one-piece spring clip for mounting.



Series 367 (No Series 245 Version)



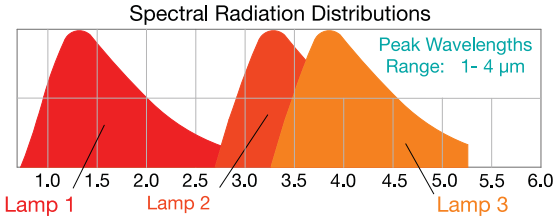
Product Inventory Available for Viewing and Selection @ www.tempco.com

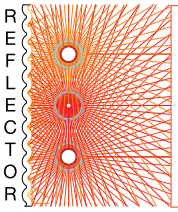
Trilogia Series Short-Medium Wave Triple IR Lamps

Design Features

- *High Short-Medium Wave Infrared Radiation Density up to 222 watts per linear inch*
- *Very Fast ON/OFF Time: 1-2 seconds*
- *All Ceramic Housing Construction*
- *Standard lamp voltages: 120 & 240*
- *All units are double-ended construction.*

Shown with Carbon Lamp (top),
Ruby Quartz Halogen-Tungsten Lamp (middle),
Carbon Lamp (bottom).





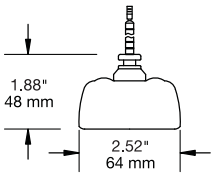
Triple Short/Medium Wave Elements with *Flat* Reflector

Style	IR Reflective Surface	Quartz Color
1	White	Clear
2	Gold	Clear
3	White	Ruby
4	Gold	Ruby

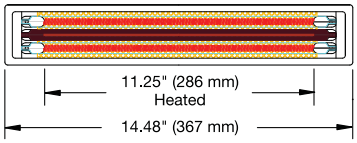
Trilogia 367 Series – 14.48" (367 mm) Overall Length

Triple Elements = Triple Wavelengths

Unit Linear Watts/in.	Unit Total Wattage	Lamp 1 Wattage	Lamp 2 Wattage	Lamp 3 Wattage	Voltage	Part Number Style 1 White Reflector Clear Lamp	Style 2 Gold Reflector Clear Lamp	Style 3 White Reflector Ruby Lamp	Style 4 Gold Reflector Lamp
182	2050	650	750	650	120 240	VST00044 VST00028	VST00043 VST00027	VST00046 VST00030	VST00045 VST00029
200	2250	750	750	750	120 240	VST00040 VST00024	VST00039 VST00023	VST00042 VST00026	VST00041 VST00025
204	2300	650	1000	650	120 240	VST00036 VST00020	VST00035 VST00019	VST00038 VST00022	VST00037 VST00021
222	2500	750	1000	750	120 240	VST00032 VST00016	VST00031 VST00015	VST00034 VST00018	VST00033 VST00017



Series 367 (No Series 245 Version)



VS Glow heaters listed have
6" ceramic bead insulated leads and
a one-piece spring clip for mounting.

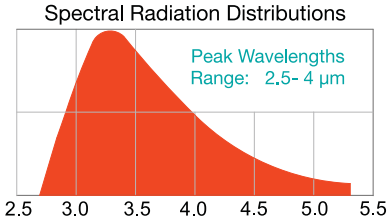
Carbono Series Medium Wave Single IR Lamps

Shown with single Carbon Element and White Reflector.

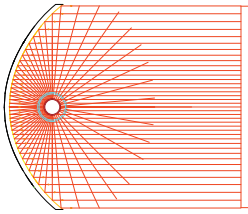
Design Features

- *High Short-Medium Wave Infrared Radiation Density up to 98 watts per linear inch*
- *Very Fast ON/OFF Time: 1-2 seconds*
- *All Ceramic Housing Construction*
- *Standard lamp voltages: 120 & 240*
- *All units are double-ended construction.*

Spectral Radiation Distributions



Directional Heat



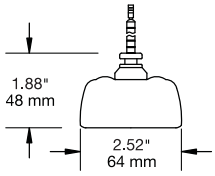
Single Medium Wave Element with *Parabolic* Reflector

Style	IR Reflective Surface	Quartz Color
1	White	Clear
2	Gold	Clear

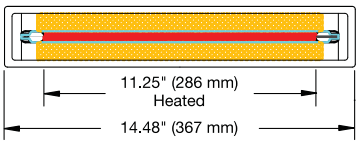
Carbono 367 Series – 14.48" (367 mm) Overall Length

Single Element Single Wavelength

Unit Linear Watts/in.	Wattage	Voltage	Part Number Style 1 White Reflector Clear Quartz	Part Number Style 2 Gold Reflector Clear Quartz
58	650	120 240	VSC00010 VSC00002	VSC00009 VSC00001
67	750	120 240	VSC00012 VSC00004	VSC00011 VSC00003
89	1000	120 240	N/A VSC00006	N/A VSC00005
98	1100	120 240	N/A VSC00008	N/A VSC00007



Series 367 (No Series 245 Version)



VS Glow heaters listed have 6" ceramic bead insulated leads and a one-piece spring clip for mounting.

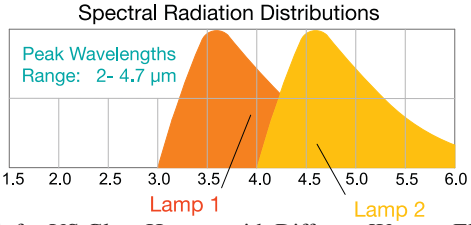
Carbono Series Dual Wave IR Lamps

Design Features

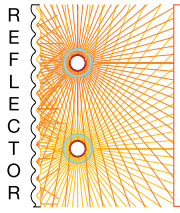
- *High Short-Medium Wave Infrared Radiation Density up to 196 watts per linear inch*
- *Very Fast ON/OFF time, 1-2 seconds*
- *All Ceramic Construction*
- *Standard lamp voltages: 120 & 240*
- *All units are double-ended construction.*

Shown with Carbon Elements and Domic Gold Ceramic Reflector.

Spectral Radiation Distributions



Graph for VS Glow Heaters with Different Wattage Elements



Dual Medium Wave Element with *Flat* Reflector

Style	IR Reflective Surface	Quartz Color
1	White	Clear
2	Gold	Clear

CONTINUED

Continued from previous page...

Carbono 367 Series – 14.48" (367 mm) Overall Length

Two Elements = Dual Wavelengths

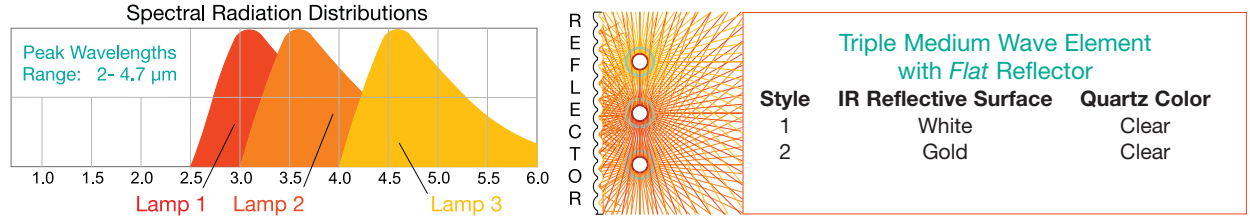
Unit Linear Watts/in.	Unit Total Wattage	Lamp 1 Wattage	Lamp 2 Wattage	Voltage	Part Number Style 1 White Reflector Clear Quartz	Part Number Style 2 Gold Reflector Clear Quartz
116	1300	650	650	120 240	VSC00032 VSC00014	VSC00031 VSC00013
124	1400	650	750	120 240	VSC00034 VSC00016	VSC00033 VSC00015
147	1650	650	1000	120 240	VSC00036 VSC00018	VSC00035 VSC00017
156	1750	650	1100	120 240	VSC00038 VSC00020	VSC00037 VSC00019
133	1500	750	750	120 240	VSC00040 VSC00022	VSC00039 VSC00021
156	1750	750	1000	120 240	VSC00042 VSC00024	VSC00041 VSC00023
164	1850	750	1100	120 240	VSC00044 VSC00026	VSC00043 VSC00025
178	2000	1000	1000	120 240	VSC00046 VSC00028	VSC00045 VSC00027
196	2200	1000	1100	120 240	VSC00048 VSC00030	VSC00047 VSC00029

Carbono Series Triple Wave IR Lamps

Design Features

- ***Medium Wave Infrared Radiation Density up to 222 watts per linear inch***
- ***Very Fast ON/OFF Time: 1-2 seconds***
- ***All Ceramic Housing Construction***
- ***Standard lamp voltages: 120 & 240***
- ***All units are double-ended construction.***

Shown with Carbon Elements and Flat White Ceramic Reflector.



Graph for VS Glow Heaters with Different Wattage Elements

Carbono 367 Series – 14.48" (367 mm) Overall Length

Three Elements = Triple Wavelengths

Unit Linear Watts/in.	Unit Total Wattage	Lamp 1 Wattage	Lamp 2 Wattage	Lamp 3 Wattage	Voltage	Part Number Style 1 White Reflector Clear Quartz	Part Number Style 2 Gold Reflector Clear Quartz
173	1950	650	650	650	120 240	VSC00058 VSC00050	VSC00057 VSC00049
200	2250	750	750	750	120 240	VSC00060 VSC00052	VSC00059 VSC00051
213	2400	650	750	1000	120 240	VSC00062 VSC00054	VSC00061 VSC00053
222	2500	650	750	1100	120 240	VSC00064 VSC00056	VSC00063 VSC00055

Orion Series Medium Long Wave Translucent IR Lamps

Design Features

- *All Ceramic Housing Construction*
- *Capable of delivering all medium and long wavelengths in any voltage from 120 to 480 volts*
- *Available in translucent or clear tubes with up to 95% IR transmittance*
- *24-K gold or white reflective surface*
- *Optional Type K thermocouple available*

Near-Zero Thermal Expansion Ceramic Housing

Construction Features

The ferritic alloy (FeCrAl) resistance coil is uniformly stretched and placed inside a stress-free environment in either translucent or clear round quartz tubes. At the time of energization, the coil will expand without any physical constraint and last longer as opposed to the physical constraints imposed by the ceramic on the coils of standard ceramic infrared heaters.

By employing quartz tubes with an infrared transmittance of up to 95%, the Joule heating generated at the coil finds a venue to exit the tube's wall without substantial losses. The infrared energy coming out of the tubes in a 360° pattern must be then re-directed to the application and for that, a highly reflective gold surface (95% reflectivity) does the job. To further reduce heat losses to the back of the heater, an optional ceramic fiber with very low heat transfer conductivity is placed between the reflector and the back wall of the heater.

Style 1—Flat-White Ceramic Reflective Surface with Translucent Round Quartz Tube

Orion 367 Series – 14.48" (367 mm) Overall Length

Ferritic Alloy One Wavelength

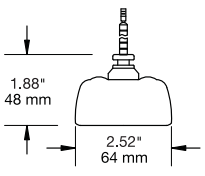
Unit Linear Watts/in.	Wattage	Voltage	Part Number Style 1 White Reflector
67	750	120 240 480	VSR00076 VSR00066 VSR00086
89	1000	120 240 480	VSR00077 VSR00067 VSR00087
133	1500	120 240 480	VSR00078 VSR00068 VSR00088
156	1750	120 240 480	VSR00079 VSR00069 VSR00089
178	2000	120 240 480	VSR00080 VSR00070 VSR00090

Orion 245 Series – 9.65" (245 mm) Overall Length

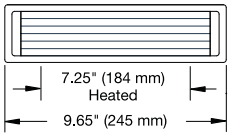
Ferritic Alloy One Wavelength

Unit Linear Watts/in.	Wattage	Voltage	Part Number Style 1 White Reflector
69	500	120 240 480	VSR00071 VSR00061 VSR00081
90	650	120 240 480	VSR00072 VSR00062 VSR00082
138	1000	120 240 480	VSR00073 VSR00063 VSR00083
166	1200	120 240 480	VSR00074 VSR00064 VSR00084
186	1350	120 240 480	VSR00075 VSR00065 VSR00085

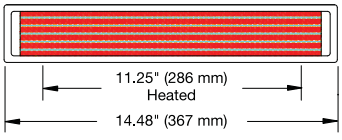
VS Glow heaters listed have 6" ceramic bead insulated leads and a one-piece spring clip for mounting.



Series 245



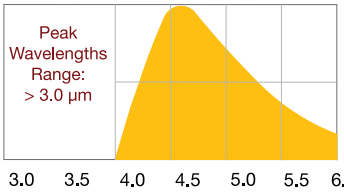
Series 367



Orion Series Medium Long Wave Clear IR Lamps

Shown with Gold Ceramic Reflector.

Spectral Radiation Distribution



Style 2—Flat-White Ceramic Reflective Surface with Clear Round Quartz Tubes
Style 3—Flat-Gold Coated Ceramic Reflective Surface with Clear Round Quartz Tubes

Orion 367 Series – 14.48" (367 mm) Overall Length

Ferritic Alloy One Wavelength

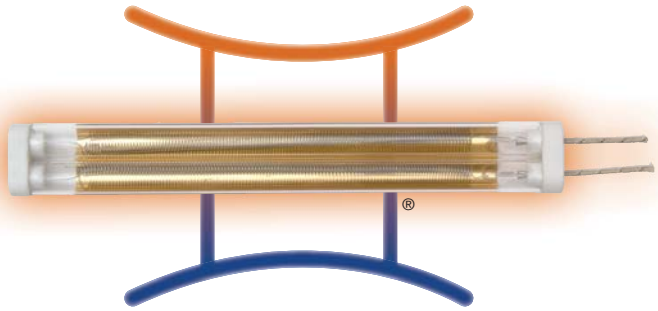
Unit Linear Watts/in.	Wattage	Voltage	Part Number Style 2 White Reflector	Part Number Style 3 Gold Reflector
67	750	120	VSR00032	VSR00031
		240	VSR00012	VSR00011
		480	VSR00052	VSR00051
89	1000	120	VSR00034	VSR00033
		240	VSR00014	VSR00013
		480	VSR00054	VSR00053
133	1500	120	VSR00036	VSR00035
		240	VSR00016	VSR00015
		480	VSR00056	VSR00055
156	1750	120	VSR00038	VSR00037
		240	VSR00018	VSR00017
		480	VSR00058	VSR00057
178	2000	120	VSR00040	VSR00039
		240	VSR00020	VSR00019
		480	VSR00060	VSR00059

Orion 245 Series – 9.65" (245 mm) Overall Length

Ferritic Alloy One Wavelength

Unit Linear Watts/in.	Wattage	Voltage	Part Number Style 2 White Reflector	Part Number Style 3 Gold Reflector
69	500	120	VSR00022	VSR00021
		240	VSR00002	VSR00001
		480	VSR00042	VSR00041
90	650	120	VSR00024	VSR00023
		240	VSR00004	VSR00003
		480	VSR00044	VSR00043
138	1000	120	VSR00026	VSR00025
		240	VSR00006	VSR00005
		480	VSR00046	VSR00045
166	1200	120	VSR00028	VSR00027
		240	VSR00008	VSR00007
		480	VSR00048	VSR00047
186	1350	120	VSR00030	VSR00029
		240	VSR00010	VSR00009
		480	VSR00050	VSR00049

Gemini® Infrared Heater Technology Emulates the Efficiency of Solar Energy in a Convenient Package for Hundreds of Industrial and Commercial Applications.



Gemini™ Medium Wave Heaters

Twin Bore Quartz Tube Technology

Design Features

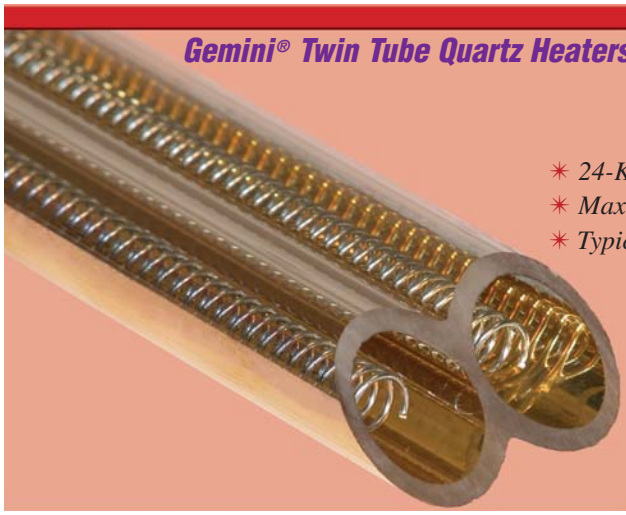
- *Industry standard twin bore quartz tube formats with 95% heat transmittance*
- *24-karat Gold Back Coating for targeted infrared applications*
- *White Ceramic Reflective Back Coating for extreme temperature requirements*
- *High power densities: 42/51/63 w/in (16/20/25 w/cm)*
- *Fast heat-up rates — Less than one minute to reach steady state conditions*
- *Very long operating life — Over 10,000 hours of highly efficient and economical continuous operation*
- *Three industry standard sizes in lengths up to 118 in. (3000mm)*

Complete Infrared Heat Technology for Every Industrial and Commercial Application Under the Sun

Medium Wave Infrared E-Mitters

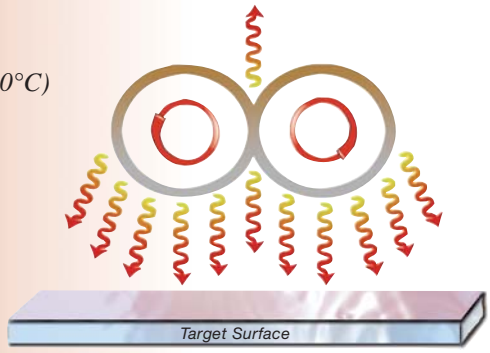
Tempco has developed specialized coatings to control the directional nature of the infrared energy emitted from the Gemini twin bore heaters. High levels of energy reflection are achieved by selectively bonding an integral high temperature coating to the half-hemisphere of the quartz tube surfaces facing away from the targeted surface. The choice of a gold or white ceramic coating depends on the maximum operating temperature required in the heating system. Also available is a clear 360° emitter for use in applications that will employ external reflective or focusing surfaces around the heater.

