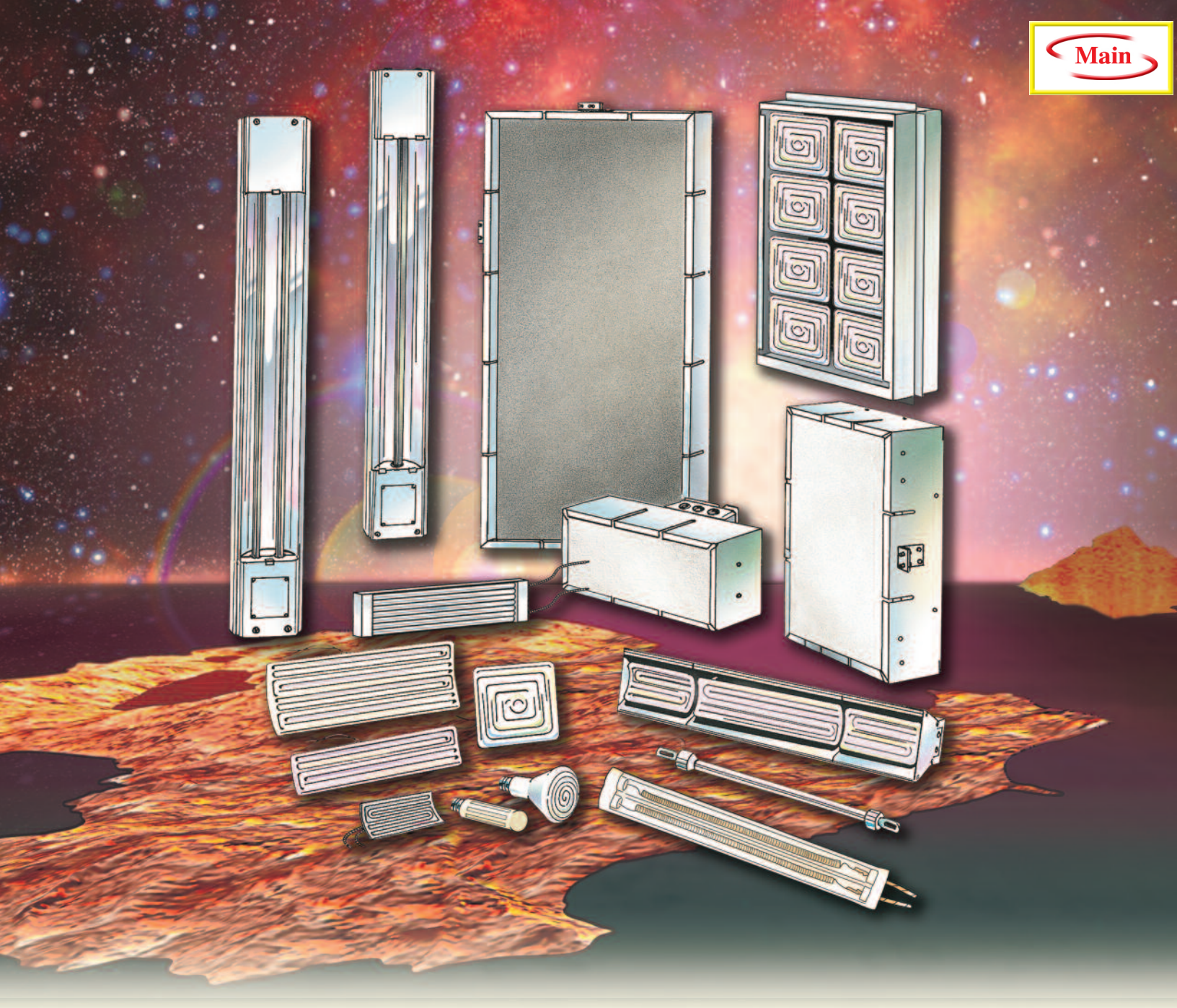

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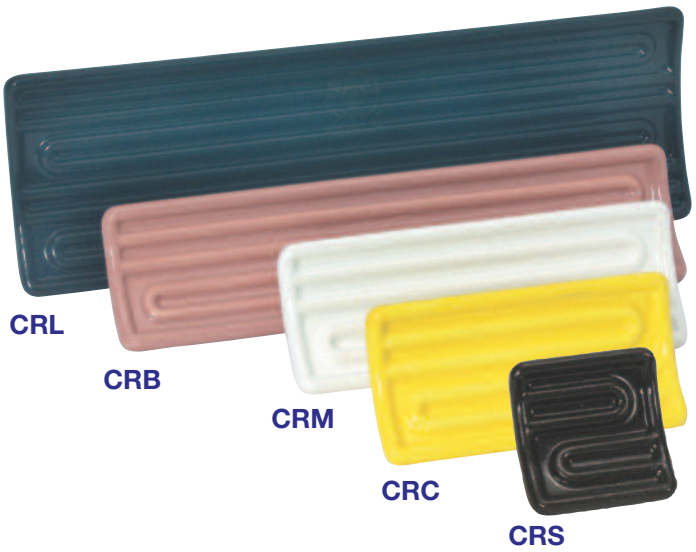
Radiant Heaters

7 section

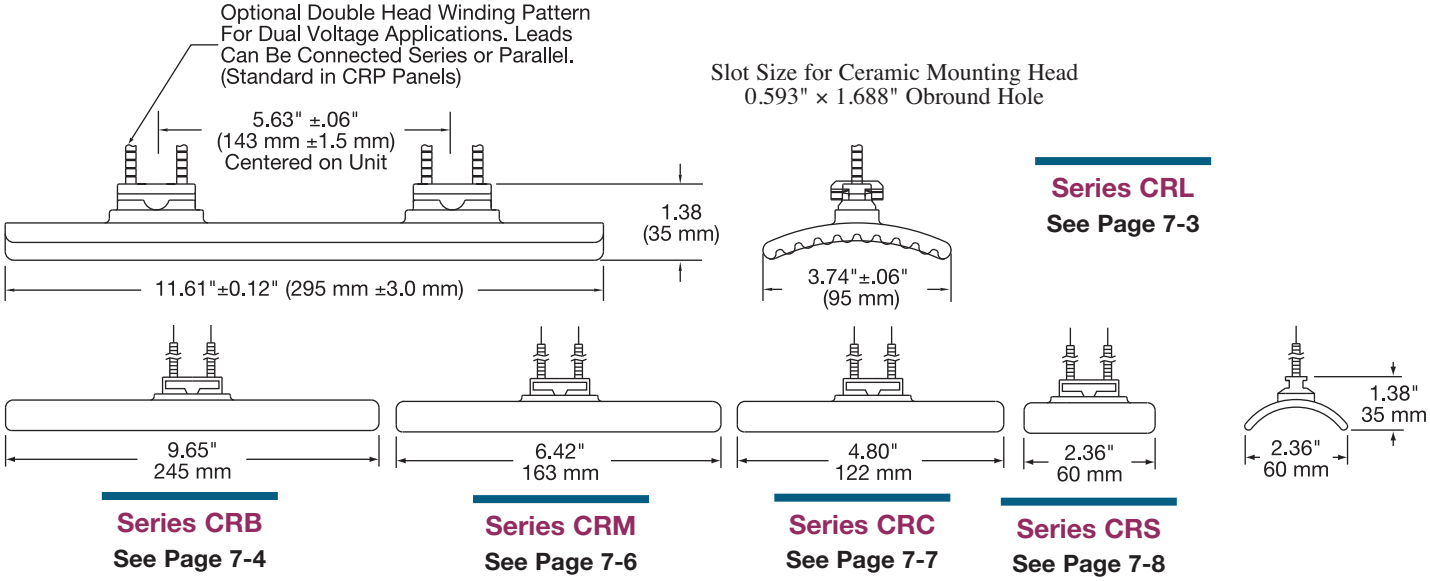
Series CRL, CRB, CRM, CRC and CRS Curved Face Ceramic E-Mitters



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 CRL
See Page 7-3

Series CRB
See Page 7-4

Series CRM
See Page 7-6

Series CRC
See Page 7-7

Series CRS
See Page 7-8

Ordering Information

Standard Heaters

Order by Part Number for Standard (Non-Stock) heaters.

Semi-Finished Stock CRB and CRC heaters ship in five business days. A Part Number will be assigned at time of order.