Gemini® Twin Tube Quartz Heaters with Gold Back Coating



95% Heat Reflection toward working surface

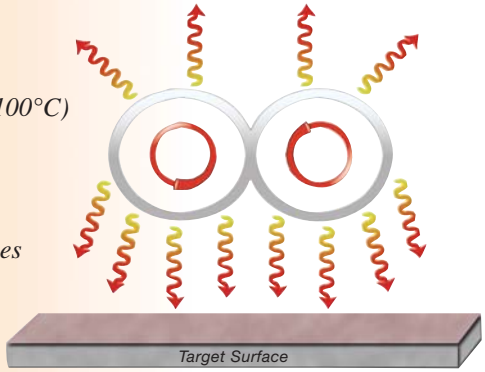
- *24-Karat Gold Back Coating*
- *Maximum Coil Temp 1472°F (800°C)*
- *Typical Applications:*
  - *-Glass Processing Industry*
  - *-Paper and Textile Industries*
  - *-Plastics Industry*



Gemini® Twin Tube Quartz Heaters with White Ceramic Back Coating

75% Heat Reflection toward working surface

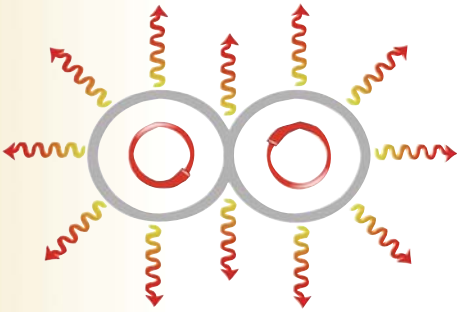
- *White Proprietary Formula Reflective Back Coating*
- *Maximum Coil Temp. 2012°F (1100°C)*
- *Typical Applications:*
  - *-Stress Relieving of Metal Components*
  - *-Drying Foils*
  - *-Paper and Textile Industries*



Gemini® Twin Tube Quartz Heaters Without Coating (for external reflector)

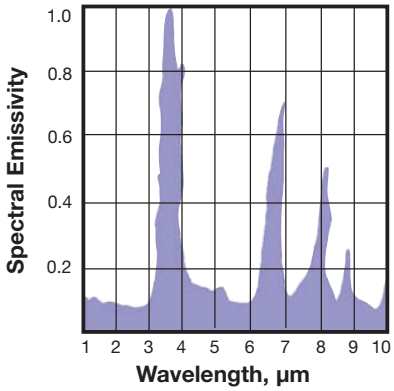
360° Heat Radiation

- *No back coating*
- *Maximum Coil Temp. 2012°F (1100°C)*
- *Typical Applications:*
  - *-PVC Panel Coating Cure*
  - *-Curing Coating on Rubber Seals*
  - *-Powder Coating Industry*
  - *-Wood Processing Industry*
  - *-Culinary Arts Industry*



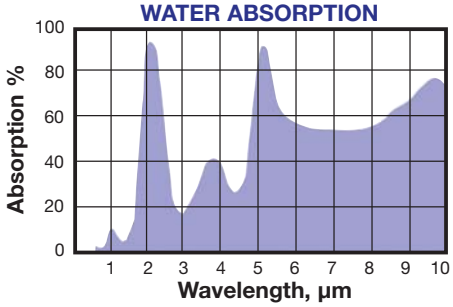
Medium Wave Infrared E-Mitters

SPECTRAL EMISSIVITY OF PET FILM



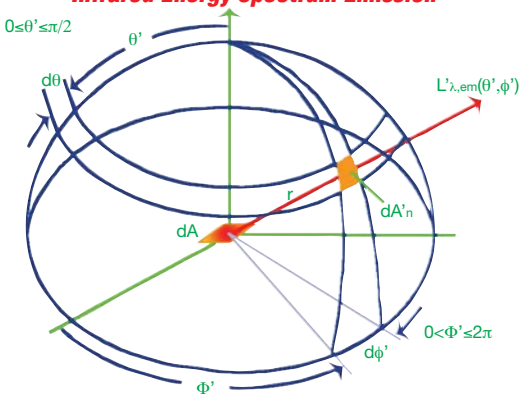
WAVELENGTH CONTROL – The very low heat transmission losses through the clear quartz material of the twin bore heaters allow Tempco's engineers to carefully design the peak emitted wavelength of these heaters to match the peak absorption wavelength for a given material or application. By modifying the temperature of the emitter, its peak emitted wavelength will change according to Wien's displacement law (see pg. 7-107). All emitters will emit a range of wavelengths above and below their peak value. (See spectrum graph on page 7-103.) The design of an efficient infrared heating system must consider both the spectral nature and directional properties of thermal radiation.

WATER ABSORPTION



SPECTRAL NATURE: To address this issue, heaters should be designed to emit wavelengths that closely match the absorption band of the processed material in a given application. By carefully considering the broad side-bands of the emitted radiation and absorption, it is possible to design systems that will enhance the heat transfer rates at different stages of the heating process.

Infrared Energy Spectrum Emission



Vaporization of water is best achieved in the infrared spectrum at wavelengths in the range of 3.1 and 6.1 μm (microns). After the water is removed, the infrared heating rate should match the absorption spectrum of the base material to avoid damaging it thermally. Similar approaches are used in many industries, such as Automotive, Glass and Plastic processing, Textiles, Electronics and many others.

DIRECTIONAL NATURE: The directional nature of the heat distribution is dealt with by consideration of how to direct heat toward an application. The efficiency of the heating system depends strongly on the percentage of the total infrared energy generated at the resistance coil that reaches the target material. Consideration must be given to the fact that this infrared energy propagates from the emitter in all possible directions in a non-uniform distribution of single wavelength components.

Design Specifications

Performance Ratings

Reflective Backing	Gold	White Ceramic	Clear* (no backing)
Maximum Coil Temperature	1472ºF (800ºC)	2012ºF (1100ºC)	2012ºF (1100ºC)
Peak Emitted Wavelength Range (microns)	2.7-6.5	2.1-6.5	2.1-6.5
Radiation Pattern	180º	180º	360º
Nominal Reflected Heat Efficiency	95%	75%	0%

*Clear tubes are designed for use with external reflector.

Electrical Ratings

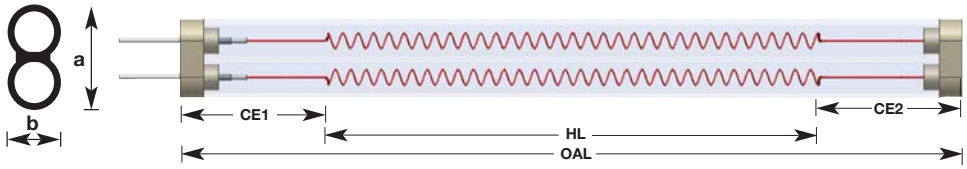
Twin Bore Format Style	A (17 x 8mm)	B (23 x 11mm)	C (33 x 15mm)
Maximum Power Density (per unit length)	42 w/in (16.5 w/cm)	51 w/in (20 w/cm)	63 w/in (25 w/cm)
Maximum Voltage	480V	480V	600V
Maximum Amperage	10A	15A	25A
Maximum Surface Watt Density	32wsi	36wsi	36wsi

Standard wattage tolerance is +5%, -10%; closer tolerances available upon request

Medium Wave Infrared E-Mitters

Wire Leads for Standard Configuration are 18 ga. Stranded Lead Wire, Rated 842°F (450°C), 600V.

OAL: Overall Length
CE1: Lead End Cold Section
HL: Heated Length
CE2: Blind End Cold Section



Dimensional Specifications

Twin Bore Tube Sizes	A	B	C
Twin Tube Section Dimensions (a x b)	17 mm x 8 mm (.67 × .31 in)	23mm × 11mm (.91 x .43 in)	33mm × 15mm (1.3 x .59 in)
Maximum Length (OAL)	2000 mm (78.75 in)	2000 mm (78.75 in)	3000 mm (118 in)
Minimum Length (OAL)	122 mm (4.8 in)	245 mm (9.65 in)	245 mm (9.65 in)
Minimum Lead End Cold Length (Std. CE1) (both ends of double end units)	25 mm (.98 in)	38 mm (1.50 in)	41 mm (1.61 in)
Minimum Blind End Cold Length (Std. CE2) (single ended units only)	19 mm (.75 in)	19 mm (.75 in)	19 mm (.75 in)
Overall Length (OAL) Tolerance			
Up to 500 mm (19.7 in)	± 2.5mm (.10 in)		
501-1000 mm (19.7-39.4 in)	± 3.5mm (.14 in)		
1001-1500 mm (39.4-59.0 in)	± 5mm (.20 in)		
Over 1500 mm (59.0 in)	± 6mm (.24 in)		
Heated Length (HL) Tolerance			
Up to 500 mm (19.7 in)	± 5mm (.20 in)		
501-1000 mm (19.7-39.4 in)	± 7mm (.28 in)		
1001-1500 mm (39.4-59.0 in)	±10mm (.39 in)		
Over 1500 mm (59.0 in)	±12mm (.47 in)		

Consult factory for closer tolerances.

Exceptional Clear Quartz Twin Bore Material with Proven Application Results

Automotive: Airbag assembly, headliner formation, roof rack bonding, mirror manufacturing, flux powder drying, adhesive activation on protective strips, powder coating, spot repair, friction material bonding, plastic bumper drying, forming & painting

Plastics: PET bottle blow molding, pellet/granulate drying, polypropylene fiber fusing, plastic component extruding/bending, ink drying, and laminating

Glass: Preheating, coating/paint curing, light bulb production

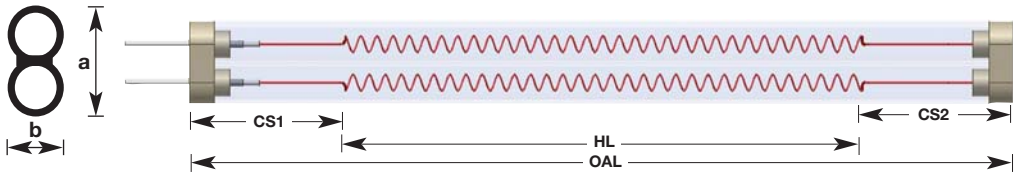
Food Industry: Chocolate processing, cake heating/baking, food warming

Paper, Electronics, Metals, Semi-conductor Processing, Textiles, Furniture & much more

Standard Design (Non–Stock) Gemini Medium Wave Infrared E-Mitters

Leads for Standard Configuration are 18 ga. Stranded Lead Wire, Rated 842°F (450°C), 600V.

OAL: Overall Length
CS1: Lead End Cold Section
HL: Heated Length
CS2: Blind End Cold Section



Twin Bore Quartz Format Dimensions a (in)	a (mm)	b (in)	b (mm)	Overall Length (in)	Overall Length (mm)	Heated Length (in)	Heated Length (mm)	Power Watts	Part Numbers @ 220 Volts Coatings: Gold	White	None	Linear Power Watts per inch	Heraeus Part Number (Note 1)	Configuration Styles	Lead Exit Angle
0.71	18	0.31	8	15.7	400	11.8	300	500	GEM00001	GEM10001	GEM20001	42.4	2439L	A	0°
0.87	22	0.39	10	23.6	600	19.7	500	1000	GEM00002	GEM10002	GEM20002	50.8	5167L	A	0°
1.30	33	0.59	15	35.4	900	31.5	800	2000	GEM00003	GEM10003	GEM20003	63.5	5054L	A	0°
1.30	33	0.59	15	43.3	1100	39.4	1000	2500	GEM00004	GEM10004	GEM20004	63.5	5255L	A	0°
0.87	22	0.39	10	51.2	1300	47.2	1200	2500	GEM00005	GEM10005	GEM20005	53.0	3923L	E	0°
1.30	33	0.59	15	55.9	1420	51.2	1300	3250	GEM00006	GEM10006	GEM20006	63.5	3187L	A	0°
1.30	33	0.59	15	63.0	1600	59.1	1500	3750	GEM00007	GEM10007	GEM20007	63.5	4585L	A	0°
1.30	33	0.59	15	66.9	1700	63.0	1600	4000	GEM00008	GEM10008	GEM20008	63.5	2912L	A	0°
1.30	33	0.59	15	70.9	1800	66.9	1700	4100	GEM00009	GEM10009	GEM20009	61.3	4863L	A	0°
1.30	33	0.59	15	75.6	1920	70.9	1800	4500	GEM00010	GEM10010	GEM20010	63.5	4783L	A	0°
1.30	33	0.59	15	83.5	2120	78.7	2000	5000	GEM00011	GEM10011	GEM20011	63.5	4619L	A	0°
1.30	33	0.59	15	102.4	2600	98.4	2500	6250	GEM00012	GEM10012	GEM20012	63.5	3874L	A	0°
0.71	18	0.31	8	15.7	400	11.8	300	500	GEM00013	GEM10013	GEM20013	42.4	—	A	90°
0.87	22	0.39	10	23.6	600	19.7	500	1000	GEM00014	GEM10014	GEM20014	50.8	—	A	90°
1.30	33	0.59	15	35.4	900	31.5	800	2000	GEM00015	GEM10015	GEM20015	63.5	—	A	90°
1.30	33	0.59	15	43.3	1100	39.4	1000	2500	GEM00016	GEM10016	GEM20016	63.5	—	A	90°
0.87	22	0.39	10	51.2	1300	47.2	1200	2500	GEM00017	GEM10017	GEM20017	53.0	—	E	90°
1.30	33	0.59	15	55.9	1420	51.2	1300	3250	GEM00018	GEM10018	GEM20018	63.5	—	A	90°
1.30	33	0.59	15	63.0	1600	59.1	1500	3750	GEM00019	GEM10019	GEM20019	63.5	—	A	90°
1.30	33	0.59	15	66.9	1700	63.0	1600	4000	GEM00020	GEM10020	GEM20020	63.5	—	A	90°
1.30	33	0.59	15	70.9	1800	66.9	1700	4100	GEM00021	GEM10021	GEM20021	61.3	—	A	90°
1.30	33	0.59	15	75.6	1920	70.9	1800	4500	GEM00022	GEM10022	GEM20022	63.5	—	A	90°
1.30	33	0.59	15	83.5	2120	78.7	2000	5000	GEM00023	GEM10023	GEM20023	63.5	—	A	90°
1.30	33	0.59	15	102.4	2600	98.4	2500	6250	GEM00024	GEM10024	GEM20024	63.5	—	A	90°

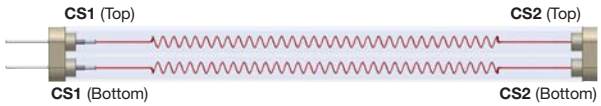
Note 1. Heraeus numbers applicable only to gold coated heaters

Optional Coil Configuration Styles/Distributed Wattage

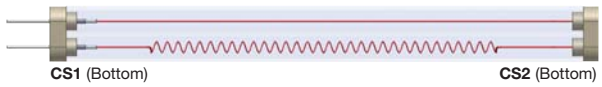
Using alternate stretching configurations to achieve distributed wattage; Tempco can easily customize Gemini series heaters to fit your application. Below are various configurations with "A" Standard for Single Ended and "B" Standard for Double-Ended:

Single Ended Terminations

A (Standard)

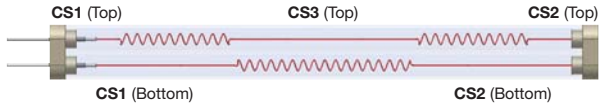


C



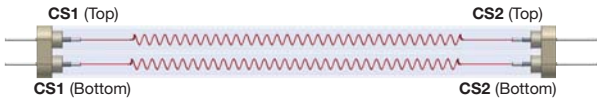
E

G



Double Ended Terminations

B (Standard)



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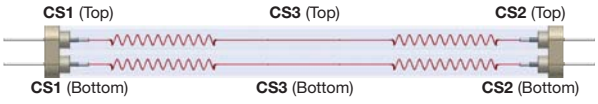

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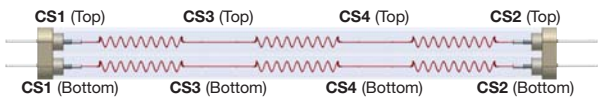

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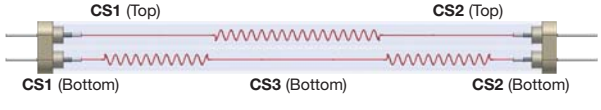

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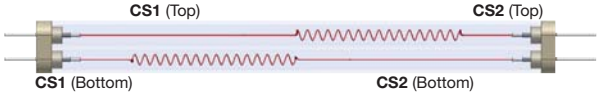


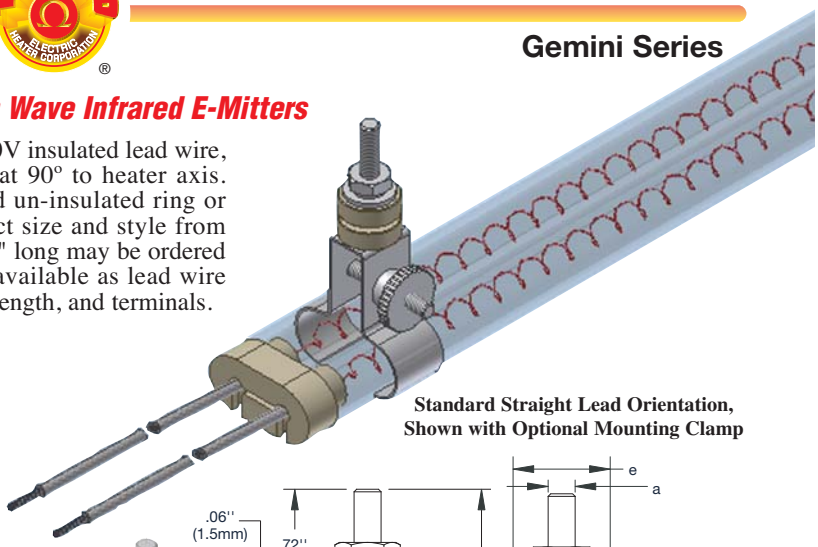
Product Inventory Available for Viewing and Selection @ www.tempco.com

Gemini Medium Wave Infrared E-Mitters

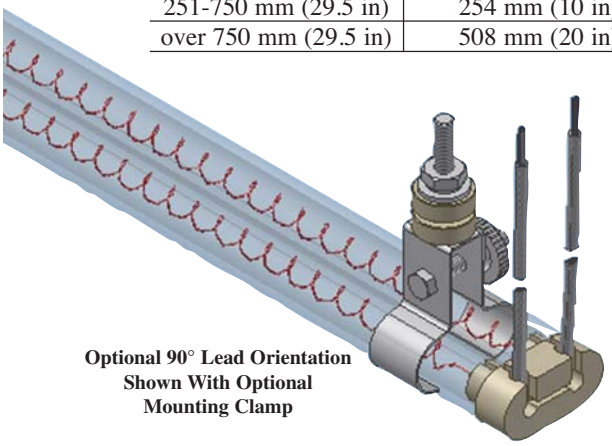
Lead configurations and lengths – 18 ga., 842°F (450°C), 600V insulated lead wire, 3/8" stripped ends standard, oriented straight out ends or at 90° to heater axis. Optional styles of high temperature insulated lead wire and un-insulated ring or spade terminals are available to suit your application. Select size and style from charts on page 7-21. 18 ga. bare stranded heater leads up to 9" long may be ordered with optional ceramic bead insulators. Longer lengths are available as lead wire options only. When ordering, specify lead orientation, style, length, and terminals.

Standard Lead Lengths:

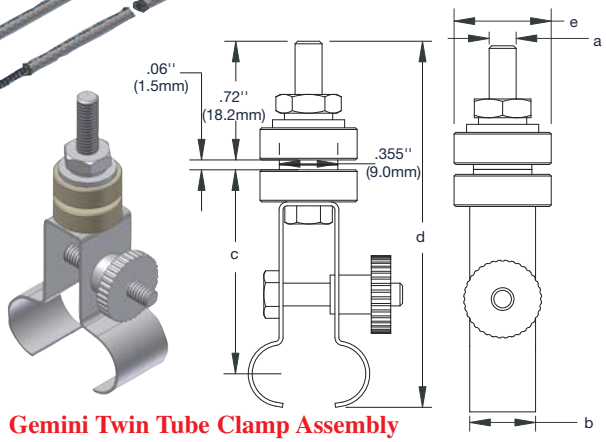
Heater Length (OAL)	Standard Lead Length
Up to 250 mm (9.8 in)	152 mm (6 in)
251-750 mm (29.5 in)	254 mm (10 in)
over 750 mm (29.5 in)	508 mm (20 in)



Standard Straight Lead Orientation, Shown with Optional Mounting Clamp



Optional 90° Lead Orientation Shown With Optional Mounting Clamp



Gemini Twin Tube Clamp Assembly

Twin Bore Tube Size

Clamp Size	a x b
A	17 × 8mm
B	23 × 11mm
C	33 × 15mm

Gemini Stainless Steel Clamp Specifications and Dimensions

Clamp Size Type (Dimensions)	A (17 x 8 mm)	B (23 x 11 mm)	C (33 x 15 mm)
Clamp Assembly Part Number	CRK00040	CRK00041	CRK00042
Mounting Stud Threads (a)	10-32	10-32	10-32
Clamp Width (b)	0.40" (10.2 mm)	0.40" (10.2 mm)	0.60" (15.2 mm)
Heater Mounting Height (c)	1.18" (30 mm)	1.24" (31.5 mm)	1.42" (36 mm)
Overall Clamp Height (d)	2.20" (56 mm)	2.24" (57 mm)	2.72" (69 mm)
Ceramic Insulator Diameter (e)	0.59" (15 mm)	0.59" (15 mm)	0.59" (15 mm)
Panel Mounting Hole Diameter	0.375" (9.5 mm)	0.375" (9.5 mm)	0.375" (9.5 mm)

Recommended mounting panel thickness range is 18-14 ga.

Ordering Information

Stock Heaters

Order by Tempco Part Number for heaters listed on page 7-76.

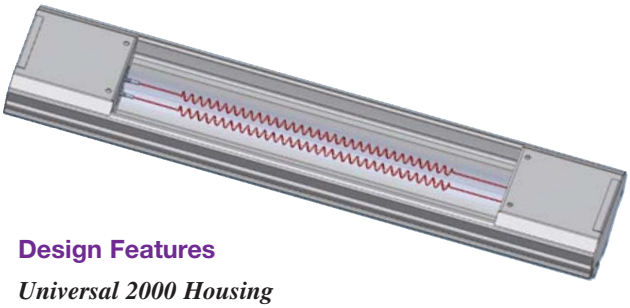
Custom Engineered/Manufactured Heaters

Because TEMPCO understands that an electric heater can be very application specific, for sizes not listed TEMPCO will design and manufacture a Gemini Infrared Heater or modular housing to meet your requirements. **Standard lead time is 3 weeks.**

Please Specify the following:

- ❑ Reflective Coating — Gold, White Ceramic or None
- ❑ Twin Bore Format Style (A, B, or C)
- ❑ Wattage or Watts/In
- ❑ Single or Double End
- ❑ Overall Length (OAL)
- ❑ Heated Length (HL)
- ❑ Lead Orientation (0° or 90°)
- ❑ Voltage
- ❑ Quantity
- ❑ Lead Wire Terminals (page 7-21)
- ❑ Lead Wire Style/Length (Page 7-21)
- ❑ Winding Pattern (Page 7-76, A-J or as required)
- ❑ Ceramic Bead Option (9" max. length)
- ❑ CRA Linear Housing Option (See page 7-79)
- ❑ Cold End Lengths (CE1 & CE2)

Gemini Medium Wave Infrared E-Mitters Assemblies using a Universal 2000 Housing

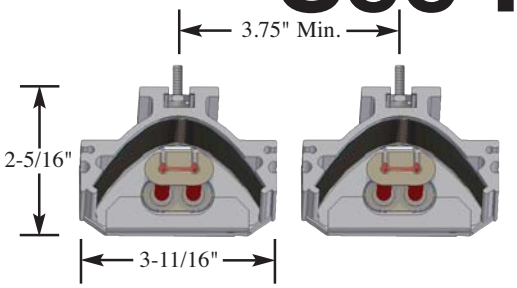


Design Features

Universal 2000 Housing

- *Direct retrofit into existing applications*
- *Rugged anodized extruded aluminum housing*
- *Adaptable to all Gemini twin bore format sizes*
- *Standard units utilize a clear Quartz double ended heater (33 × 15 mm) with minimum cold ends (winding pattern B page 7-76).*
- *Single end and dual voltage/multiple heat options*
- *Universal mounting and ease of wiring. See page 7-89 for housing mounting and dimensions and page 7-97 for wiring diagrams.*

See Page 7-79



Universal 2000 Modular Housing Assemblies with Gemini Twin Bore Quartz Heaters

These rugged assemblies are 220V, double-ended units (winding B, page 7-76) with one twin bore format C (33×15 mm) clear Quartz heater mounted at the focal point of the polished aluminum reflector at a power density of 63.5 w/linear inch.

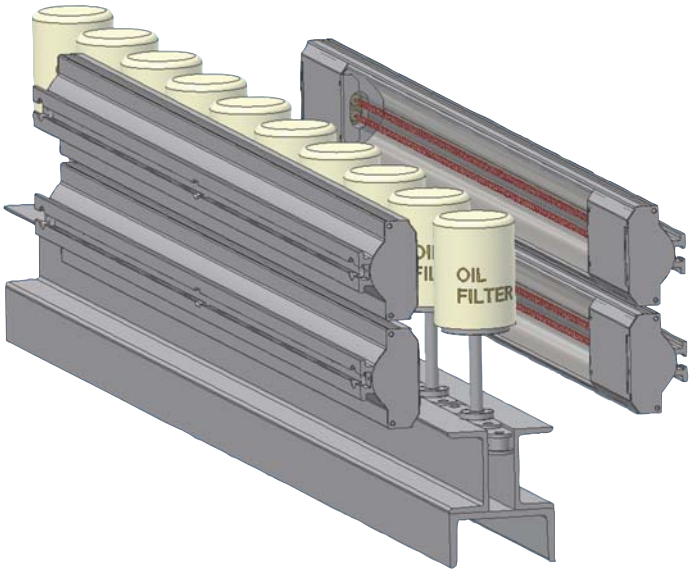
Housing Assy P/N	Housing Length in	Housing Length mm	Gemini Heater P/N	Watts	Heated Length (HL) in.	Heated Length (HL) mm
TRH80001	43.31	1100	GEM20003	2000	31.5	800
TRH80002	51.18	1300	GEM20004	2500	39.4	1000
TRH80003	62.99	[illegible]	GEM20006	3250	51.2	1300
TRH80004	70.87	1800	GEM20007	3750	59.1	1500
TRH80005	74.80	1900	GEM20008	4000	63.0	1600
TRH80006	78.74	2000	GEM20009	4100	66.9	1700
TRH80007	82.68	2100	GEM20010	4500	70.9	1800
TRH80008	90.55	2300	GEM20011	5000	78.7	2000
TRH80009	110.2	2800	GEM20012	6250	98.4	2500

Select a **Housing Assembly** by size and electrical rating from the table above. Assemblies are supplied with Gemini Infrared E-Mitters with no back coating.
Consult Tempco for other [illegible] styles.

These housings are available for any format (A, B, or C) Gemini Series Heater. Specify watts, volts and heated length (or w/in) required, and TEMPCO will design a unit to suit your application. Gold or white ceramic coated heaters, single end units, and dual voltage/multiple heat options are available. See TRH wiring options on pg 7-97. For housing dimensions and mounting details see pg 7-89.

Installation notes: These units are for horizontal mounting only. Units have ceramic terminal blocks for field wiring. Wire used inside junction box should be rated for 250°C or higher and sized per NEC for the unit voltage and amperage ratings.

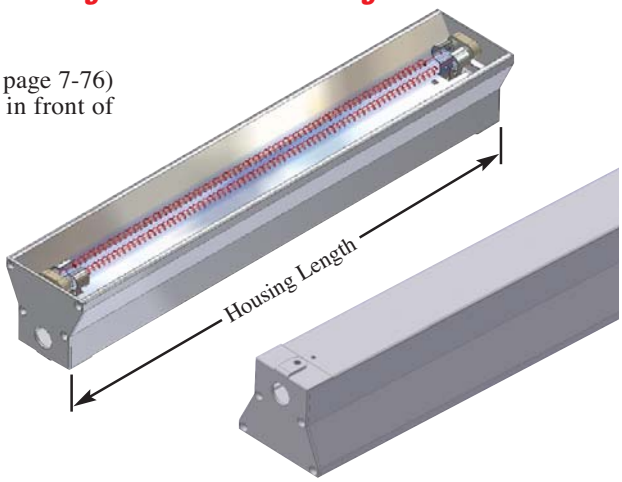
Consult TEMPCO with your requirements.



Gemini Medium Wave Infrared E-Mitter Assemblies using a CRA Linear Housing

CRA Linear Modular Housing Assemblies

These compact assemblies are 220V, single ended units (winding pattern A, page 7-76) with one twin bore format C (33 x 15 mm) Gemini quartz heater mounted in front of an aluminized steel reflector at a power density of 63.5 w/linear inch.



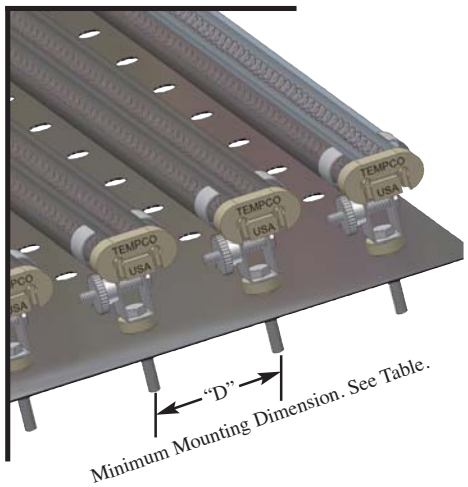
Design Features

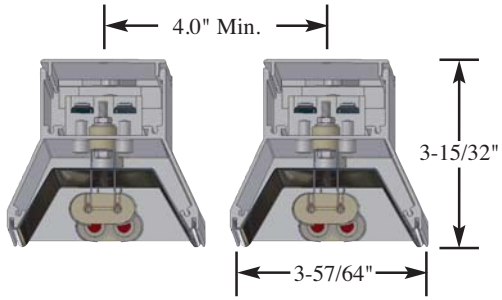
- *Rapid heatup/cooldown and low residual heat retention*
- *Compact lightweight extruded anodized housing*
- *High efficiency aluminized steel reflector for harsh environments and high temperature applications*
- *Adaptable to all Gemini Twin Bore sizes*
- *Standard units utilize a high efficiency twin bore quartz single ended heater (33 by 15 mm) with minimum cold ends (winding pattern A, page 7-76)*
- *Double end units and dual voltage/multiple heat options*

Watts	Housing Length in	Housing Length mm	Heated Length (HL) in.	Heated Length (HL) mm	Housing Assembly Part Number Heater Back Coating Gold	White	None	Gemini Replacement Heater Part Number Gold	White	None
2000	36.42	925	31.5	800	CRA80001	CRA80015	CRA80024	GEM00015	GEM10015	GEM20015
2500	44.29	1125	39.4	1000	CRA80002	CRA80016	CRA80025	GEM00016	GEM10016	GEM20016
3250	56.89	1445	51.2	1300	CRA80003	CRA80017	CRA80026	GEM00018	GEM10018	GEM20018
3750	63.98	1625	59.1	1500	CRA80004	CRA80018	CRA80027	GEM00019	GEM10019	GEM20019
4000	67.91	1725	63	1600	CRA80005	CRA80019	CRA80028	GEM00020	GEM10020	GEM20020
4100	71.85	1825	66.9	1700	CRA80006	CRA80020	CRA80029	GEM00021	GEM10021	GEM20021
4500	76.57	1945	70.9	1800	CRA80007	CRA80021	CRA80030	GEM00022	GEM10022	GEM20022
5000	84.45	2145	78.7	2000	CRA80008	CRA80022	CRA80031	GEM00023	GEM10023	GEM20023
6250	103.35	2625	98.4	2500	CRA80009	CRA80023	CRA80032	GEM00024	GEM10024	GEM20024

Select a **Housing Assembly** by size and electrical rating from the table above. Assemblies are available in clear or with the Gemini heater coatins as shown. Consult Tempco lengths, voltages or power ratings not shown. For housing dimensions and mounting details see pg 7-17.

Custom housings are available for any format (A, B, or C) Gemini Series Heater. Specify watts, volts and heated length (or w/in) required and TEMPCO will design a unit to suit your application. Clear, gold, or white ceramic coated heaters and doubled end wiring, and chrome steel reflector options are available. **Installation notes:** These units are for horizontal mounting only. Units have ceramic terminal blocks for field wiring connections inside rear compartment of housing.





Minimum Spacing between Heaters in Modular Housings and Array Assemblies ("D" Dim.)

Twin Bore Tube Size	A (17 x 8mm)	B (23 x 11mm)	C (33 x 15mm)
Heaters Mounted in ARA Arrays	1.43"	1.63"	2.00"
Heaters Mounted in CRA Linear Housings*	4.00"	4.00"	4.00"

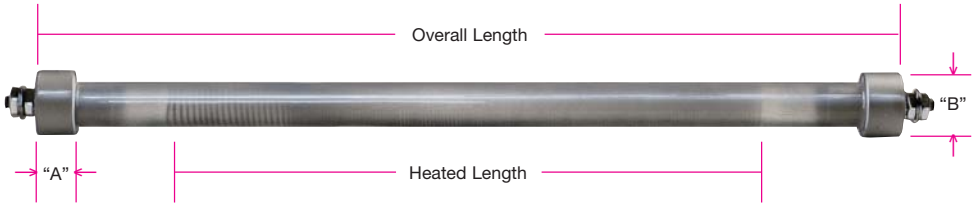
*Minimum center-to-center spacing of housings

ARA Single Panel Custom Arrays are also available for the Gemini Series Heaters. See page 7-13 for details.

Radiant Process Heaters

Radiant Quartz Heaters

Vitreous Silica Quartz Tube



Ceramic End Cap Dimensions

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 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 with a quick heat and cool down response time. For most efficient heating and longer operating life, quartz heating applications should be rated around 35 to 40 watts per square inch.

Our 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.

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.

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*

QUARTZ HEATER SPECIFICATIONS

Dimensional

Diameters: 3/8", 1/2" and 5/8"

Max. Length: 3/8"dia. 50", 1/2" dia. 100", 5/8" dia. 100"

Length Tolerance: Minimum ±1/8" up to 12" long, ±2% over 12" long

Electrical

Max. Volts: 480 Volts

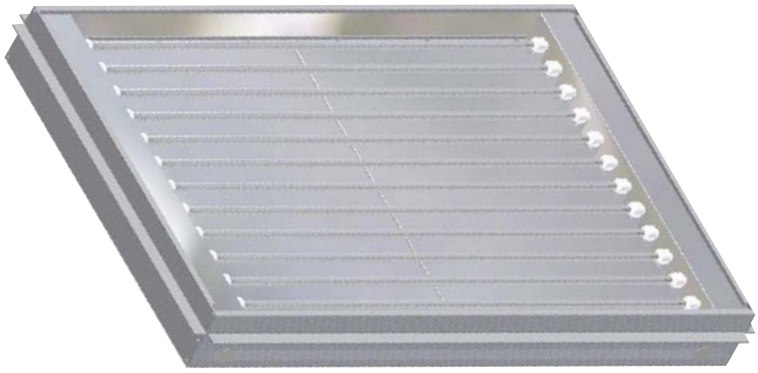
Max. Amperage: 20 Amps

Resistance Tolerance: +10%, –5%

Wattage Tolerance: +5%, –10%

Max Watt Density: 40 Watts/in²

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



ARA Array Panel with 1/2" Dia. Quartz Heaters

Custom 4" high ARA panels with 1/2" diameter T2 Quartz elements are available. Tempco will design and build to your specifications. Consult us with your requirements. (See ARA panels page 7-5)

Single Element and Dual Element 1/2" Dia. Quartz Heaters in Universal 2000 Housing—See pages 7-90 and 7-91

Vitreous Silica Quartz Tube

Standard Sizes and Electrical Ratings

Vitreous Silica Quartz Tube heaters listed have Type T1 termination.

Quartz Tube Diameter	Overall Length in	Overall Length mm	Heated Length in	Heated Length mm	Watts	Part Number 120V	Part Number 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

Terminations

Type T3 **End Caps with Slots**

Slots in ceramic end caps are for mounting in grooved sheet metal housings. Coil tension and the slots hold the heater in place and allow for thermal expansion of the assembly. 1/4" quick-disconnect tabs standard for lead wire connection. Screw terminals optional.

Terminations

Type T1 **Standard Termination**

10-32 thread screw terminal standard termination.