Custom Engineered/Manufactured Heaters

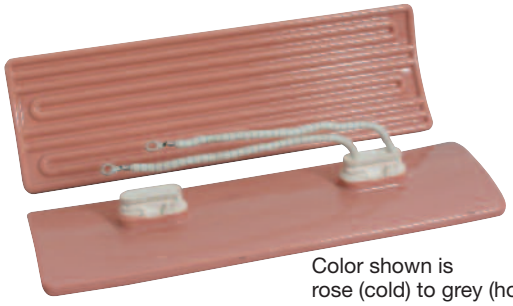
Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** can manufacture a Ceramic E-Mitter to meet your requirements. ***Standard lead time is 3 weeks.***

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 7-20

View Product Inventory @ www.tempco.com

Series CRL Curved Face Ceramic E-Mitters – Size: 95 mm × 295 mm (3.74" × 11.61")



Color shown is rose (cold) to grey (hot)

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRL E-Mitters

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	Color	Watt Density*		Heater Body Temp.** (Typical Operating)		Peak Emitted	Part Number		
			(W/in²)	(W/cm²)	°F	°C	Wavelength***	Without Thermocouple	Standard Type K Thermocouple	Low Noise Type K Thermocouple
500	120	Yellow to Orange	11.9	1.9	796	424	4.15	CRL20021	—	CRL20022
500	220-240	Rose to Grey	11.9	1.9	796	424	4.15	CRL10009	CRL10010	—
500	220-240	White	11.9	1.9	796	424	4.15	CRL00009	CRL00010	—
500	240/480	Yellow to Orange	11.9	1.9	796	424	4.15	CRL20023	—	CRL20024
750	120/240	Yellow to Orange	17.9	2.8	956	513	3.68	CRL20025	—	CRL20026
750	220-240	Rose to Grey	17.9	2.8	956	513	3.68	CRL10011	CRL10012	—
750	220-240	White	17.9	2.8	956	513	3.68	CRL00011	CRL00012	—
750	240/480	Yellow to Orange	17.9	2.8	956	513	3.68	CRL20027	—	CRL20028
950	220-240	Rose to Grey	22.7	3.5	1053	567	3.45	CRL10001	CRL10002	—
950	220-240	White	22.7	3.5	1053	567	3.45	CRL00001	CRL00002	—
1000	220-240	Rose to Grey	23.9	3.7	1076	580	3.40	CRL10013	CRL10014	—
1000	220-240	White	23.9	3.7	1076	580	3.40	CRL00013	CRL00014	—
1000	240/480	Yellow to Orange	23.9	3.7	1076	580	3.40	CRL20029	—	CRL20030
1150	220-240	Rose to Grey	27.5	4.3	1145	618	3.25	CRL10003	CRL10004	
1150	220-240	White	27.5	4.3	1145	618	3.25	CRL00003	CRL00004	—
1250	240/480	Yellow to Orange	29.9	4.6	1191	644	3.16	CRL20031	—	CRL20032
1400	480	Rose to Grey	33.5	5.2	1262	683	3.03	CRL10015	CRL10016	—
1400	480	White	33.5	5.2	1262	683	3.03	CRL00015	CRL00016	—
1500	240/480	Yellow to Orange	35.9	5.6	1308	709	2.95	CRL20033	—	CRL20034
1600	480	Rose to Grey	38.2	5.9	1351	733	2.88	CRL10017	CRL10018	—
1600	480	White	38.2	5.9	1351	733	2.88	CRL00017	CRL00018	—
1800	480	Rose to Grey	43.0	6.7	1418	770	2.78	CRL10019	CRL10020	—
1800	480	White	43.0	6.7	1418	770	2.78	CRL00019	CRL00020	—

NOTES: All dual voltage heaters have two windings (parallel connected for the lower voltage & series connected for the higher voltage). Single voltage heaters are single winding designs.

Units with an internal "low noise" style thermocouple have 12" leads (see page 7-14). Standard type "K" T/C units also available.

Heaters with yellow to orange color are exact replacements for heaters in CRP Modular 12 × 12 CRP Radiant Panels on page 7-24.

*** 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.

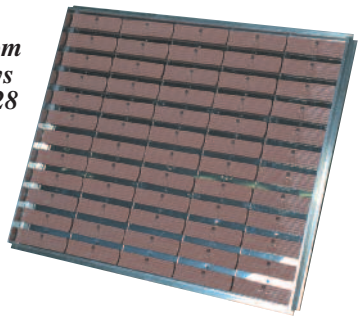
***** Peak infrared radiation wavelength** as calculated from Wien's Law, for operating temperature shown. Expressed in microns (μm).

Custom Heater Assemblies & Power Control Panels

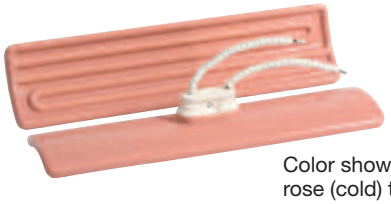
Type CRA Custom Linear Arrays start on page 7-18

Array Power/Temperature Control Panels (see page 7-37)

Type ARA Custom Structural Arrays start on page 7-28



Series CRB Curved Face Ceramic E-Mitters – Size: 60 mm × 245 mm (2.36" × 9.65")



Color shown is rose (cold) to grey (hot)

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRB E-Mitters

E-Mitters listed have 3.50" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Color	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
150	220/240	Rose to Grey	6.48	1.00	560	293	CRB10216	CRB10217
150	220/240	White	6.48	1.00	560	293	CRB00216	CRB00217
250	220/240	Rose to Grey	10.80	1.67	756	402	CRB10006	CRB10008
250	220/240	White	10.80	1.67	756	402	CRB00006	CRB00008
400	220/240	Rose to Grey	17.27	2.68	942	506	CRB10014	CRB10016
400	220/240	White	17.27	2.68	942	506	CRB00014	CRB00016
650	120	Rose to Grey	28.07	4.35	1156	624	CRB10020	CRB10022
650	120	White	28.07	4.35	1156	624	CRB00020	CRB00022
650	220/240	Rose to Grey	28.07	4.35	1156	624	CRB10023	CRB10025
650	220/240	White	28.07	4.35	1156	624	CRB00023	CRB00025
650	480	Rose to Grey	28.07	4.35	1156	624	CRB10088	CRB10165
650	480	White	28.07	4.35	1156	624	CRB00088	CRB00165
1000	120	Rose to Grey	43.18	6.69	1420	771	CRB10028	CRB10030
1000	120	White	43.18	6.69	1420	771	CRB00028	CRB00030
1000	220/240	Rose to Grey	43.18	6.69	1420	771	CRB10031	CRB10033
1000	220/240	White	43.18	6.69	1420	771	CRB00031	CRB00033
1000	480	Rose to Grey	43.18	6.69	1420	771	CRB10089	CRB10045
1000	480	White	43.18	6.69	1420	771	CRB00089	CRB00045

Semi-Finished Stock CRB E-Mitters (Five Business Day Manufacturing)

Semi-Finished Series CRB E-Mitters listed below are stocked ready for color glazing. Colors available are metamorphing rose (cold) to grey (hot), traditional white, metamorphing yellow (cold) to orange (hot), and black.

They can be terminated with beaded leads up to 6" long with spliced-on lead wire for lengths beyond 6" and straight, ring, or spade terminals. Some are available with a thermocouple (any length).

A part number will be assigned at time of order.

Wattage	Voltage	Watt Density* (W/in²)	Watt Density* (W/cm²)	Heater Body** Temperature (Typical) °F	Heater Body** Temperature (Typical) °C	Optional Thermocouple (Any Length)
400	230	17.27	2.68	942	506	N/A
650	230	28.07	4.35	1156	624	Type K
650	480	28.07	4.35	1156	624	N/A
1000	230	43.18	6.69	1420	771	Type K
1000	480	43.18	6.69	1420	771	Type J or K

CRB Ordering Information (See page 7-2)

Series CRB Curved Face Ceramic E-Mitter Specifications

Series CRB – Size: 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

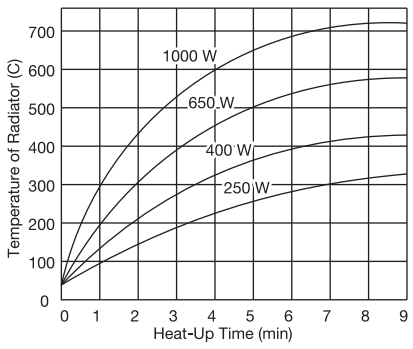
*** Watt density** calculated using heater face surface area.