Type T2 **Panel Mount Bushings**

10-32 thread screw terminals with extension bushings for CRA/TRH housing assemblies.

Type ST **Tabs with Slotted Holes**

1/2" wide × 3/4" long, with a 9/32" × 3/8" slot. Alternate mounting method.

Type FT **Quick Disconnect Fuse Type**

Fuse type connector provides ease of installation. Connectors are 3/8" OD × 1/2" long brass.

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 (also for T1 or T2).

Mounting Clamps can be found on page 7-77.

Ordering Information

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
- ❑ Mounting Clamps (See page 7-77)

Infrared Medium Wave Panel Heaters

3 EMITTER FACE CONSTRUCTION STYLES
Will Accommodate a Diverse Selection of Process Heating Applications Requiring the Advantages of Medium Wave Infrared Heating

Energy Efficient
80% of the Radiant Energy is Transmitted to the Process

Rugged Construction
Excellent Durability Life Expectancy of up to 25,000 Hours

Direct Retrofits for Existing Applications and Custom Design/Engineering for New Applications

Rugged Construction for Trouble Free Service

Panel Infrared Heaters are available in a complete range of standard emitter face construction styles, sizes, electrical ratings and watt densities (watts/in²) with optional thermowell only or to include a type J or K thermocouple.

Ordering information and product selection can be found on pages 7-83 through 7-87.

Experience the Tempco Advantage

Panel Infrared Heaters shown on this page are a small representation of the many Custom Engineered and Manufactured designs we have produced.

If you have a special application and need free technical assistance, consult our team of professionals with your requirements.

We Welcome Your Inquiries

Infrared Medium Wave Panel Heater Construction Styles

Style RB
Black Quartz Composite Face

High Emissivity Coating
(See page 7-84)

Style RG
Black Glass Face

Cleanable Glass Surface
(See page 7-85)

Style RW
High Temperature Quartz Glass Face

Highest Watt Density
(See page 7-86)

Design Features

Panel heaters are available in convenient building-block sizes and are equipped with mounting studs on the back for easy installation. They can be mounted in any direction, and due to the bonded construction, they are resistant to shock and vibration. This 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.

Note:
Not hermetically sealed.

Construction Characteristics

The placement of the resistance coils is 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 and bracket, and type K or J 1/8" diameter thermocouple probe.

DANGER: Fire Hazard
CAUTION Infrared Panel Heaters are not to be used in applications where flammable vapors, gases or combustible materials are present as defined in the National Electrical Code. Do not mount the heater closer than 6 inches to any structural or surrounding material that does not have a minimum temperature rating of continuous operation at 395°F (200°C). Proper ventilation is required to expel vapors or fumes away from the process and personnel.

Ordering Information

Catalog Heaters

To order a **Radiant Panel** from the tables on the following pages, fill in the last digit of the part 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:

- ❑ Construction Style (RB, RG or RW)
- ❑ Length and Width
- ❑ Watts, Volts and Phase
- ❑ Thermowell only
- ❑ Thermowell and type K or J thermocouple

Style RB Black Quartz Composite Face Infrared Panel Heaters

Design Features

- *Panel heater can be mounted in any direction*
- *High temperature black quartz composite*
- *High temperature black coating*
- *High temperature cement bond*
- *Molded ceramic fiber to hold resistance wire*
- *Precision wound resistance wire*
- *Optional quartz thermowell tube*
- *Heavy gauge aluminized steel frame*
- *Refractory blanket insulation*
- *Bulk insulation*
- *Ceramic bushings*
- *Stn. Stl. power screw terminals*
- *Mounting studs standard*
- *Electrical junction box standard*

Construction Characteristics

Tempco Style RB panel infrared heaters have a woven silica quartz composite 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.

Tempco Style RB heaters can transmit up to 80% of the input energy and can be positioned as close as 2 to 4" from the material being heated.

Specifications

Sizes: Standard sizes are listed below; special sizes can be engineered to fit specific applications.

Standard Thickness: 3"

Maximum Watt Density: 25 Watts/in^2

Maximum Voltage: Voltage can be single, dual or 3-phase up to 600 VAC (depending on heater size and wattage)

Wavelength Range: Between 2.5 and 6.0 microns (µm)

Maximum Temperature: 1600°F (872°C)

Distributed Wattage and Zoning: Yes

Typical Applications

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

Note: To complete the part numbers below, include the designated number that applies to the following options:

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

Non-Stock Standard Sizes and Ratings of Style RB Black Face Infrared Heaters

Width		Length		15W/in^2				25W/in^2			
in	mm	in	mm	Watts	Volts	Ph.	Part Number	Watts	Volts	Ph.	Part Number
6	152	12	305	1080	120	1	RPB0101__	1800	240/480	1	RPB0201__
6	152	18	457	1620	240	1	RPB0102__	2700	240/480	1	RPB0202__
6	152	24	610	2160	240/480	1	RPB0103__	3600	240/480	1	RPB0203__
6	152	30	762	2700	240/480	1	RPB0104__	4500	240/480	1	RPB0204__
6	152	36	914	3240	240/480	1	RPB0105__	5400	240/480	1	RPB0205__
6	152	48	1219	4320	240/480	1	RPB0106__	7200	240/480	1	RPB0206__
12	305	12	305	2160	240/480	1	RPB0107__	3600	240/480	1	RPB0207__
12	305	18	457	3240	240/480	1	RPB0108__	5400	240/480	1	RPB0208__
12	305	24	610	4320	240/480	1	RPB0109__	7200	240	3	RPB0209__
12	305	30	762	5400	240/480	1	RPB0110__	9000	240	3	RPB0210__
12	305	36	914	6480	240	3	RPB0111__	10800	480	3	RPB0211__
12	305	48	1219	8640	240	3	RPB0112__	14400	480	3	RPB0212__
12	305	60	1524	10800	480	3	RPB0113__	18000	480	3	RPB0213__
12	305	72	1829	12960	480	3	RPB0114__	21600	480	3	RPB0214__
16	406	16	406	3840	240/480	1	RPB0115__	6400	240/480	1	RPB0215__
16	406	24	610	5760	240/480	1	RPB0116__	9600	240	3	RPB0216__
18	457	18	457	4860	240/480	1	RPB0117__	8100	240	3	RPB0217__
24	610	24	610	8640	240	3	RPB0118__	14400	480	3	RPB0218__

Style RG High Temperature Glass Face Infrared Panel Heaters

Design Features

- *Panel heater can be mounted in any direction*
- *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 wound resistance wire*
- *Optional quartz thermowell tube*
- *Heavy gauge aluminized steel frame*
- *Refractory blanket insulation*
- *Bulk insulation*
- *Ceramic bushings*
- *Stn. Stl. power screw terminals*
- *Mounting studs standard*
- *Electrical junction box standard*

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 quartz glass at a more economical price. Tempco Style RG is the ideal heater when a cleanable surface (ie. bottom heaters of a thermoforming oven) is required. It can be positioned as close as 2 to 4" from the material being heated.

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.

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.

Standard Thickness: 3"

Maximum Watt Density: 20 Watts/in²

Maximum Voltage: Voltage can be single, dual or 3-phase up to 600 VAC (depending on heater size and wattage)

Wavelength Range: Between 2.5 and 6.0 microns (µm)

Maximum Temperature: 1600°F (872°C)

Distributed Wattage and Zoning: Yes

Note: To complete the part numbers below, include the designated number that applies to the following options:

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

Non-Stock Standard Sizes and Ratings of Style RG High Temperature Glass Infrared Heaters

Width		Length		10W/in²				15W/in²			
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__

Style RW Panel Heater

Style RW High Temperature Pure Quartz Glass Face Infrared Panel Heaters

Design Features

- *Translucent quartz glass 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*
- *Stn. Stl. power screw terminals*
- *Optional thermowell*
- *Mounting studs standard*
- *Electrical junction box standard*

Construction Characteristics

Tempco Style RW Radiant Panel Heaters use pure quartz glass for the emitter surface.

Tempco Style RW heaters can transmit up to 89% of the power input as infrared energy. They can be positioned as close as 2 to 4" from the material being heated.

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.

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" × 4"; Max.: 20" × 20"

Standard Thickness: 3"

Maximum Watt Density: 40 Watts/in²

Maximum Voltage: Voltage can be single, dual or 3-phase up to 600 VAC (depending on heater size and wattage)

Wavelength Range: Between 2.5 and 6.0 microns (µm)

Maximum Temperature: 1700°F (926°C)

Distributed Wattage and Zoning: Yes

Note: To complete the part numbers below, include the designated number that applies to the following options:

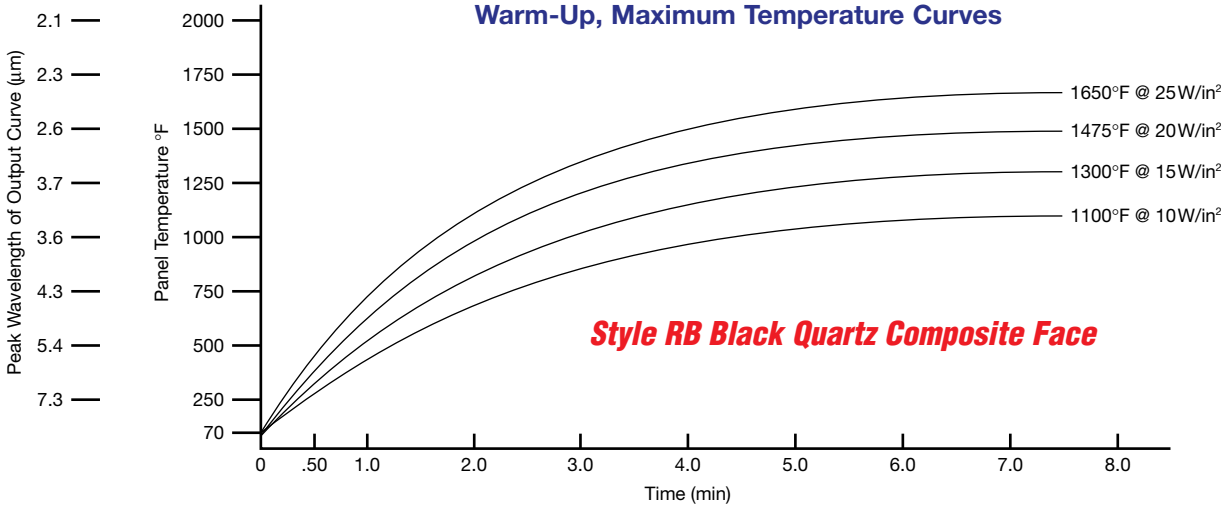
0 = Plain, no thermowell or T/C
1 = Thermowell only
2 = Thermowell and type K T/C
3 = Thermowell and type J T/C

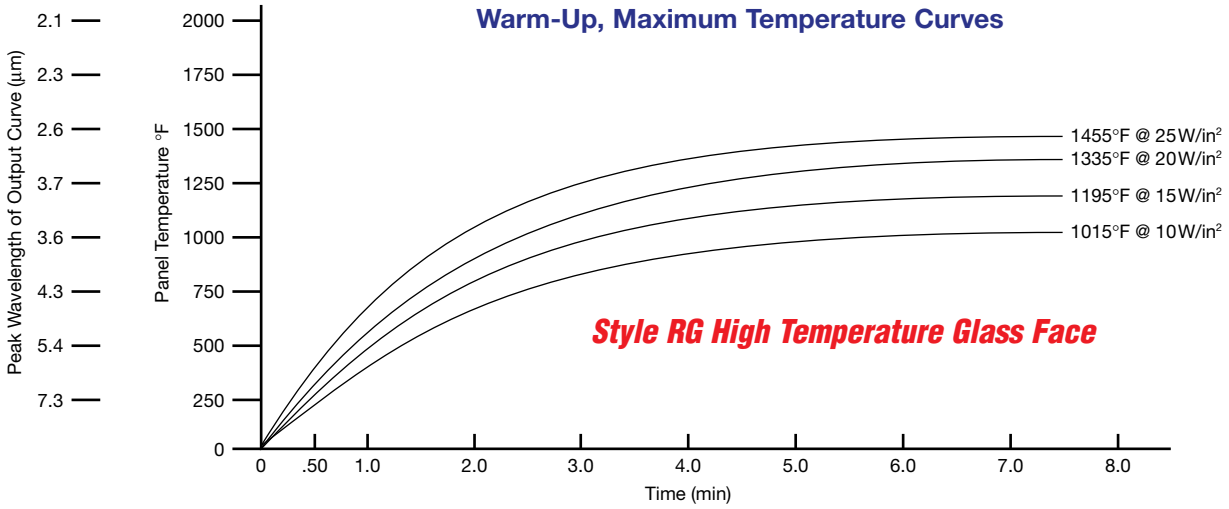
Non-Stock Standard Sizes and Ratings of Style RW High Temperature Glass Infrared Heaters

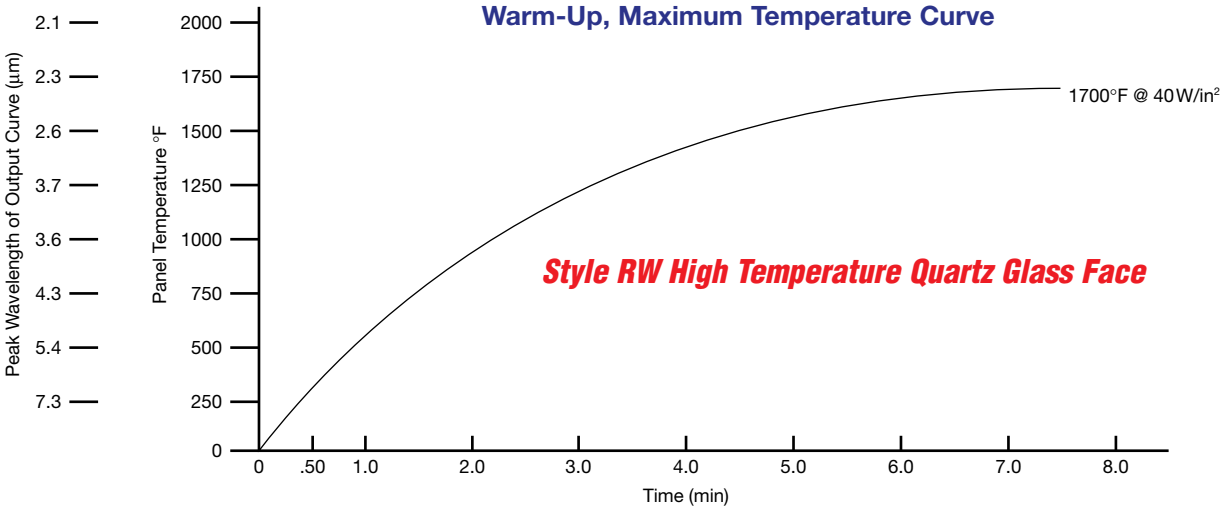
Width		Length		40W/in²			
in	mm	in	mm	Watts	Volts	Ph.	Part Number
4	102	10	254	1600	240	1	RPW0101__
6	152	10	254	2400	240/480	1	RPW0102__
6	152	12	305	2880	240/480	1	RPW0103__
8	203	10	254	3200	240/480	1	RPW0104__
10	254	10	254	4000	240/480	1	RPW0105__
12	305	10	254	4800	240/480	1	RPW0106__
12	305	12	305	5760	240/480	1	RPW0107__

Infrared Medium Wave Panel Heater Warm-Up Curves

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.







TUBULAR RADIANT HEATER ASSEMBLIES

Universal 2000 heaters are ideal for reliable service, providing great flexibility for many diverse industrial and commercial applications.

Universal 2000 with Gemini Heating System
(See page 7-72)

Designed for Maximum Efficiency, Ease of Installation and Trouble-Free Service…

As the product name implies, Universal 2000 radiant heaters are a direct retrofit replacement for existing and new applications, utilizing similar products regardless of make.

Its unique design offers several quality enhancements without compromising fit and function on existing applications.

Delivering Value-Added Performance

Universal 2000 heaters are ideal for reliable service, providing great flexibility for many diverse industrial and commercial applications. Manufactured with the proper options, Universal 2000 Radiant Heater Assemblies can be used outdoors or in wet locations.

Typical Applications

- *Adhesive Drying*
- *Comfort Heating*
- *Conveyorized Drying*
- *Drying Bulk Materials*
- *Drying Ceramics*
- *Food Warming*
- *Freeze Protection*
- *Heating Rubber or Steel Rolls*
- *Ink Drying*
- *Manufacturing Glass & Mirrors*
- *Moisture Evaporation*
- *Outdoor Comfort Heating*
- *Paint Drying*
- *Resin Curing*
- *Shrink Fitting*
- *Thermoforming*
- *Washdown Facilities*
- *Welding Preheating*

Universal 2000

Construction Characteristics

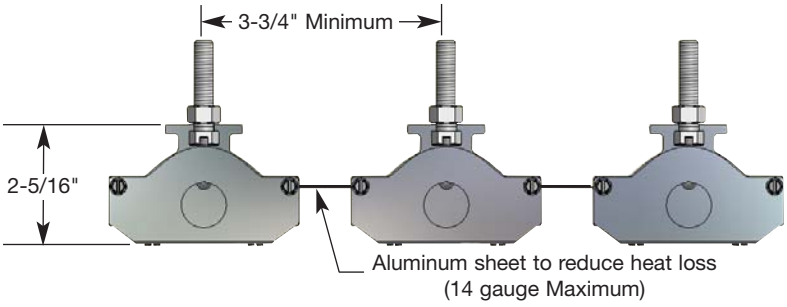
The Universal 2000 Radiant Heater stands apart from all other similar products. Its rugged construction, enhanced design features and flexibility in installation allow it to be used in applications requiring a single unit or to be used as modules creating various configurations for process radiant heating systems.

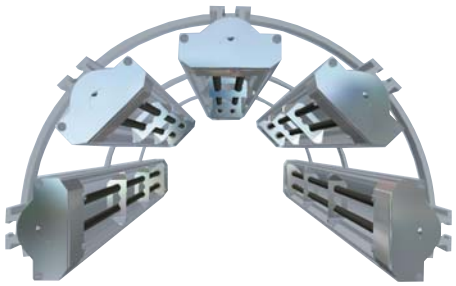
Universal 2000 Radiant Heaters are available in a full range of standard construction variations, physical dimensions and electrical ratings. They are also available in custom engineered/manufactured units up to 132" (3353 mm) for series TRH1, 4 and 6. TRH3 and 5 series units are available up to 120" (3048 mm) lengths. Special electrical ratings, single end wiring, dual voltage, multiple heat designs, and optional fast response Quartz heater options (TRH1 & 2 NEMA1 units only), along with pre-wired units using flexible/rigid conduit or SJO cord/plug can be custom designed to fit your application.