**** 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.

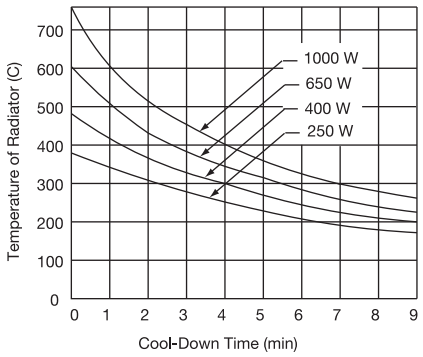
***** Peak infrared radiation wavelength** as calculated from Wien's Law, for operating temperature shown. Expressed in microns (μm).

Typical Heating and Cooling Behavior of CRB Ceramic E-Mitters

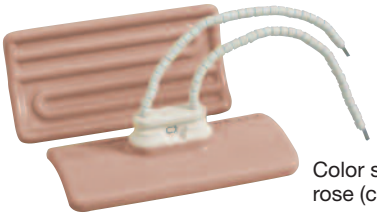
Warm-Up Time Graph



Cool-Down Time Graph



Series CRM Curved Face Ceramic E-Mitters – Size: 60 mm × 163 mm (2.36" × 6.42")



Color shown is rose (cold) to grey (hot)

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRM E-Mitters

E-Mitters listed have 3.50" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Color	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
425	120	Rose to Grey	27.44	4.25	1144	618	CRM10008	CRM10011
425	120	White	27.44	4.25	1144	618	CRM00008	CRM00011
500	120	Rose to Grey	32.28	5.00	1239	671	CRM10009	CRM10012
500	120	White	32.28	5.00	1239	671	CRM00009	CRM00012
600	220/240	Rose to Grey	38.74	6.00	1360	738	CRM10010	CRM10013
600	220/240	White	38.74	6.00	1360	738	CRM00010	CRM00013

Series CRM Curved Face Ceramic E-Mitter Specifications

Series CRM – Size: 60 mm × 163 mm (2.36" × 6.42")

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

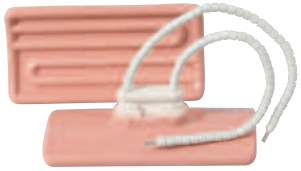
*** Watt density** calculated using heater face surface area.

**** 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).

CRM Ordering Information (See page 7-2)

Series CRC Curved Face Ceramic E-Mitters – Size: 60 mm × 122 mm (2.36" × 4.80")



Color shown is rose (cold) to grey (hot)

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRC E-Mitters

E-Mitters listed have 3.50" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Color	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
125	220/240	Rose to Grey	10.80	1.67	756	402	CRC10005	CRC10007
125	220/240	White	10.80	1.67	756	402	CRC00005	CRC00007
200	220/240	Rose to Grey	17.27	2.68	942	506	CRC10013	CRC10015
200	220/240	White	17.27	2.68	942	506	CRC00013	CRC00015
325	120	Rose to Grey	28.07	4.35	1156	624	CRC10018	CRC10020
325	120	White	28.07	4.35	1156	624	CRC00018	CRC00020
325	220/240	Rose to Grey	28.07	4.35	1156	624	CRC10021	CRC10023
325	220/240	White	28.07	4.35	1156	624	CRC00021	CRC00023
325	480	Rose to Grey	28.07	4.35	1156	624	CRC10064	CRC10140
325	480	White	28.07	4.35	1156	624	CRC00064	CRC00140
500	120	Rose to Grey	43.18	6.69	1420	771	CRC10024	CRC10026
500	120	White	43.18	6.69	1420	771	CRC00024	CRC00026
500	220/240	Rose to Grey	43.18	6.69	1420	771	CRC10027	CRC10029
500	220/240	White	43.18	6.69	1420	771	CRC00027	CRC00029
500	480	Rose to Grey	43.18	6.69	1420	771	CRC10066	CRC10141

Semi-Finished Stock CRC E-Mitters (Five Business Day Manufacturing)

Semi-Finished Series CRC E-Mitters listed below are stocked ready for color glazing. Colors available are metamorphing rose (cold) to grey (hot), traditional white, metamorphing yellow (cold) to orange (hot), and black.

They can be terminated with beaded leads up to 6" long with spliced-on lead wire for lengths beyond 6" and straight, ring, or spade terminals. Some are available with a thermocouple (any length).

A part number will be assigned at time of order.

Wattage	Voltage	Watt Density* (W/in²)	Watt Density* (W/cm²)	Heater Body** Temperature (Typical) °F	Heater Body** Temperature (Typical) °C	Optional Thermocouple (Any Length)
200	230	17.27	2.68	942	506	Type K
325	230	28.07	4.35	1156	624	Type K
325	480	28.07	4.35	1156	624	N/A
500	230	43.18	6.69	1420	771	Type K
500	480	43.18	6.69	1420	771	N/A

CRC Ordering Information (See page 7-2)

CONTINUED

Series CRC Curved Face Ceramic E-Mitter Specifications

Continued from previous page…

Series CRC Curved Face Ceramic E-Mitters – Size: 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 CRS Curved Face Ceramic E-Mitters – Size: 60 mm × 60 mm (2.36" × 2.36")

Optional Features

- ✳ *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- ✳ *Two-Piece Wave Mounting Clip (page 7-14)*
- ✳ *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- ✳ *Arrays and Power/Temperature Control Panels (start on page 7-15)*

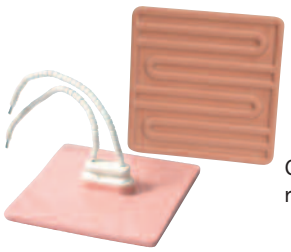
Standard (Non-Stock) CRS E-Mitters

E-Mitters listed have 3.50" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Color	Watt Density* (W/in²)	Watt Density* (W/cm²)	Part Number Without Thermocouple	Part Number With Type K Thermocouple
162	120	White	28.07	4.35	CRS00002	CRS00009
162	220/240	White	28.07	4.35	CRS00005	CRS00012
250	120	White	43.18	6.69	CRS00003	CRS00010
250	220/240	White	43.18	6.69	CRS00006	CRS00013

CRS Ordering Information (See page 7-2)

Series CRG Flat Face Ceramic E-Mitters – Size: 122 mm (4.80") square



Color shown is rose (cold) to grey (hot)

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRG E-Mitters

E-Mitters listed have 3-1/2" 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	Color	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	Rose to Grey	10.9	1.7	758	403	CRG10026	CRG10027
250	220/240	White	10.9	1.7	758	403	CRG00026	CRG00027
325	220/240	Rose to Grey	14.1	2.2	862	461	CRG10028	CRG10029
325	220/240	White	14.1	2.2	862	461	CRG00028	CRG00029
400	220/240	Rose to Grey	17.4	2.7	944	507	CRG10030	CRG10031
400	220/240	White	17.4	2.7	944	507	CRG00030	CRG00031
650	220/240	Rose to Grey	28.2	4.4	1159	626	CRG10032	CRG10033
650	220/240	White	28.2	4.4	1159	626	CRG00032	CRG00033
800	220/240	Rose to Grey	34.7	5.4	1287	697	CRG10034	CRG10035
800	220/240	White	34.7	5.4	1287	697	CRG00034	CRG00035
1000	220/240	Rose to Grey	43.4	6.7	1422	772	CRG10036	CRG10037
1000	220/240	White	43.4	6.7	1422	772	CRG00036	CRG00037

Series CRG Flat Face Ceramic E-Mitter Specifications

Watts/Square Inch vs. Temperature Data

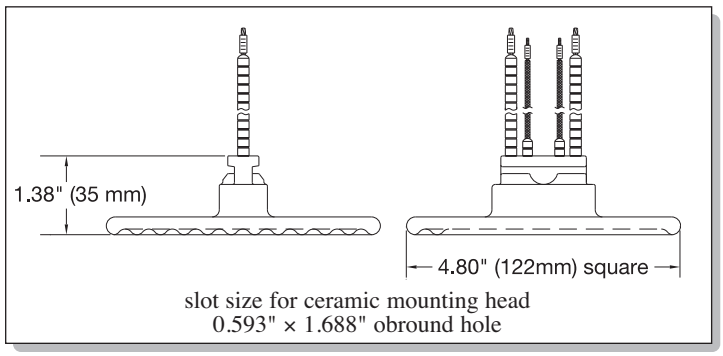
Watts	Surface W/in²*	Heater Body °F Rise	Heater Body Temp @ 72°F**	Primary Emitted Wavelength*** (μ)
250	10.9	686	758	4.28
325	14.1	790	862	3.95
400	17.4	872	944	3.72
650	28.2	1087	1159	3.22
800	34.7	1215	1287	2.99
1000	43.4	1350	1422	2.77

*** 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).

Series CRG Dimensions

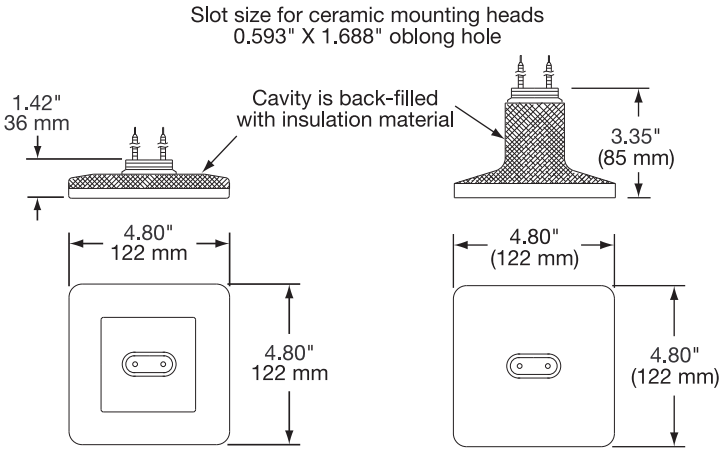


slot size for ceramic mounting head
0.593" × 1.688" obround hole

CRG Ordering Information
See page 7-2

Insulated Flat Face Short Neck Series CRH and Long Neck Series CRD Ceramic E-Mitters

CRH shown in white and CRD in metamorphing rose (cold) to grey (hot)



Series CRH Dimensions | **Series CRD Dimensions**

CRH and 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 improved operating life.

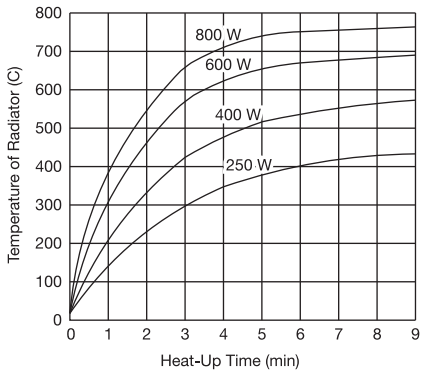
Design Features

- ***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 6µm infrared radiation wavelength***

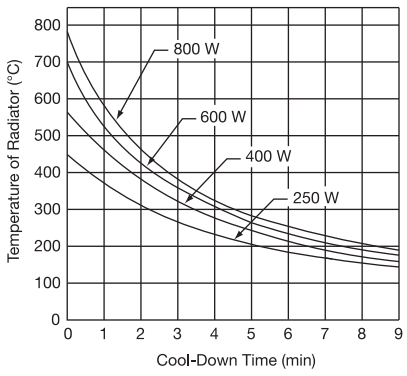
Optional Features

- ***Additional Power or Thermocouple Lead Lengths (page 7-23)***
- ***Two-Piece Wave Mounting Clip (page 7-14)***
- ***Reflectors and Other Accessories (pages 7-20 through 7-23)***
- ***Arrays and Power/Temperature Control Panels (start on page 7-15)***

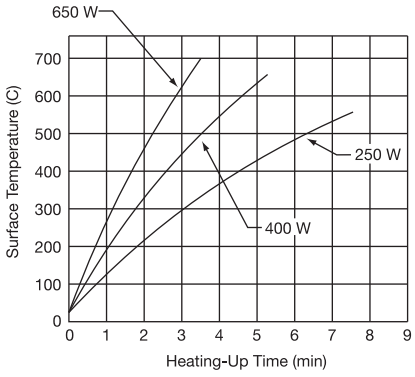
Warm-up Curve CRH Short Shaft



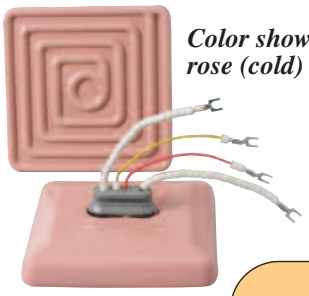
Cool-Down Curve CRH Short Shaft



Warm-up Curve CRD Long Shaft



Series CRH E-Mitters – Size: 122 mm (4.80") square



Color shown is rose (cold) to grey (hot)

Optional Features

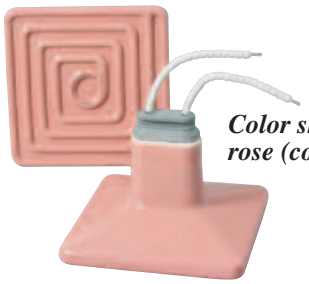
- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRH E-Mitters

E-Mitters listed have 3.50" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Color	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	Rose to Grey	10.84	1.68	757	403	CRH10029	CRH10030
250	220/240	White	10.84	1.68	757	403	CRH00029	CRH00030
400	220/240	Rose to Grey	17.34	2.69	943	506	CRH10018	CRH10005
400	220/240	White	17.34	2.69	943	506	CRH00018	CRH00005
600	220/240	Rose to Grey	26.01	4.03	1117	603	CRH10010	CRH10011
600	220/240	White	26.01	4.03	1117	603	CRH00010	CRH00011
800	220/240	Rose to Grey	34.68	5.38	1286	697	CRH10001	CRH10019
800	220/240	White	34.68	5.38	1286	697	CRH00001	CRH00019

Series CRD E-Mitters – Size: 122 mm (4.80") square



Color shown is rose (cold) to grey (hot)

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRD E-Mitters

E-Mitters listed have 3.50" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Color	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	Rose to Grey	10.84	1.68	757	403	CRD10001	CRD10005
250	220/240	White	10.84	1.68	757	403	CRD00001	CRD00005
400	220/240	Rose to Grey	17.34	2.69	943	506	CRD10002	CRD10006
400	220/240	White	17.34	2.69	943	506	CRD00002	CRD00006
650	220/240	Rose to Grey	28.18	4.37	1158	626	CRD10004	CRD10008
650	220/240	White	28.18	4.37	1158	626	CRD00004	CRD00008

* **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.

Ordering Information

Standard Heaters

Order by Part Number for Standard (Non-Stock) heaters.

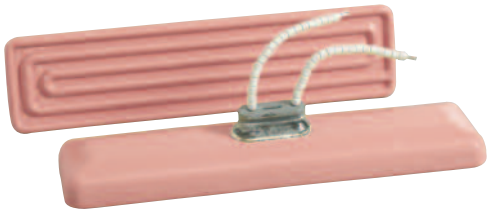
Custom Engineered/Manufactured Heaters

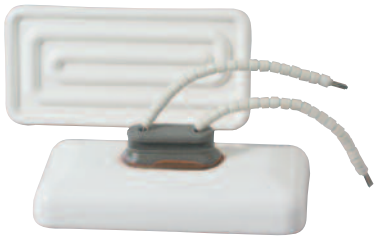
Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** can manufacture a CRH or CRD E-Mitter to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ **Size: CRH or CRD**
- ❑ **Colors:** Standard are metamorphing rose and straight white, optional are metamorphing yellow and straight black
- ❑ **Wattage:** Up to 35w/in² (5.4w/cm²)
- ❑ **Voltage:** 120, 208, 240, 277, 480 and others (dependent on design)
- ❑ **Thermocouple:** Standard Type K or optional Type J
- ❑ **Additional Options:** Start on page 7-20
- ❑ **Description of Process & Temperature**

Insulated Flat Face Short Neck Series CRN and CRZ Ceramic E-Mitters

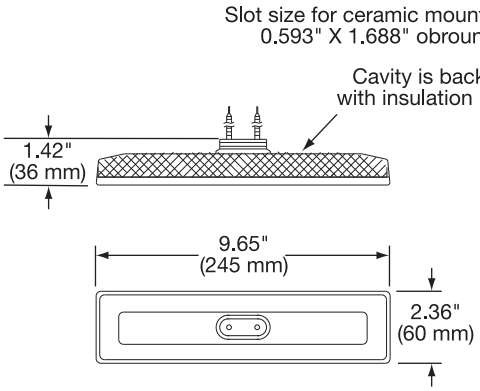




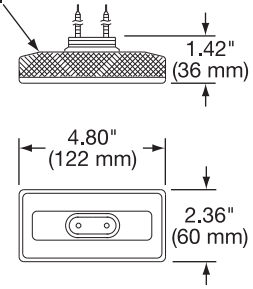
Design Features

- ✶ *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. Optional type J thermocouple is also available.*
- ✶ *Long operating life—over 10,000-plus hours of continuous operation under normal conditions*
- ✶ *Performance is unaffected under adverse atmospheric conditions.*
- ✶ *2.5 to 6µm infrared radiation wavelength*

Series CRN Dimensions



Series CRZ Dimensions



CRN and 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 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 improved operating life.