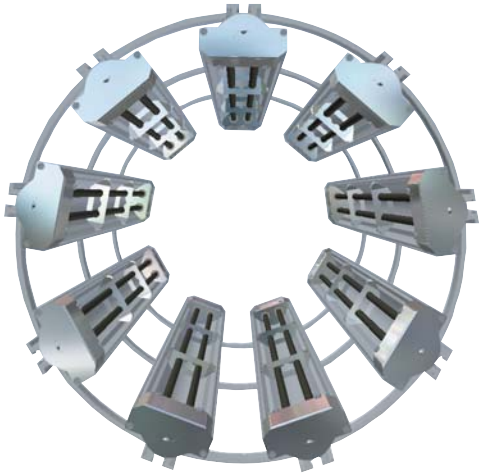
Design Features

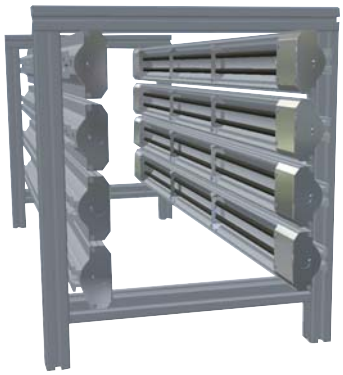
- *Direct retrofit to existing applications*
- *Rugged anodized extruded aluminum housing*
- *Polished aluminum reflector (replaceable)*
- *Incoloy® sheath tubular heaters (replaceable)*
- *Element Support brackets (replaceable)*
- *Sliding mounting bolts (replaceable)*
- *Dual internal wireways for single end wiring*
- *Ground terminal lug*
- *Slots for heat shield on side of housing for between units*
- *Convenient field wiring*
- *Made to order*

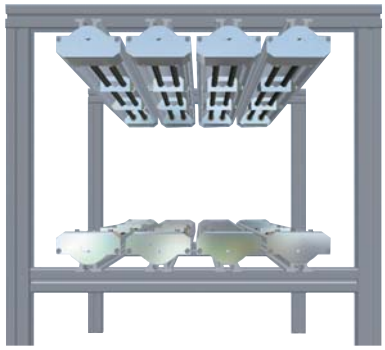
Typical Installations











Ordering Information

Catalog Heaters

Order by Catalog Part Number.

Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, Tempco can manufacture a Tubular Radiant Heater to meet your requirements. ***Standard lead time is 4 weeks.***

Please Specify the following:

- ❑ Overall Housing Length
- ❑ Wattage and Voltage
- ❑ Termination Features
- ❑ Wiring Options (Single or Double Ended)
- ❑ Series Construction Style

TRH1 Series — Single Straight Element Double End Termination

Non-Stock Standard Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number	Replacement Element Part Number	Optional Protective Wire Guard
600	120	18	10	TRH10001	THE09100	GRD-104-104
600	208	18	10	TRH10002	THE09101	GRD-104-104
600	240	18	10	TRH10003	THE09102	GRD-104-104
600	277	18	10	TRH10004	THE09103	GRD-104-104
800	120	24	16	TRH10005	THE09104	GRD-104-105
800	208	24	16	TRH10006	THE09105	GRD-104-105
800	240	24	16	TRH10007	THE09106	GRD-104-105
800	277	24	16	TRH10008	THE09107	GRD-104-105
1100	120	30	22	TRH10009	THE09108	GRD-104-106
1100	208	30	22	TRH10010	THE09109	GRD-104-106
1100	240	30	22	TRH10011	THE09110	GRD-104-106
1100	277	30	22	TRH10012	THE09111	GRD-104-106
1100	480	30	22	TRH10013	THE09112	GRD-104-106
1300	208	36	28	TRH10014	THE09113	GRD-104-107
1300	240	36	28	TRH10015	THE09114	GRD-104-107
1300	277	36	28	TRH10016	THE09115	GRD-104-107
1300	480	36	28	TRH10017	THE09116	GRD-104-107
1800	208	48	40	TRH10018	THE09117	GRD-104-108
1800	240	48	40	TRH10019	THE09118	GRD-104-108
1800	277	48	40	TRH10020	THE09119	GRD-104-108
1800	480	48	40	TRH10021	THE09120	GRD-104-108
2500	208	60	51	TRH10022	THE09121	GRD-104-109
2500	240	60	51	TRH10023	THE09122	GRD-104-109
2500	277	60	51	TRH10024	THE09123	GRD-104-109
2500	480	60	51	TRH10025	THE09124	GRD-104-109
3000	208	72	63	TRH10026	THE09125	GRD-104-110
3000	240	72	63	TRH10027	THE09126	GRD-104-110
3000	277	72	63	TRH10028	THE09127	GRD-104-110
3000	480	72	63	TRH10029	THE09128	GRD-104-110
3600	208	84	75	TRH10030	THE09129	GRD-104-111
3600	240	84	75	TRH10031	THE09130	GRD-104-111
3600	277	84	75	TRH10032	THE09131	GRD-104-111
3600	480	84	75	TRH10033	THE09132	GRD-104-111

Replacement Reflectors for the TRH1

(installation instructions included)

Reflector Kit Part Number	*Number of Reflectors Supplied	Overall 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	51
SMPR-1024	2	72	63
SMPR-1025	2	84	75
SMPR-1026	2	96	84.5
SMPR-1027	3	108	98.5

*Units over 48 inches have segmented reflectors

Replacement Element Support Brackets

Part Number: SMPR-1013

Replacement End Plates

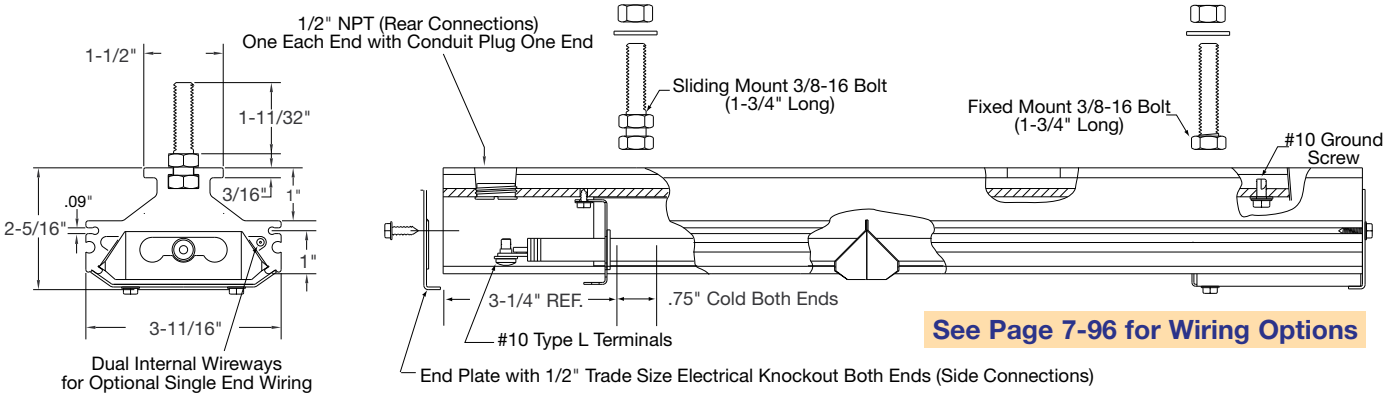
Part Number: SMP-123-104

Replacement Bolts

Sliding Bolt
Part Number: FAS-102-108

Fixed Bolt
Part Number: SCW-139-109

Optional Heating Element Protective Guard
Prevents accidental direct contact with heating element.



See Page 7-96 for Wiring Options

See Page 7-98 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

TRH2 Series — Dual Straight Element Double End Termination

Replacement Reflectors for the TRH2
(installation instructions included)

Reflector Kit Part Number	*Number of Reflectors Supplied	Overall 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	51
SMPR-1024	2	72	63
SMPR-1025	2	84	75
SMPR-1026	2	96	84.5
SMPR-1027	3	108	98.5

*Units over 48 inches have segmented reflectors

Replacement Element Support Brackets
Part Number: SMPR-1013

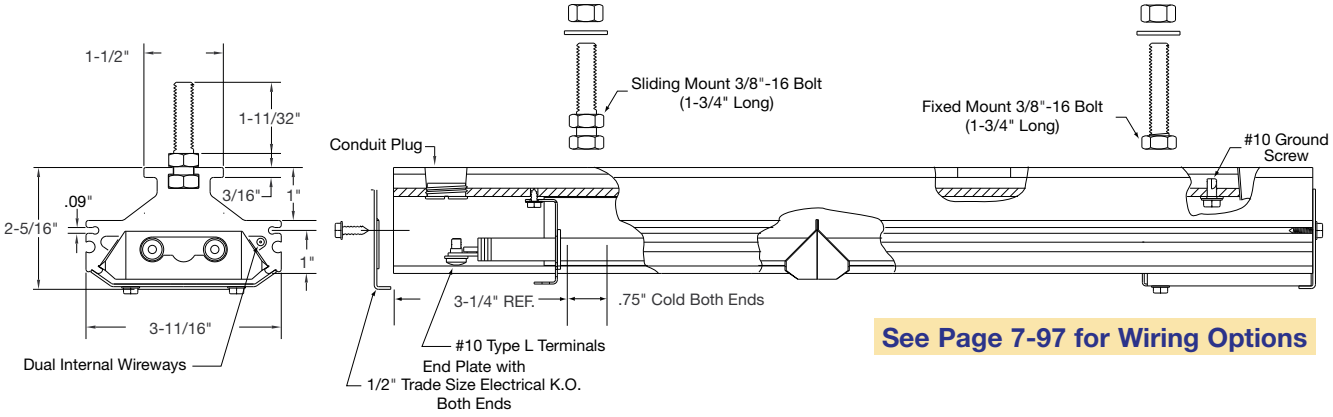
Replacement End Plates
Part Number: SMP-123-104

Replacement Bolts
Sliding Bolt
Part Number: FAS-102-108
Fixed Bolt
Part Number: SCW-139-109

Non-Stock Standard Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number	Replacement Element Part Number	Optional Protective Wire Guard
1200	120	18	10	TRH20001	THE09100	GRD-104-104
1200	208	18	10	TRH20002	THE09101	GRD-104-104
1200	240	18	10	TRH20003	THE09102	GRD-104-104
1200	277	18	10	TRH20004	THE09103	GRD-104-104
1600	120	24	16	TRH20005	THE09104	GRD-104-105
1600	208	24	16	TRH20006	THE09105	GRD-104-105
1600	240	24	16	TRH20007	THE09106	GRD-104-105
1600	277	24	16	TRH20008	THE09107	GRD-104-105
2200	120	30	22	TRH20009	THE09108	GRD-104-106
2200	208	30	22	TRH20010	THE09109	GRD-104-106
2200	240	30	22	TRH20011	THE09110	GRD-104-106
2200	277	30	22	TRH20012	THE09111	GRD-104-106
2200	480	30	22	TRH20013	THE09112	GRD-104-106
2600	208	36	28	TRH20014	THE09113	GRD-104-107
2600	240	36	28	TRH20015	THE09114	GRD-104-107
2600	277	36	28	TRH20016	THE09115	GRD-104-107
2600	480	36	28	TRH20017	THE09116	GRD-104-107
3600	208	48	40	TRH20018	THE09117	GRD-104-108
3600	240	48	40	TRH20019	THE09118	GRD-104-108
3600	277	48	40	TRH20020	THE09119	GRD-104-108
3600	480	48	40	TRH20021	THE09120	GRD-104-108
5000	208	60	51	TRH20022	THE09121	GRD-104-109
5000	240	60	51	TRH20023	THE09122	GRD-104-109
5000	277	60	51	TRH20024	THE09123	GRD-104-109
5000	480	60	51	TRH20025	THE09124	GRD-104-109
6000	208	72	63	TRH20026	THE09125	GRD-104-110
6000	240	72	63	TRH20027	THE09126	GRD-104-110
6000	277	72	63	TRH20028	THE09127	GRD-104-110
6000	480	72	63	TRH20029	THE09128	GRD-104-110
7200	208	84	75	TRH20030	THE09129	GRD-104-111
7200	240	84	75	TRH20031	THE09130	GRD-104-111
7200	277	84	75	TRH20032	THE09131	GRD-104-111
7200	480	84	75	TRH20033	THE09132	GRD-104-111

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).



See Page 7-97 for Wiring Options

See Page 7-98 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

TRH3 Series — Single Hairpin Element Bend Single End Termination

Non-Stock Standard Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number	Replacement Element Part Number	Optional Protective Wire Guard
800	120	12	7	TRH30001	THE09133	GRD-104-112
800	208	12	7	TRH30002	THE09134	GRD-104-112
800	240	12	7	TRH30003	THE09135	GRD-104-112
800	277	12	7	TRH30004	THE09136	GRD-104-112
1200	120	18	13	TRH30005	THE09137	GRD-104-113
1200	208	18	13	TRH30006	THE09138	GRD-104-113
1200	240	18	13	TRH30007	THE09139	GRD-104-113
1200	277	18	13	TRH30008	THE09140	GRD-104-113
1800	208	24	19	TRH30009	THE09141	GRD-104-114
1800	240	24	19	TRH30010	THE09142	GRD-104-114
1800	277	24	19	TRH30011	THE09143	GRD-104-114
1800	480	24	19	TRH30012	THE09144	GRD-104-114
2500	208	30	25	TRH30013	THE09145	GRD-104-115
2500	240	30	25	TRH30014	THE09146	GRD-104-115
2500	277	30	25	TRH30015	THE09147	GRD-104-115
2500	480	30	25	TRH30016	THE09148	GRD-104-115
3000	208	36	31	TRH30017	THE09149	GRD-104-116
3000	240	36	31	TRH30018	THE09150	GRD-104-116
3000	277	36	31	TRH30019	THE09151	GRD-104-116
3000	480	36	31	TRH30020	THE09152	GRD-104-116
3600	208	48	43	TRH30021	THE09153	GRD-104-117
3600	240	48	43	TRH30022	THE09154	GRD-104-117
3600	277	48	43	TRH30023	THE09155	GRD-104-117
3600	480	48	43	TRH30024	THE09156	GRD-104-117
5000	208	60	55	TRH30025	THE09157	GRD-104-118
5000	240	60	55	TRH30026	THE09158	GRD-104-118
5000	277	60	55	TRH30027	THE09159	GRD-104-118
5000	480	60	55	TRH30028	THE09160	GRD-104-118

Replacement Reflectors for the TRH3

(installation instructions included)

Reflector Kit Part Number	*Number of Reflectors Supplied	Overall 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

*Units over 48 inches have segmented reflectors

Replacement Element Support Brackets

Part Number: SMPR-1014

Replacement End Plates

End Plate by Terminal Box
Part Number: SMP-123-104

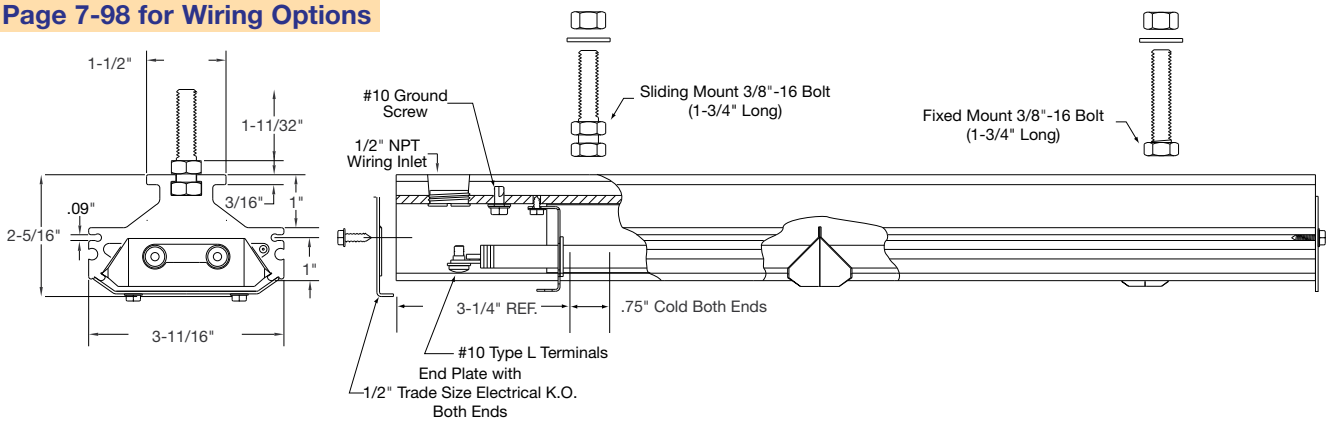
End Plate Back End
Part Number: SMP-123-105

Replacement Bolts

Sliding Bolt
Part Number: FAS-102-108

Fixed Bolt
Part Number: SCW-139-109

See Page 7-98 for Wiring Options



See Page 7-98 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

TRH4 Series — Dual Hairpin Element Bend Double End Termination

Replacement Reflectors for the TRH4
(installation instructions included)

Reflector Kit Part Number	*Number of Reflectors Supplied	Overall 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-1064	2	60	52
SMPR-1070	2	72	64
SMPR-1069	2	84	76
SMPR-1071	2	96	88
SMPR-1072	3	108	100

*Units over 48 inches have segmented reflectors

Replacement Element Support Brackets
Part Number: SMPR-1014

Replacement End Plates
Part Number: SMP-123-104

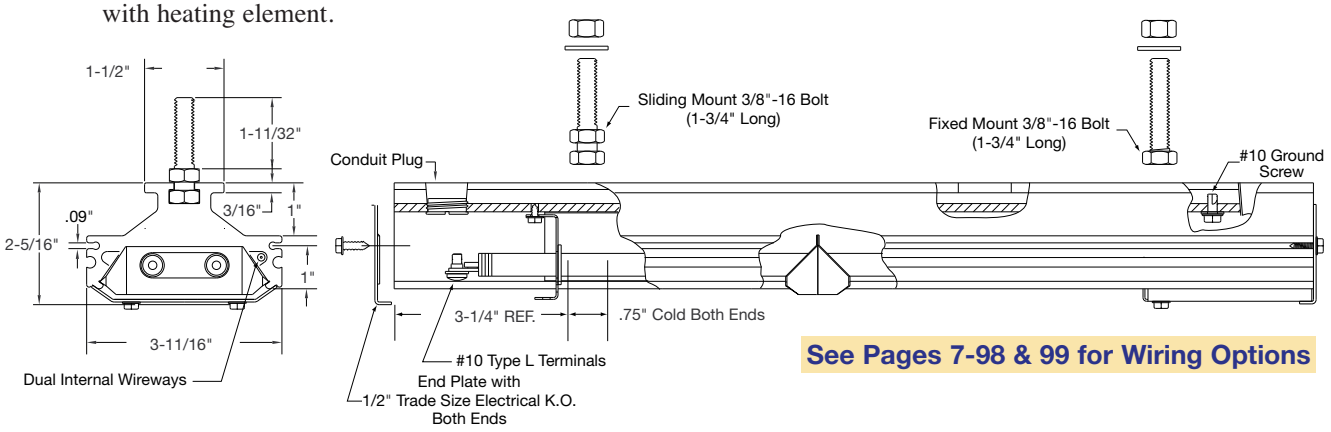
Replacement Bolts
Sliding Bolt
Part Number: FAS-102-108
Fixed Bolt
Part Number: SCW-139-109

Optional Heating Element Protective Guard
Prevents accidental direct contact with heating element.