Ordering Information

Standard Heaters

Order by Part Number for Standard (Non-Stock) heaters.

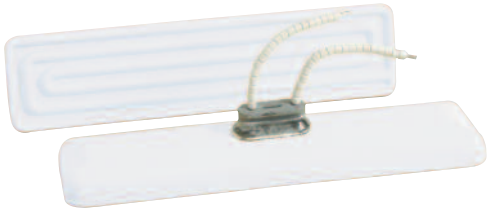
Custom Engineered/Manufactured Heaters

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

Please Specify the following:

- ❑ **Size: CRN or CRZ**
- ❑ **Colors:** Standard are metamorphing rose and straight white, optional are metamorphing yellow and straight black
- ❑ **Wattage:** Up to 35w/in² (5.4w/cm²)
- ❑ **Voltage:** 120, 208, 240, 277, 480 and others (dependent on design)
- ❑ **Thermocouple:** Standard Type K or optional Type J
- ❑ **Additional Options:** Start on page 7-20

CRN E-Mitters – Size: 60 mm × 245 mm (2.36" × 9.65")



Optional Features

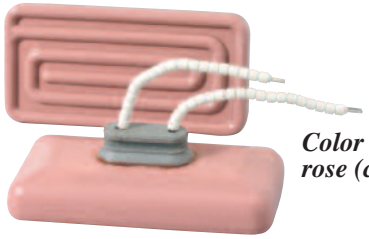
- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRN E-Mitters

E-Mitters listed have 3.50" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Color	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	Rose to Grey	10.97	1.70	762	406	CRN10001	CRN10005
250	220/240	White	10.97	1.70	762	406	CRN00001	CRN00005
400	220/240	Rose to Grey	17.56	2.72	948	509	CRN10002	CRN10006
400	220/240	White	17.56	2.72	948	509	CRN00002	CRN00006
600	220/240	Rose to Grey	26.33	4.08	1123	606	CRN10003	CRN10007
600	220/240	White	26.33	4.08	1123	606	CRN00003	CRN00007
800	220/240	Rose to Grey	35.11	5.44	1294	701	CRN10004	CRN10008
800	220/240	White	35.11	5.44	1294	701	CRN00004	CRN00008

CRZ E-Mitters – Size: 60 mm × 122 mm (2.36" × 4.80")



Color shown is rose (cold) to grey (hot)

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRZ E-Mitters

E-Mitters listed have 3.50" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Color	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
125	220/240	Rose to Grey	10.93	1.69	761	405	CRZ10001	CRZ10005
125	220/240	White	10.93	1.69	761	405	CRZ00001	CRZ00005
200	220/240	Rose to Grey	17.48	2.71	947	508	CRZ10002	CRZ10006
200	220/240	White	17.48	2.71	947	508	CRZ00002	CRZ00006
300	220/240	Rose to Grey	26.23	4.07	1121	605	CRZ10003	CRZ10007
300	220/240	White	26.23	4.07	1121	605	CRZ00003	CRZ00007
400	220/240	Rose to Grey	34.97	5.42	1291	699	CRZ10004	CRZ10008
400	220/240	White	34.97	5.42	1291	699	CRZ00004	CRZ00008
400	480	White	34.97	5.42	1291	699	CRZ00013	CRZ00014

* **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.

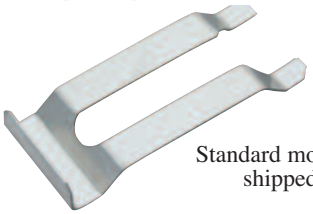
Mounting Accessories and Low Noise Thermocouple Option

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")

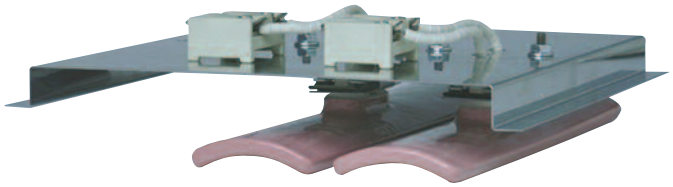
Part Number: CRK00008

All Items Available from Stock

Single Element Mounting Bracket

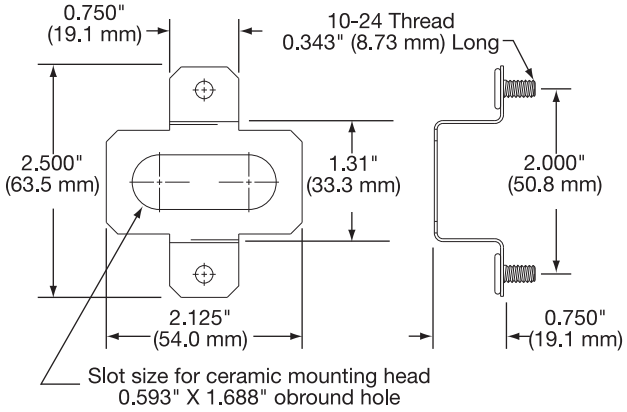
A convenient method for mounting individual E-Mitters to a flat surface or panel for spot heating applications

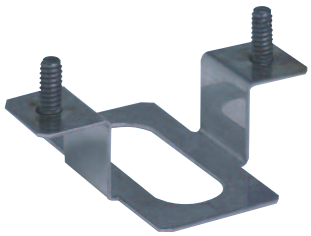
Part Number: CRK00018



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.

High Temperature Ceramic Terminal Blocks (Part Number EHD-108-101) are used to connect power to the heater leads and 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)
K	Straight Pigtails	8
K	Straight Pigtails	12
K	Straight Pigtails	24
K	Straight Pigtails	48
J	Straight Pigtails	12
J	Straight Pigtails	48

View Product Inventory @ www.tempco.com

Infrared Radiant Heating Array Systems

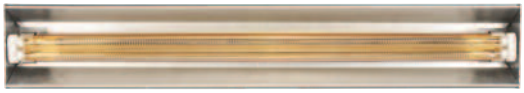
Modular Components Simplify Construction of Large Infrared Heating Systems

CRA Linear Array for Ceramic E-Miters (page 7-16)

CRA Linear Array for KTE and KTG E-Mitters (page 7-47)

QRH Quartz — Universal 2000 Housing (page 7-56)

CRA Linear Array for Gemini Medium Wave (page 7-68)



KRH Quartz — Universal 2000 Housing (page 7-72)

Series TRH — Tubular Element in Universal 2000 Housing (page 7-74)

Type ARA Array for Ceramic E-Mitters (page 7-28)

Type ARV Array for KTE & KTG E-Mitters (page 7-48)

Type ARG Gemini Medium Wave Arrays (page 7-69)

Type ARK Quartz Tube Arrays (page 7-70)

Type ARC Channel Strip Heater Arrays (page 8-10)

Type ART Tubular Heater Arrays (page 10-17)

***TEMPCO** will design & manufacture a panel array system, including a power and temperature control panel that meets your needs.*

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*
- *1/2" trade size wiring entrance at both ends*
- *40" 1000 Watt CRA10025 shown above*

Standard (Non-Stock) and Stock Sizes and Electrical Ratings

Assemblies with a Thermocouple have One E-Mitter with a Built-In Type K Thermocouple.