Non-Stock Standard Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number	Replacement Element Part Number	Optional Protective Wire Guard
6000	208	72	64	TRH40001	THE09161	GRD-104-119
6000	240	72	64	TRH40002	THE09162	GRD-104-119
6000	277	72	64	TRH40003	THE09163	GRD-104-119
6000	480	72	64	TRH40004	THE09164	GRD-104-119
7200	208	84	76	TRH40005	THE09165	GRD-104-120
7200	240	84	76	TRH40006	THE09166	GRD-104-120
7200	277	84	76	TRH40007	THE09167	GRD-104-120
7200	480	84	76	TRH40008	THE09168	GRD-104-120
8000	208	96	88	TRH40009	THE09169	GRD-104-121
8000	240	96	88	TRH40010	THE09170	GRD-104-121
8000	277	96	88	TRH40011	THE09171	GRD-104-121
8000	480	96	88	TRH40012	THE09172	GRD-104-121
9000	208	108	100	TRH40013	THE09173	GRD-104-122
9000	240	108	100	TRH40014	THE09174	GRD-104-122
9000	277	108	100	TRH40015	THE09175	GRD-104-122
9000	480	108	100	TRH40016	THE09176	GRD-104-122

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).



See Pages 7-98 & 99 for Wiring Options

See Page 7-98 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

Universal 2000 TRH5

TRH5 Series — Single Hairpin Element Liquid Tight Single End Termination

Non-Stock Standard Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number	Replacement Element Part Number	Optional Protective Wire Guard
800	120	12	7	TRH50001	THE09177	GRD-104-112
800	208	12	7	TRH50002	THE09178	GRD-104-112
800	240	12	7	TRH50003	THE09179	GRD-104-112
800	277	12	7	TRH50004	THE09180	GRD-104-112
1200	120	18	13	TRH50005	THE09181	GRD-104-113
1200	208	18	13	TRH50006	THE09182	GRD-104-113
1200	240	18	13	TRH50007	THE09183	GRD-104-113
1200	277	18	13	TRH50008	THE09184	GRD-104-113
1800	208	24	19	TRH50009	THE09185	GRD-104-114
1800	240	24	19	TRH50010	THE09186	GRD-104-114
1800	277	24	19	TRH50011	THE09187	GRD-104-114
1800	480	24	19	TRH50012	THE09188	GRD-104-114
2500	208	30	25	TRH50013	THE09189	GRD-104-115
2500	240	30	25	TRH50014	THE09190	GRD-104-115
2500	277	30	25	TRH50015	THE09191	GRD-104-115
2500	480	30	25	TRH50016	THE09192	GRD-104-115
3000	208	36	31	TRH50017	THE09193	GRD-104-116
3000	240	36	31	TRH50018	THE09194	GRD-104-116
3000	277	36	31	TRH50019	THE09195	GRD-104-116
3000	480	36	31	TRH50020	THE09196	GRD-104-116
3600	208	48	43	TRH50021	THE09197	GRD-104-117
3600	240	48	43	TRH50022	THE09198	GRD-104-117
3600	277	48	43	TRH50023	THE09199	GRD-104-117
3600	480	48	43	TRH50024	THE09200	GRD-104-117
5000	208	60	55	TRH50025	THE09201	GRD-104-118
5000	240	60	55	TRH50026	THE09202	GRD-104-118
5000	277	60	55	TRH50027	THE09203	GRD-104-118
5000	480	60	55	TRH50028	THE09204	GRD-104-118

Replacement Reflectors for the TRH5

(installation instructions included)

Reflector Kit Part Number	*Number of Reflectors Supplied	Overall 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

*Units over 60 inches have segmented reflectors

Replacement Element Support Brackets

Part Number: SMPR-1014

Replacement End Plates

End Plate by Terminal Box
Part Number: SMP-123-108

End Plate Back End
Part Number: SMP-123-105

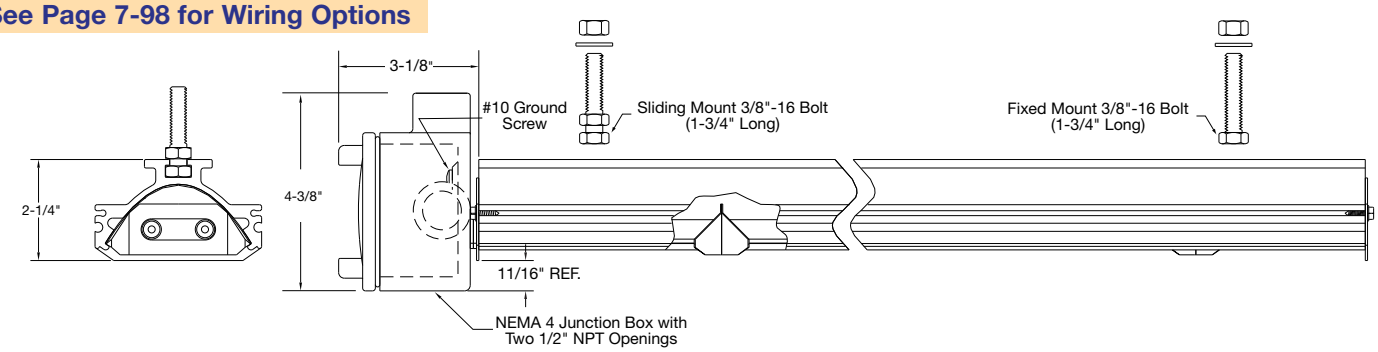
Replacement Bolts

Sliding Bolt
Part Number: FAS-102-108

Fixed Bolt
Part Number: SCW-139-109

Optional Heating Element Protective Guard
Prevents accidental direct contact with heating element.

See Page 7-98 for Wiring Options



See Page 7-98 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

TRH6 Series — Dual Hairpin Element Liquid Tight Double End Termination

Replacement Reflectors for the TRH6
(installation instructions included)

Reflector Kit Part Number	*Number of Reflectors Supplied	Overall 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	88
SMPR-1050	2	108	100

*Units over 60 inches have segmented reflectors

Replacement Element Support Brackets
Part Number: SMPR-1014

Replacement End Plates
Part Number: SMP-123-108

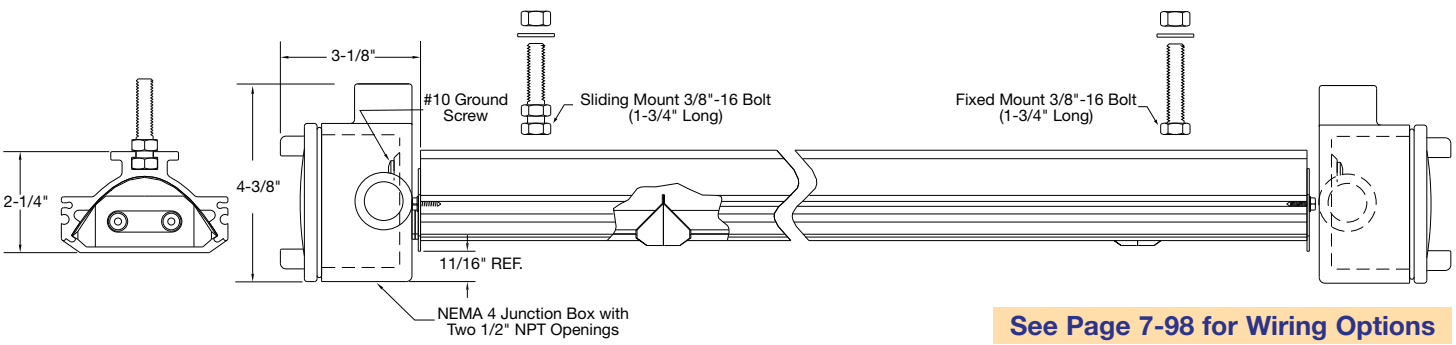
Replacement Bolts
Sliding Bolt
Part Number: FAS-102-108

Fixed Bolt
Part Number: SCW-139-109

Non-Stock Standard Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number	Replacement Element Part Number	Optional Protective Wire Guard
6000	208	72	64	TRH60001	THE09205	GRD-104-119
6000	240	72	64	TRH60002	THE09206	GRD-104-119
6000	277	72	64	TRH60003	THE09207	GRD-104-119
6000	480	72	64	TRH60004	THE09208	GRD-104-119
7200	208	84	76	TRH60005	THE09209	GRD-104-120
7200	240	84	76	TRH60006	THE09210	GRD-104-120
7200	277	84	76	TRH60007	THE09211	GRD-104-120
7200	480	84	76	TRH60008	THE09212	GRD-104-120
8000	208	96	88	TRH60009	THE09213	GRD-104-121
8000	240	96	88	TRH60010	THE09214	GRD-104-121
8000	277	96	88	TRH60011	THE09215	GRD-104-121
8000	480	96	88	TRH60012	THE09216	GRD-104-121
9000	208	108	100	TRH60013	THE09217	GRD-104-122
9000	240	108	100	TRH60014	THE09218	GRD-104-122
9000	277	108	100	TRH60015	THE09219	GRD-104-122
9000	480	108	100	TRH60016	THE09220	GRD-104-122

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).



See Page 7-98 for Wiring Options

See Page 7-98 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

Installation Recommendations

Installation Recommendations

1. Sliding mounting bolts (1-3/4" long, 3/8-16 thread) slide along the length of the aluminum housing for mounting the heater to common structural framing materials, creating multiple heater installations accommodating flat, rectangular, polygonal, cylindrical or any other shape arrays.
   Minimum distance of 3-3/4" on center for heaters mounted side-by-side. Do not exceed 42" between sliding mounting bolts.
2. To reduce heat losses, heat deflector shields up to 14 gauge thick are recommended between heaters. Fiber insulation can also be placed behind the heater housing.
3. In applications where water or solvents are being evaporated, proper ventilation is required to expel vapors or fumes.
4. Standard NEMA 1 electrical enclosures located at opposite ends of the heater housing with standard 7/8" dia. knock-outs and a ½" NPT conduit threaded opening out the top of the housing facilitate single or double end wiring. Heaters with NEMA 3-4 boxes have dual 1/2" trade size hubs oriented 90° to each other. Openings accept standard electrical fittings.
5. Hold the tubular heater terminal tabs with pliers when tightening the screws to ensure secure electrical connections. Use only high temperature hook-up lead wire and nickel-plated steel or monel lugs — Available from Tempco; see page 7-21 and Section 15.

Electrical wiring should be done by a qualified electrician with full knowledge of the installation and in accordance with local codes and the National Electrical Code.

High temperature hook-up wire and terminal lugs are available from stock. See page 7-21 and Section 15.

Maintenance

1. **Never perform any type of service prior to disconnecting all electrical power to the heater installation.**
2. To maintain reflector efficiency, clean periodically with mild soap and water. Do not use alkali or other strong cleaners. They will dull the aluminum reflector finish.
3. **Replacement of elements, support brackets and reflectors.** (A) Remove terminal enclosure covers. (B) Disconnect power wires from element terminals. (C) Snap out support brackets. (D) Remove elements and old reflectors from front of unit.
   When replacing elements, reflectors should be replaced. Install new reflectors by snapping edges into housing grooves and reassemble other parts in reverse order.
   Replacement parts are available from stock; see pages 7-90 through 7-95.

Wiring Hints – Wire selection depends on the requirements of the installation.

Wire Temperature Rating for inside the heater housing should be 482°F (250°C) or higher depending on the installation.

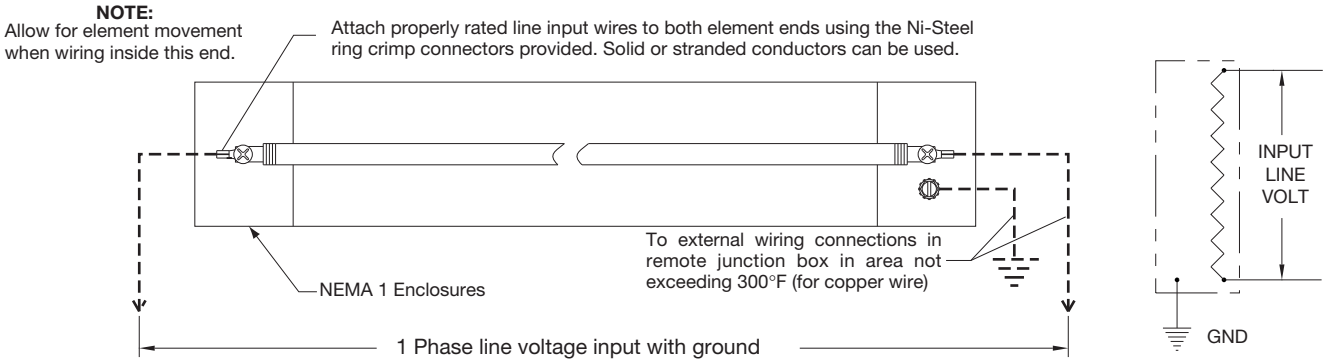
Voltage Rating should be equal to the operating voltage of the installation.

Wire Conductors should be nickel, nickel plated copper or nickel clad copper.

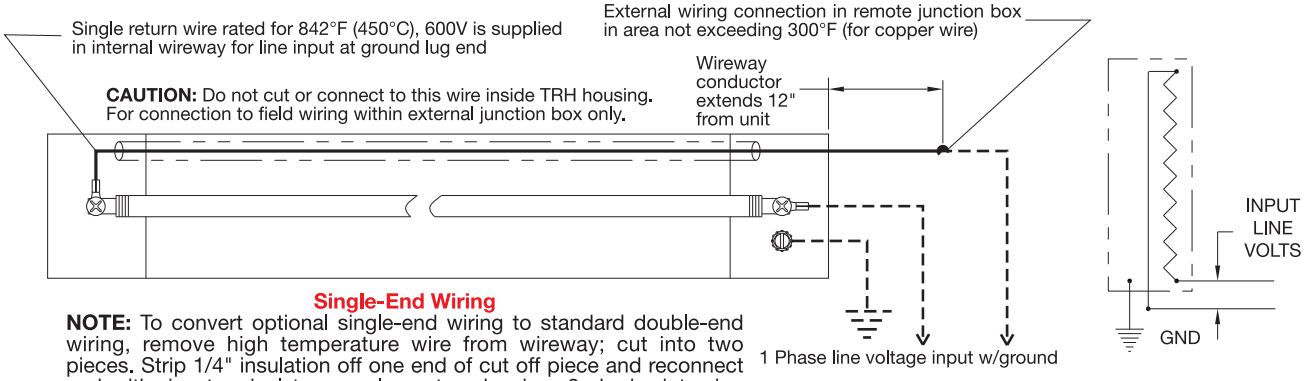
Do not use pure copper wire conductors.

Amperage Rating (wire gauge) should be 12 gauge for units drawing over 20 Amps of current. Use 14 gauge for units drawing under 20 Amps of current.