Stock Items Are Shown In RED

Nominal Housing Length	Total Assembly Wattage	E-Mitter Wattage	Number of E-Mitters	Part Number Assembly with no T/C	Part Number Assembly with K T/C	Replacement E-Mitters with no T/C	Replacement E-Mitters with K T/C
10"	250	250	1	CRA10001	CRA10048	CRB10006	CRB10008
	400	400	1	CRA10002	CRA10049	CRB10014	CRB10016
	650	650	1	CRA10003	CRA10050	CRB10023	CRB10025
	1000	1000	1	CRA10004	CRA10051	CRB10031	CRB10033
	250	125	2	CRA10005	CRA10052	CRC10005	CRC10007
	400	200	2	CRA10006	CRA10053	CRC10013	CRC10015
	650	325	2	CRA10007	CRA10054	CRC10021	CRC10023
	1000	500	2	CRA10008	CRA10055	CRC10027	CRC10029
20"	500	250	2	CRA10009	CRA10056	CRB10006	CRB10008
	800	400	2	CRA10010	CRA10057	CRB10014	CRB10016
	1300	650	2	CRA10011	CRA10058	CRB10023	CRB10025
	2000	1000	2	CRA10012	CRA10059	CRB10031	CRB10033
	500	125	4	CRA10013	CRA10060	CRC10005	CRC10007
	800	200	4	CRA10014	CRA10061	CRC10013	CRC10015
	1300	325	4	CRA10015	CRA10062	CRC10021	CRC10023
	2000	500	4	CRA10016	CRA10063	CRC10027	CRC10029
30"	750	250	3	CRA10017	CRA10064	CRB10006	CRB10008
	1200	400	3	CRA10018	CRA10065	CRB10014	CRB10016
	1950	650	3	CRA10019	CRA10066	CRB10023	CRB10025
	3000	1000	3	CRA10020	CRA10046	CRB10031	CRB10033
	750	125	6	CRA10021	CRA10067	CRC10005	CRC10007
	1200	200	6	CRA10022	CRA10068	CRC10013	CRC10015
	1950	325	6	CRA10023	CRA10069	CRC10021	CRC10023
	3000	500	6	CRA10024	CRA10070	CRC10027	CRC10029
40"	1000	250	4	CRA10025	CRA10071	CRB10006	CRB10008
	1600	400	4	CRA10026	CRA10072	CRB10014	CRB10016
	2600	650	4	CRA10027	CRA10073	CRB10023	CRB10025
	4000	1000	4	CRA10028	CRA10047	CRB10031	CRB10033
	1000	125	8	CRA10029	CRA10074	CRC10005	CRC10007
	1600	200	8	CRA10030	CRA10075	CRC10013	CRC10015
	2600	325	8	CRA10031	CRA10076	CRC10021	CRC10023
	4000	500	8	CRA10032	CRA10077	CRC10027	CRC10029
50"	1250	250	5	CRA10131	CRA10118	CRB10006	CRB10008
	2000	400	5	CRA10255	CRA10301	CRB10014	CRB10016
	3250	650	5	CRA10226	CRA10103	CRB10023	CRB10025
	5000	1000	5	CRA10152	CRA10302	CRB10031	CRB10033

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.

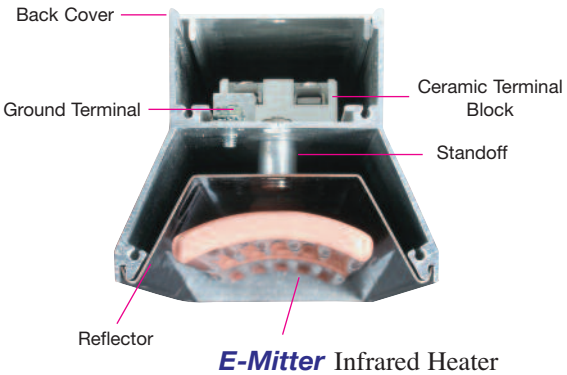
WARNING: Hazard of Electric Shock. Installation must be grounded to earth to avoid shock hazard. Disconnect power to installation before servicing or installing heater.

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.

CRA Linear Heater Assemblies — Construction

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 with 5/16-18 mounting bolts for use up to 250°C (482°F) extrusion temperature***
- ***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" trade size electrical fittings***

Wiring Options

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

Stainless steel armor cable — 18" armor cable over 24" leads
Galvanized armor cable — 18" armor cable over 24" leads
Stainless steel wire braid — 18" wire braid over 24" leads
Fiberglass leads (450°C rating) — 12" long plain leads
If longer leads and/or longer armor cable are required, specify when ordering.

Prewired with 24" SJO Cable
(includes ground wire)

- 16 ga. cable (Up to 15 Amps)
- 14 ga. cable (Up to 22 Amps Max.)
- 12 ga. cable (Up to 28 Amps Max.)
- Max. terminal box temperature 194°F (90°C)
- If longer cable is required, specify when ordering.

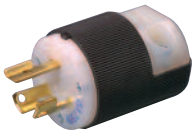
Stock Heavy Duty Quick Disconnect Plugs and Connectors

Reference	NEMA P or R	Max. Amps	Volts	Plug Part Number	Connectors (Female) Part Number
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


P8


P3


P4


P5

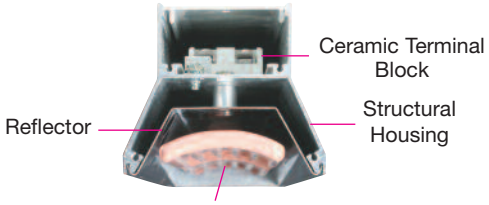
Optional Electrical Plugs listed can be attached to armor cable, HPN cord or plain leads described under wiring Options. Connectors listed are cable mount matching units for the plugs listed and are ordered separately. See page 15-15 for additional plugs and connectors.

Custom CRA Linear Heater Assemblies Using Standard Components

Do It Yourself or let Tempco build an array to your exact specifications using standard components.

Consult Tempco for arrays using custom designed components.

Components Required To Build A Custom CRA Linear Heater using Standard Items



Example

Steps to Design a Custom CRA E-Mitter Linear Assembly from Standard Components

Designing a 40-inch-long CRA assembly using a stock housing length.

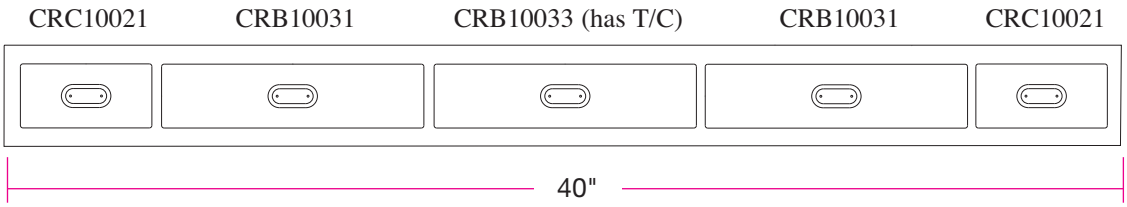
Step 1) **Select the Housing.** This application can use the standard CRK00004 housing from the Standard CRK Housing Lengths Table on page 7-19. Note the Maximum Power Rating of the housing when making your selection.

Step 2) **Select the E-Mitters Series.** The CRK Housing Lengths Table gives the various possible E-Mitter configurations that will fit the housing selected. A combination of CRBs and CRCs will be used for this application. 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.

CRB E-Mitters can be found on page 7-4.
CRC E-Mitters can be found on page 7-7.

Step 3) **Select the Reflectors.** Select E-Mitter Reflectors to match the Style and Quantity of E-Mitters you selected. 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. Note: Reflectors are complete with mounting hardware to attach to housing (page 7-20).

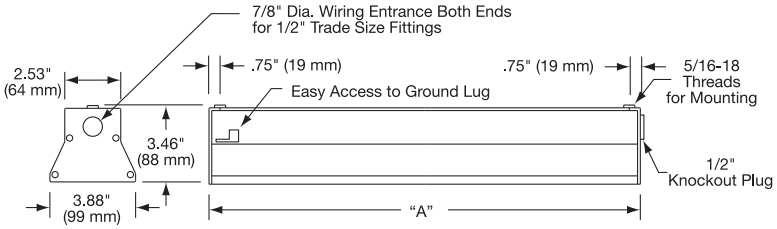
Step 4) **Select the Terminal Blocks.** Select the number of terminal blocks required for wiring. This would typically be one for each heater for the power leads and one for each thermocouple (page 7-21 and 7-22). A total of six terminal Blocks, Part Number EHD-108-101, are required. One for the power leads of each E-Mitter and one for the thermocouple on CRB10033.