TRH1 (page 7-90) Standard Double-End Wiring



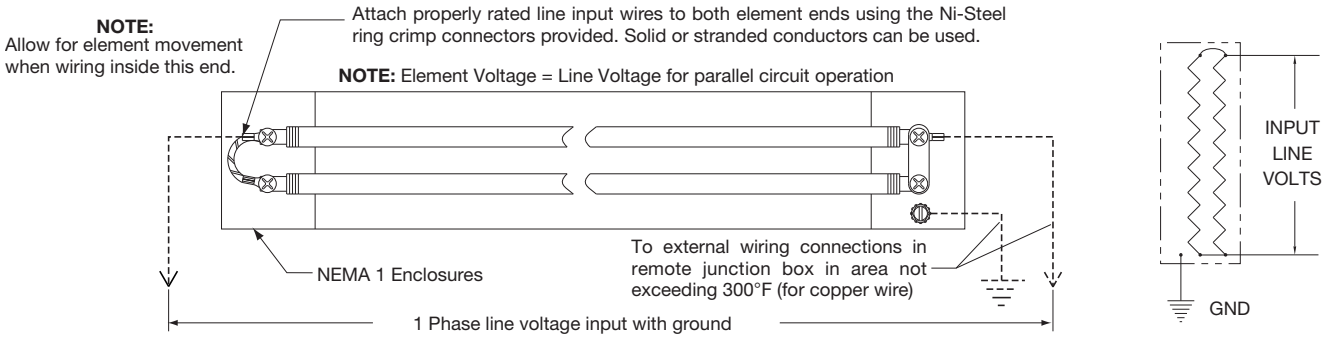
TRH1 (page 7-90) Optional Single End-Wiring



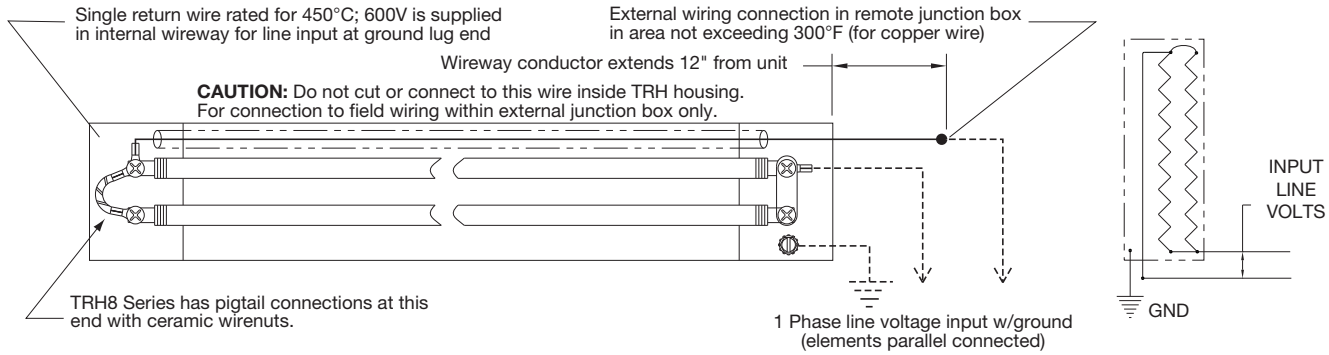
Single-End Wiring

NOTE: To convert optional single-end wiring to standard double-end wiring, remove high temperature wire from wireway; cut into two pieces. Strip 1/4" insulation off one end of cut off piece and reconnect end with ring terminal to one element end; crimp 2nd wire into ring

TRH2 (page 7-91) Standard Double-End Wiring



TRH2 (page 7-91) Optional Single-End Wiring



TRH2 (page 7-91) Multiple Heat/Dual Voltage Wiring

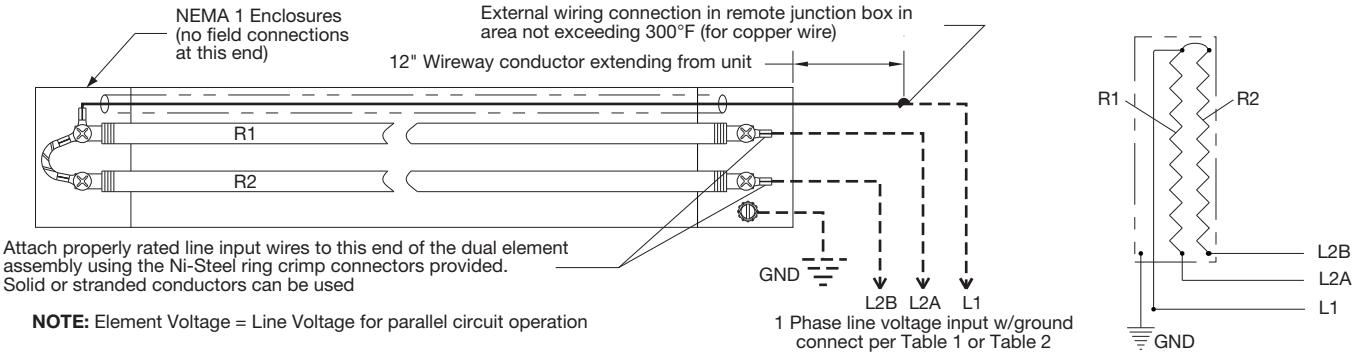


TABLE 1

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 240/480V or 120/240V rated units)

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

CAUTION

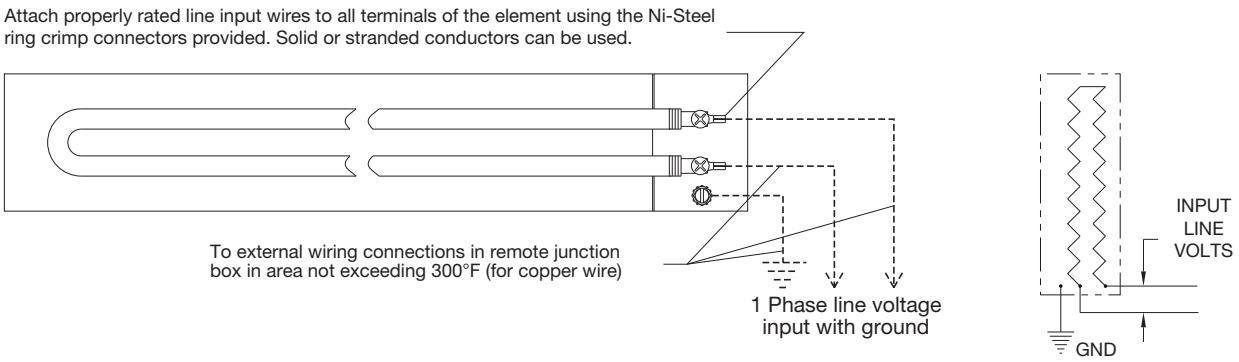
DANGER: Fire Hazard. Radiant Process Heaters with NEMA 1 electrical housings are not to be used in applications where flammable vapors, gases or liquids are present as defined in the National Electrical Code.

Do not mount the heater closer than 6 inches to any structural or surrounding material that does not have a minimum temperature rating of continuous operation at 395°F (200°C).

Proper ventilation is required to expel vapors or fumes away from the process and personnel.

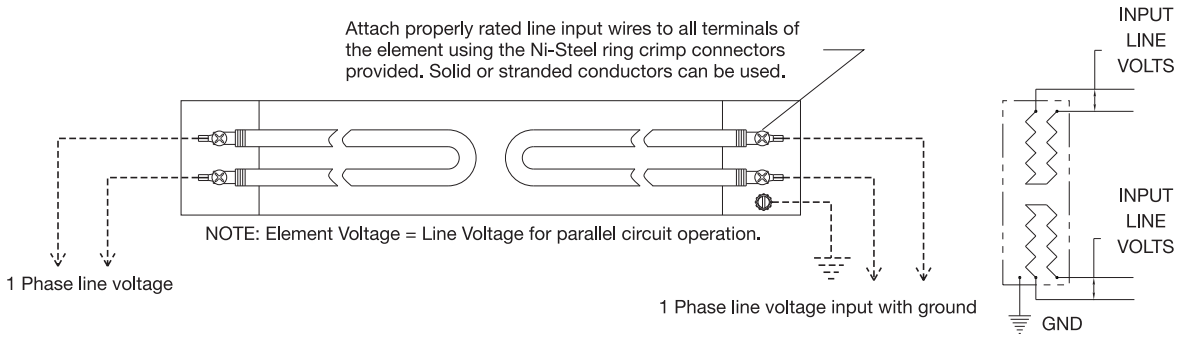
Universal 2000 TRH Wiring Options

TRH3 (page 7-92) and TRH5 (page 7-94) Standard Single-End Wiring



TRH4 (page 7-93) and TRH6 (page 7-95) Standard Double-End Wiring

(**Note:** This is the only option available for TRH 6 series.)



Stock Heavy Duty Quick Disconnect Plugs and Receptacles

Reference	NEMA P or R	Max. Amps	Volts	Plug Part No.	Receptacle Part No.
P3 straight	5-15	15A	125V	EHD-102-103	EHD-103-102
P4 twist lock	L5-15	15A	125V	EHD-102-113	EHD-103-104
P6 twist lock	L6-20	20A	250V	EHD-102-122	EHD-103-105
P7 twist lock	L6-30	30A	250V	EHD-102-126	EHD-103-125

Optional Electrical Plugs listed can be attached to armor cable or SJO cord described under wiring options. Receptacles listed are cable mount matching units for the plugs listed and are ordered separately.

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 194°F (90°C)

If longer cable is required, specify when ordering.


P3

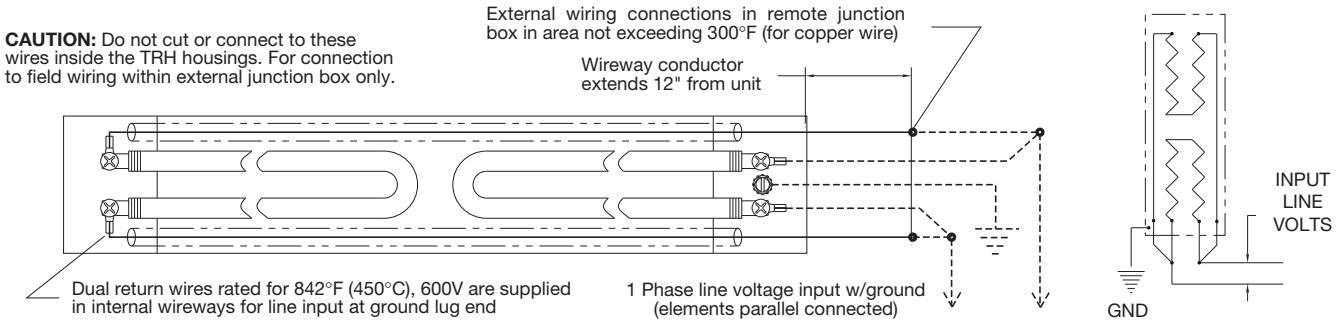

P4


P6


P7

All Items Available from Stock

TRH4 (page 7-93) Optional Single-End Wiring



TRH4 (page 7-93) Multiple Heat/Dual Voltage Wiring

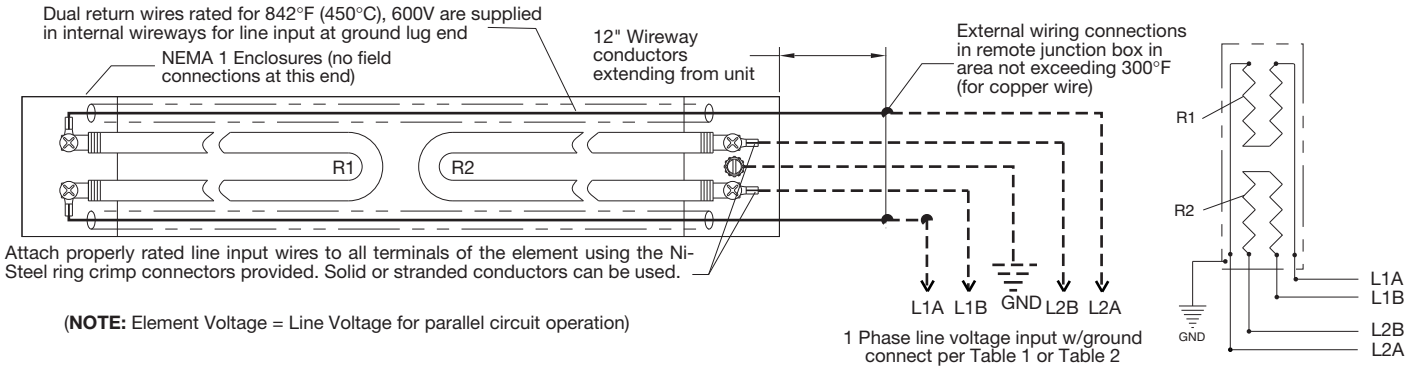


TABLE 1

Multiple Heat Connections (Single Input Voltage)

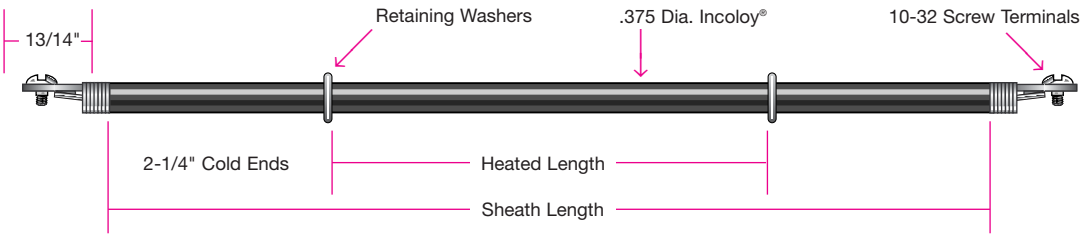
Heat Range	Line Input Wiring
Max Heat	L1A & L1B to L2A & L2B in parallel
Medium Heat	L1A to L1B or L2A to L2B only
Low Heat	L1A to L1B, input L2A to L2B

TABLE 2

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

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

Standard Universal Heater Replacements



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

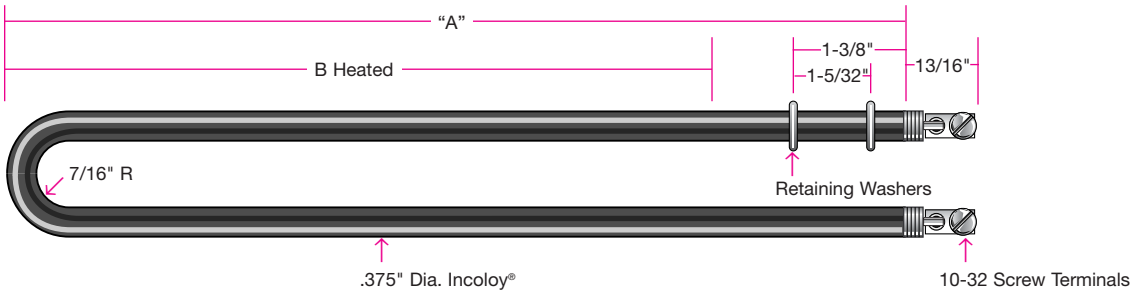
Watts	Volts	Overall Length in.	Heated Length in.	Cold Ends in.	Watlow® No.	Chromalox® Catalog No.	PCN	TEMPCO Part Number
400	120	10¼	7¼	1½	RDN10E1	RTU-2063AX35	147766	THE04300
650	120	16⅝	13⅜	1½	RDN16L1	RTU-2063AX29	147774	THE04301
800	120	21 1/16	16 13/16	2⅛	RDN21B1	RTU-2083A	106112	THE04302
800	208	21 1/16	16 13/16	2⅛	RDN21B2	RTU-2083AV	106120	THE04303
800	240	21 1/16	16 13/16	2⅛	RDN21B10	RTU-2083A	106139	THE04304
800	277	21 1/16	16 13/16	2⅛	RDN21B4	RTU-2083AV	106147	THE04305
1100	120	27⅛	22⅞	2⅛	RDN27C1	RTU-3113A	106155	THE04306
1100	208	27⅛	22⅞	2⅛	RDN27C2	RTU-3113AV	106163	THE04307
1100	240	27⅛	22⅞	2⅛	RDN27C10	RTU-3113A	106171	THE04308
1100	277	27⅛	22⅞	2⅛	RDN27C4	RTU-3113AV	106180	THE04309
1300	240	32⅛	27⅞	2⅛	RDN32C10	RTU-3133A	108409	THE04310
1300	480	32⅛	27⅞	2⅛	RDN32C11	RTU-3133A	108396	THE04311
1800	208	42⅞	38⅝	2⅛	RDN42R2	RTU-4183AV	106198	THE04312
1800	240	42⅞	38⅝	2⅛	RDN42R10	RTU-4183A	106200	THE04314
1800	277	42⅞	38⅝	2⅛	RDN42R4	RTU-4183AV	106219	THE04315
1800	480	42⅞	38⅝	2⅛	RDN42R11	RTU-4183A	106227	THE04316
2500	208	57½	53¼	2⅛	RDN57J2	RTU-5253AV	106235	THE04317
2500	240	57½	53¼	2⅛	RDN57J10	RTU-5253A	106243	THE04318
2500	277	57½	53¼	2⅛	RDN57J4	RTU-5253AV	106251	THE04319
2500	480	57½	53¼	2⅛	RDN57J11	RTU-5253A	106260	THE04320
3000	208	69¼	65	2⅛	RDN69E2	RTU-6303AV	106278	THE04321
3000	240	69¼	65	2⅛	RDN69E10	RTU-6303A	106286	THE04322
3000	277	69¼	65	2⅛	RDN69E4	RTU-6303AV	106294	THE04323
3000	480	69¼	65	2⅛	RDN69E11	RTU-6303A	106307	THE04324
3600	208	81¼	77	2⅛	RDN81E2	RTU-7363AV	106315	THE04325
3600	240	81¼	77	2⅛	RDN81E10	RTU-7363A	106323	THE04326
3600	277	81¼	77	2⅛	RDN81E4	RTU-7363AV	106331	THE04327
3600	480	81¼	77	2⅛	RDN81E11	RTU-7363A	106340	THE04328
4000	240	109¼	105	2⅛	RDN109E10	RTU-7303AX10	106358	THE04329
5000	240	134½	127¾	3⅜	RDN134J10	RTU-7303AX13	106366	THE04330
5500	240	153⅜	145⅞	4	RDN153R10	RTU-7303AX9A	106374	THE04331
6500	240	179¼	171¼	4	RDN179E10	RTU-7363AX38	106382	THE04332

Ordering Information

Select the Part Number of the replacement Tubular Element that meets your requirement.

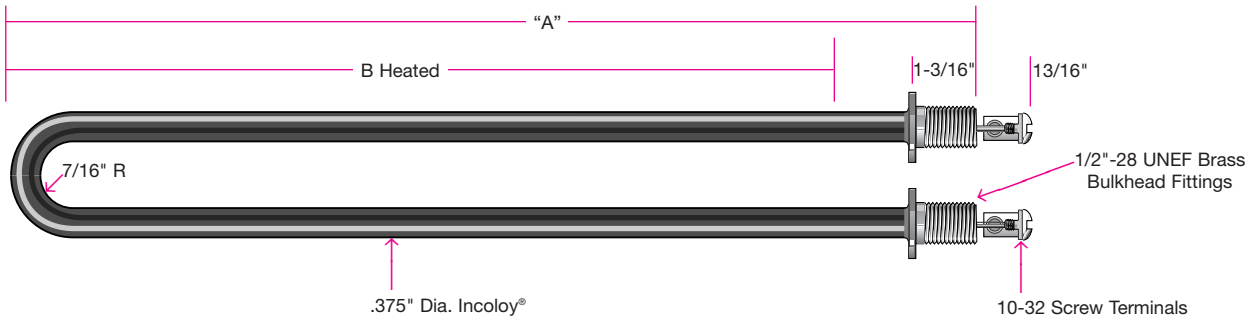
Standard lead time is 2 to 3 weeks.