Standard 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 7-20) or the terminal block (Part Number EHD-108-101) required for wiring each heater (see page 7-21).



Standard (Non-Stock) Housing Lengths Table

Nominal Housing Length in	"A" Dim. in	"A" Dim. mm	Housing Part Number	Examples of Possible E-Mitter Configurations	Maximum Power
5	5.19	131.8	CRK00024	1 CRC or 1 CRZ	.5KW
10	10.13	257.2	CRK00001	1 CRB or 1 CRN, 2 CRCs or 2 CRZs	1KW
15	15.06	382.6	CRK00023	3 CRCs or 3 CRZs (1 CRB and 1 CRC) or (1 CRN and 1 CRZ)	1.5KW
20	20.00	508.0	CRK00002	2 CRBs or 2 CRNs, 4 CRCs or 4 CRZs (1 CRB and 2 CRCs) or (1 CRN and 2 CRZs)	2KW
25	24.94	633.4	CRK00022	5 CRCs or 5 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	2.5KW
30	29.88	758.8	CRK00003	3 CRBs or 3 CRNs, 6 CRCs or 6 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	3KW
35	34.81	884.2	CRK00019	7 CRCs or 7 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	3.5KW
40	39.75	1009.7	CRK00004	4 CRBs or 4 CRNs, 8 CRCs or 8 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	4KW
50	49.63	1260.5	CRK00021	5 CRBs or 5 CRNs, 10 CRCs or 10 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	5KW
60	59.50	1511.3	CRK00027	6 CRBs or 6 CRNs, 12 CRCs or 12 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	6KW
70	69.38	1762.1	CRK00029	7 CRBs or 7 CRNs, 14 CRCs or 14 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	7KW

Standard housings are available from as-assembled stock in 10", 20", 30", 40" and 50" lengths. Other housing lengths can be made to your requirements.

Ordering Information

Standard Assemblies

Order by Part Number on page 7-16. 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.***

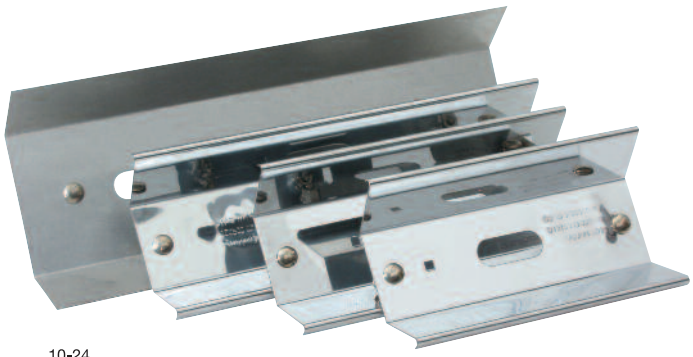
Please Specify the following:

- ❑ 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.

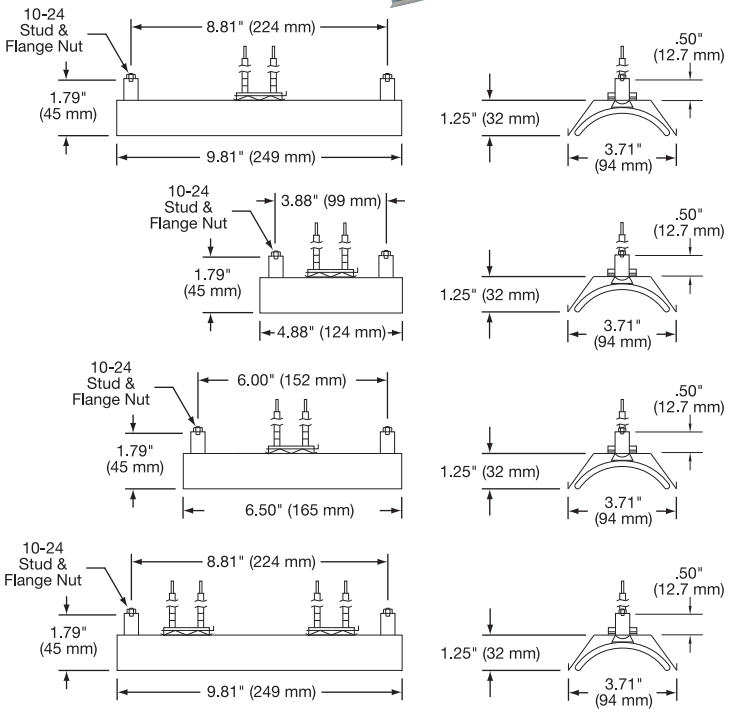
CRA Linear Heater Components

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)

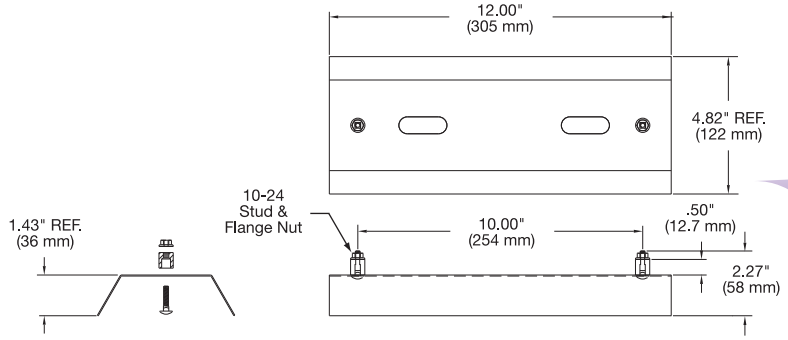
For One CRM E-Mitter

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

Porcelain Material, Maximum Temperature Rating 1200°F (645°C), 300V Maximum, EHD-114-102, EHD-114-103 and EHD-114-104 are UL Recognized (File E9809) and CSA Certified.

Part Number	Wire Range (Solid or Stranded Wire)		Skirt Length	Opening ID	Outer Diameter
EHD-114-102	2#22	1#18 + 1#16	.687"	.250"	.406"
EHD-114-103	2#20	2#16	.750"	.312"	.484"
EHD-114-104	2#18	2#14	.843"	.406"	.531"
EHD-114-105	1#16 + 1#14	1#14 + 2#12	1.00"	.468"	.703"

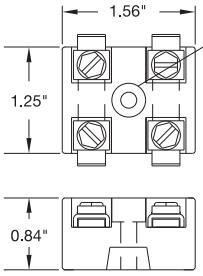
View Product Inventory @ www.tempco.com

Standard Ceramic Terminal Blocks for Internal Wiring

Used for internal connections within 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
- **Terminals:** #8 Screw
- **Body Material:** Steatite

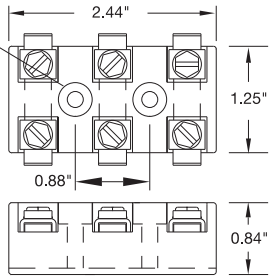


0.40" Counterbore
.19" Dia. Through Hole
(for mounting screws)

Mounting Hardware Supplied per Mounting Hole

Part Number SCW-102-109
#8 x 7/8 Pan Head Sheet Metal Screw

Part Number WAS-119-106
#8 External Tooth Lockwasher



Part Number: EHD-108-101

Part Number: EHD-108-121

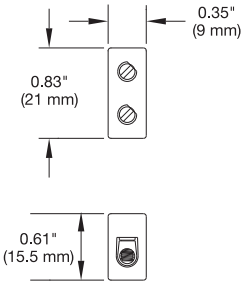
Ceramic Terminal Blocks (Enclosed Terminals)

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

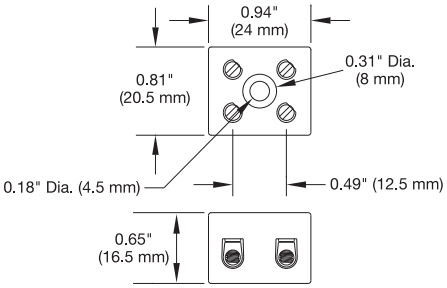
Design Features

- **Maximum Voltage:** 380 VAC
- **Maximum Current:** 30 Amps
- **Maximum Temperature:** 240°C/464°F
- **AWG:** 26-12 stranded, 26-14 solid
- **Screw:** M3, zinc plated steel
- **Terminal Body:** Nickel plated brass
- **Body Material:** Porcelain
- **Rating:** CE, VDE