Standard Universal Heater Replacements



Universal "U" Bend Elements Standard Sizes and Electrical Ratings Replacement Cross Reference Listing

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



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

Watts	Volts	Overall "A" Dim. in.	Heated "B" Dim. in.	Watlow® No.	Chromalox® Catalog No.	Chromalox® PCN	TEMPCO Part Number
800	120	10 1/2	8 3/8	RDN21B1B	UTU-2LT	106673	THE04353
800	240	10 1/2	8 3/8	RDN21B10B	UTU-2LT	106681	THE04354
1100	120	13 9/16	11 3/8	RDN27C1B	UTU-3LT	106690	THE04355
1100	240	13 9/16	11 3/8	RDN27C10B	UTU-3LT	106702	THE04356
1800	240	21 5/16	19 1/8	RDN42R10B	UTU-4LT	106710	THE04357
1800	480	21 5/16	19 1/8	RDN42R11B	UTU-4LT	106729	THE04358
2500	240	28 11/16	26 1/2	RDN57J10B	UTU-5LT	106737	THE04359
2500	480	28 11/16	26 1/2	RDN57J11B	UTU-5LT	106745	THE04360
3000	240	34 9/16	32 1/2	RDN69E10B	UTU-6LT	106753	THE04361
3000	480	34 9/16	32 1/2	RDN69E11B	UTU-6LT	106761	THE04362
3600	240	40 9/16	38 1/2	RDN81E10B	UTU-7LT	106770	THE04363
3600	480	40 9/16	38 1/2	RDN81E11B	UTU-7LT	106788	THE04364

Infrared Radiant Heaters Are Ideal for Many Diverse Applications

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*
- *Comfort heat for agricultural, zoological and reptilian pet applications*

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.

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 through space by electromagnetic waves without the need for 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

A Safety Issue

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.

Operating life

A ceramic infrared E-Mitter should not be immersed in or have contact with any liquids. The E-Mitter surface must be kept clean and free of any contamination. Failure to do so can compromise heater operating life.

Explosion Protection

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 heater's 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 strict observance of all applicable regulations.

Ceramic Infrared E-Mitter Technical Data

Heat Transfer Theory Summary

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.

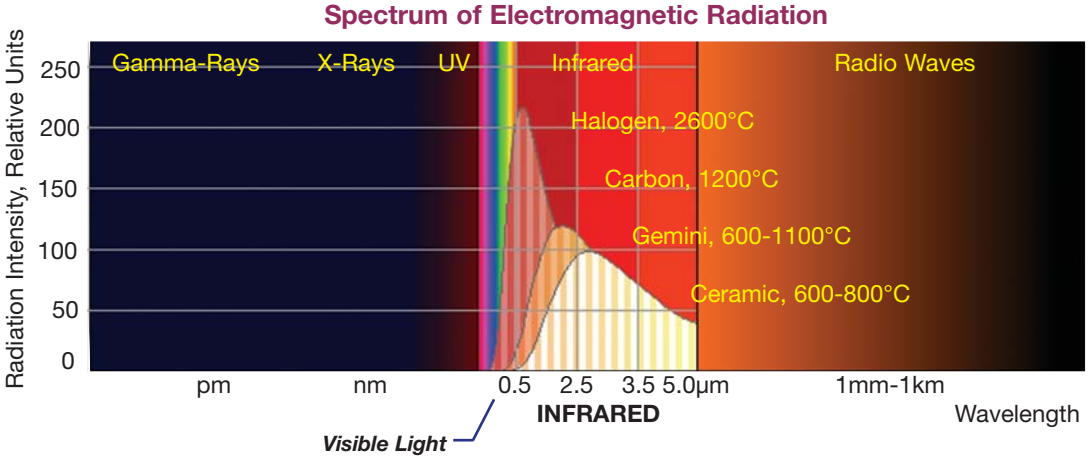
Many applications in the field are unique and present substantially different operational parameters and characteristics. This application diversity should be evaluated accordingly, and while the material presented in this section is intended to provide some background reference, it is very generalized 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 these important characteristics will lead to a better utilization of infrared heating technology.

Taking the Mystery Out of Infrared Energy



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.

WHY CAN'T WE SEE INFRARED RADIATION?

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

$$\lambda = c \div f$$

"c" is the speed of light (3×10^{-8} m/s)

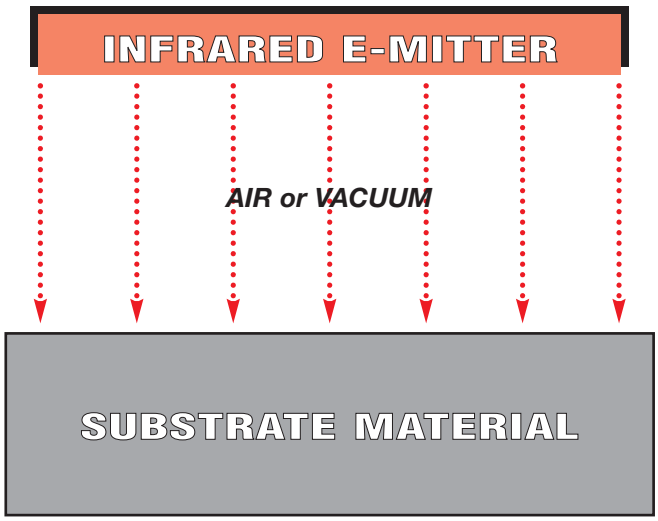
Infrared radiation wavelengths fall outside the visible range in the electromagnetic spectrum; see adjacent figure. One micrometer, µm, is equal to 10^{-6} meter.

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

$$W = \varepsilon\sigma T^4$$

"ε" is the emissivity factor
"σ" is the Stefan-Boltzmann constant (5.67×10^{-12} W/cm^{2}K^4)
"T" is the surface temperature of the object in °K
(0°C equals 273°K).

Ceramic Infrared E-Mitter Technical Data



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.

CAUTION 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	Wattage	CRB Infrared Heater Ratings								
		150	250	300	350	400	500	650	750	1000
	Surface Watt Density	6.48	10.8	12.95	15.11	17.27	21.59	28.07	32.39	43.18
PAPER										
• Heating paper pulp and papier-mâché before pressing/molding								■		
• Quick drying of lacquered paper, gummed or glued paper and cardboard									■	■
PLASTICS & RUBBER										
• 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						■	■			
TEXTILES, SILK & FIBERS										
• Drying washed, dyed and finished textiles		■						■	■	■
• Fiberglass layup and molding; Resin curing			■	■	■					
• Silk-screen printing; Fusing metallic inks					■	■	■			■
• Stress curing ovens for synthetic fibers				■	■	■	■			
TOBACCO & FOOD INDUSTRY										
• Heating food in restaurants		■	■	■						
• Tobacco drying; Grain drying		■	■							
GENERAL										
• 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		■							■	■

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

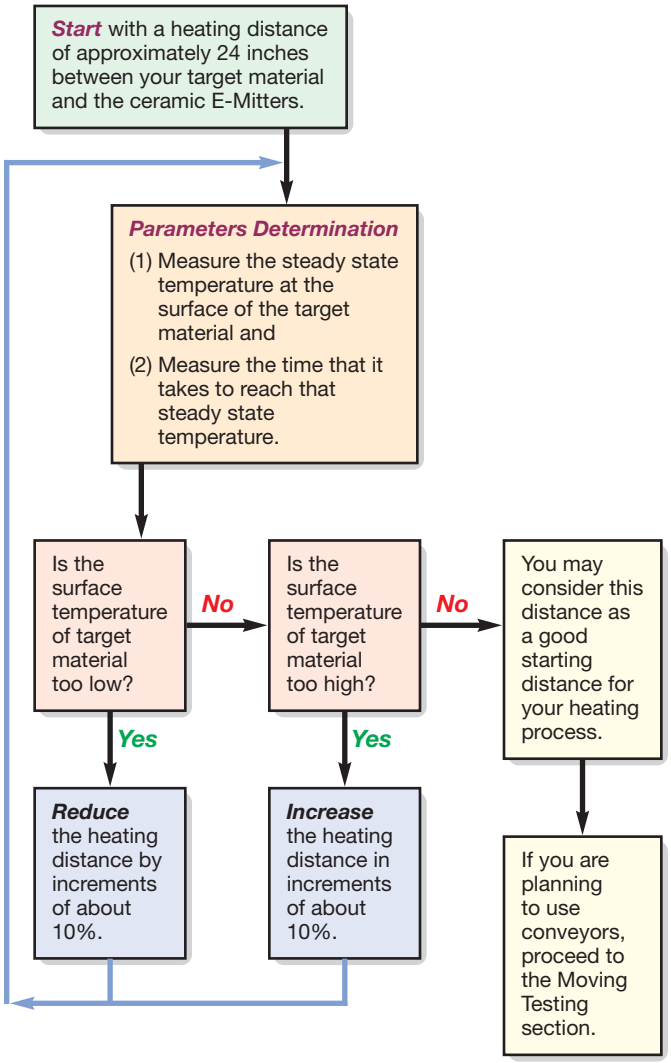
The optimum heating distance cannot be accurately determined for a given application without some preliminary testing because of the many different factors that affect the radiation transfer of heat. Therefore only general guidelines can be offered here.

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 7-104 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 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-Mitter Technical Data

Moving Testing

OBJECTIVES

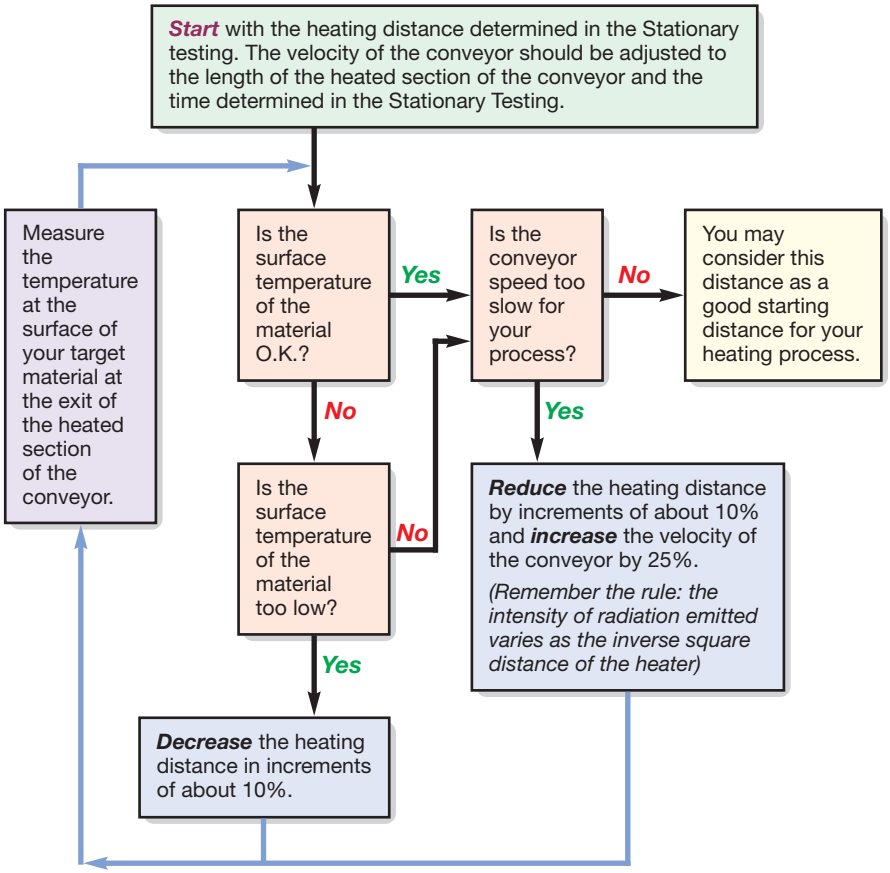
Determination of the heating distance and the velocity of the conveyor.

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.

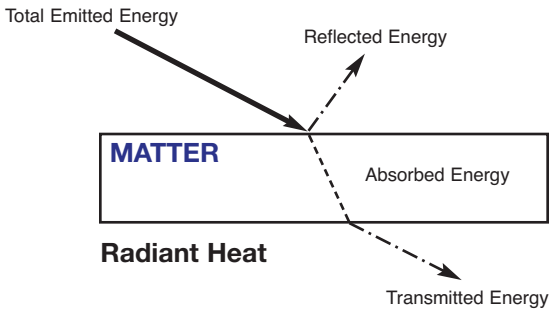
Higher thermal loading can be achieved in moving systems that result in higher production output. This higher output can be easily accomplished without complications on properly designed, installed and maintained infrared heating systems.

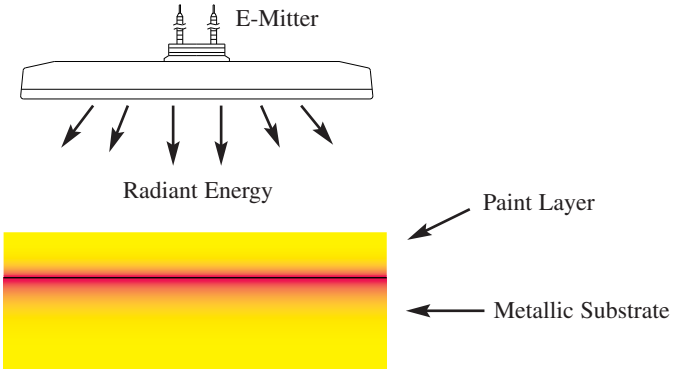


Material Thickness

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.

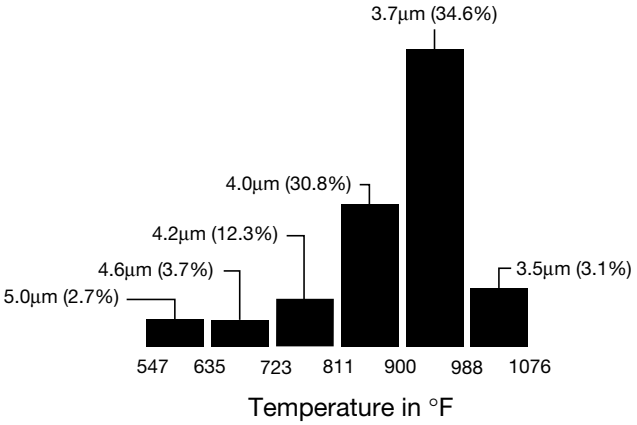




Ceramic Infrared E-Mitter Technical Data

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 with the results shown on the right. The values associated with temperature, emitted wavelength distribution and percentages, were obtained when the heater reached steady state conditions in room ambient. The value of the peak wavelength λ_{max} (3.7 microns) was calculated using Wien's displacement law for a blackbody from the peak temperature obtained in the tests. This calculation is valid since the spectral emissive power of our ceramic E-Mitter closely approximates the theoretical values in the Planck's formulation for infrared wavelength distribution. The family of Planck's IR curves are available upon request.



An Example of Emissive Power

Wien's Law is expressed by the following formula:

$\lambda_{max} = 5215.6\mu m/°F \div (T + 460)$

T = Temperature °F

λ_{max} = Peak Wavelength

Example:

What is the optimum peak E-Mitter surface temperature for heating a target material that has its best absorption in the infrared wavelength range of 4.0 to 3.4 microns (µm)?

Average peak wavelength = (4.0 + 3.4) ÷ 2 = 3.7µm

Using Wien's law we have;

3.7µm = 5215.6 ÷ (°F + 460) or °F = (5215.6 ÷ 3.7) – 460 = 949.6°F

This temperature is only a starting point and should be confirmed by testing and simulation of the exact conditions of the application. As you can see from the bar graph, this 950°F point coincides to the highest % of the radiated energy from the CRE E-Mitter that was tested. Once the heater temperature has been established the charts included in the various individual heater sections can be used to select the proper heater wattage starting point.

Conveyor Systems

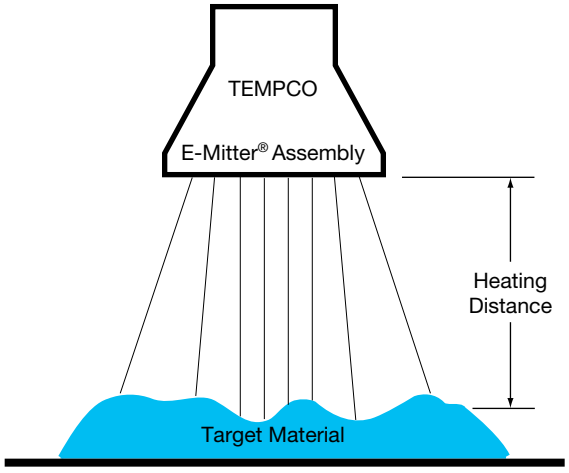
Moving heating systems generally achieve higher output per hour than is possible with static systems. The radiant heater's setpoint temperature is set higher in conveyor systems than static systems due to the limited time the product is under the heaters. Tests should be carried out to determine the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

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 it. 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.



Ceramic E-Mitter 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.

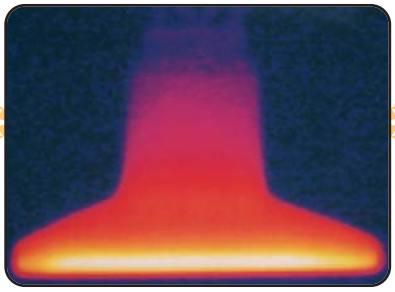
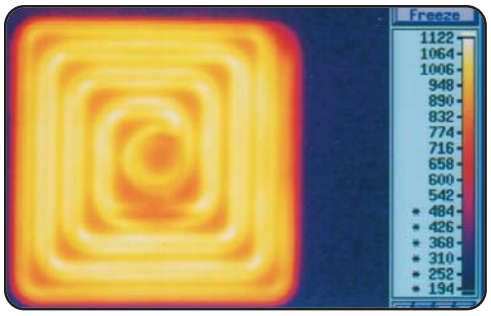
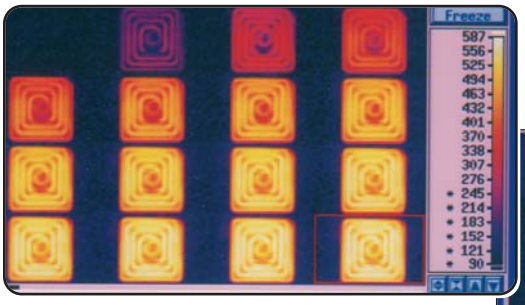


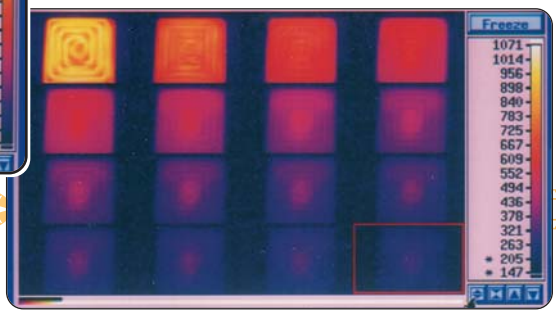
Image of Part Number CRD00002

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.





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.