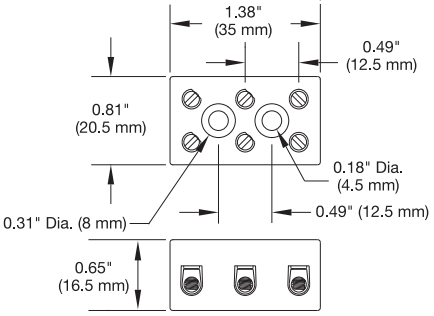
Part Number: EHD-108-116



Part Number: EHD-108-117

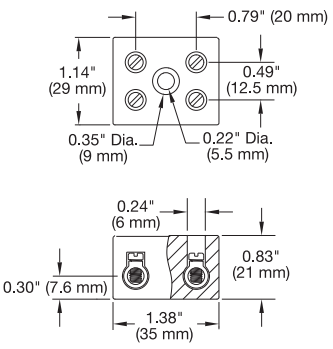


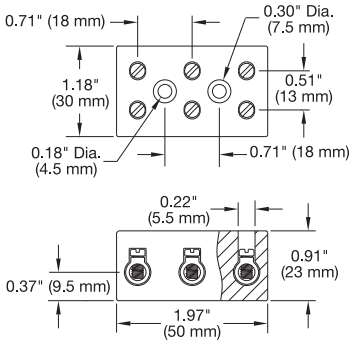
Part Number: EHD-108-118



Design Features

- **Maximum Voltage:** 600 VAC
- **Maximum Current:** 50 Amps
- **Maximum Temperature:** 200°C/392°F
- **AWG:** 14-8 ga wire
- **Screw:** M4, zinc plated steel
- **Terminal Body:** Nickel plated brass
- **Body Material:** Porcelain
- **Rating:** UL File #E69841





Part Number: EHD-108-114

Part Number: EHD-108-115

CONTINUED

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

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

Design Features

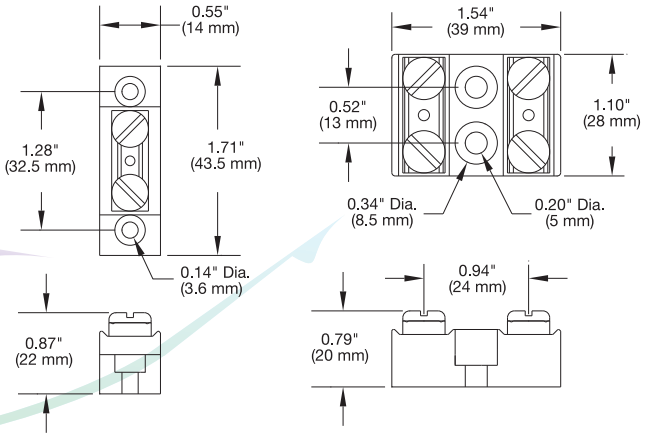
- **Maximum Voltage:** 500 VAC
- **Maximum Current:** 44 Amps @ 104°F ambient
- **Maximum Temperature:** 240°C/464°F
- **Wire Gauge:** 18 to 8 ga.
- **Terminal Screw:** M4, zinc-plated steel
- **Body Material:** Steatite
- **Agency Approvals:** None

Optional Terminal Hardware

Stainless Steel Flat Washer — Part Number: WAS-109-101

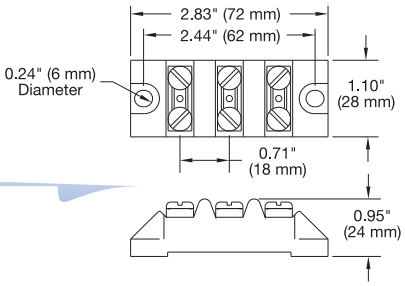
Spring Lock Washers — Part Number: WAS-118-108

Part Number: EHD-108-106

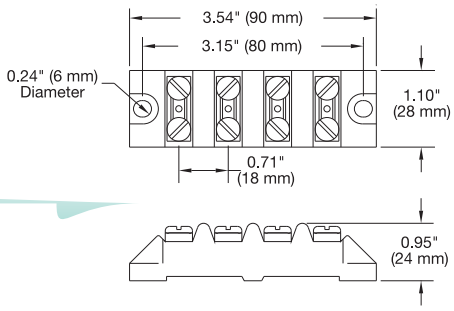


Part Number: EHD-108-107

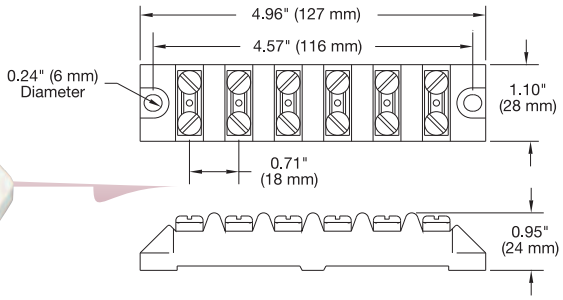
Part Number: EHD-108-108



Part Number: EHD-108-109



Part Number: EHD-108-105



All Items Available from Stock

View Product Inventory @ www.tempco.com

Stock 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 Plated Steel spade terminals.)

Terminal Type	Description	Usage	Part Number
Ring	#10 stud, 22-18 ga. wire	Heater leads	TER-110-117
	#10 stud, 16-14 ga. wire	Misc.	TER-110-106
	#10 stud, 16-14 ga. wire	Misc. (Monel material)	TER-110-104
	#10 stud, 12-10 ga. wire	Line Wiring of Assy.	TER-110-111
	#8 stud, 22-18 ga. wire	Heater leads	TER-109-110*
	#8 stud, 16-14 ga. wire	Heater leads	TER-109-104
	#8 stud, 12-10 ga. wire	Line wiring of Assy.	TER-109-106
Spade	#10 stud, 22-18 ga. wire	Misc.	TER-115-111
	#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*
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 radiant arrays. Must be used with EHD-108-101 (2-pole) or EHD-108-121 (3-pole) standard terminal blocks.

Stock High Temperature Stranded Lead Wire

The following insulated lead wires are available for internal bussing and the line input wiring of CRA Linear Housing Assemblies and AR_ Radiant Panels.

Temperature Rating	Size & Conductor	Maximum Amperage	100 Foot Spool	250 Foot Spool	500 Foot Spool	Usage
450°C, 600V	18 ga. NCC	12.3 @ 300°C (572°F)	LDWR-1088	LDWR-1098	LDWR-1142	Heater lead modifications
450°C, 600V	16 ga. NCC	18.0 @ 300°C (572°F)	LDWR-1089	LDWR-1099	LDWR-1143	Miscellaneous
450°C, 600V	14 ga. NCC	21.2 @ 300°C (572°F)	LDWR-1090	LDWR-1100	LDWR-1144	Standard for internal wiring of factory wired units
450°C, 600V	12 ga. NCC	26.2 @ 300°C (572°F)	LDWR-1091	LDWR-1101	LDWR-1145	Panel zones & line input
450°C, 600V	10 ga. NCC	35.6 @ 300°C (572°F)	LDWR-1092	LDWR-1102	LDWR-1146	Panel zones & line input
250°C, 600V	18 ga. NPC	9.0 @ 200°C (392°F)	LDWR-1093	LDWR-1103	LDWR-1147	Heater lead modifications
250°C, 600V	16 ga. NPC	14.2 @ 200°C (392°F)	LDWR-1094	LDWR-1104	LDWR-1148	Miscellaneous
250°C, 600V	14 ga. NPC	21.1 @ 200°C (392°F)	LDWR-1095	LDWR-1105	LDWR-1149	Internal panel wiring
250°C, 600V	12 ga. NPC	29.5 @ 200°C (392°F)	LDWR-1096	LDWR-1106	LDWR-1150	Panel zones & line input
250°C, 600V	10 ga. NPC	37.6 @ 200°C (392°F)	LDWR-1097	LDWR-1107	LDWR-1151	Panel zones & line input

NCC = Nickel Clad Copper, 27% Nickel by weight. NPC = Nickel Plated Copper, 2% Nickel by weight.

The 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) rated wires amperage is derated over 200°C (392°F). Maximum ambient is 225°C (437°F).

See page 15-2 for additional specifications.

See amperage tables in Engineering Section 16 for more details on current carrying capacity of Tempco's high temperature lead wire. For bare wire consult Tempco, for ceramic beads see page 15-13.

Stock High Temperature Thermocouple Wire

The following insulated thermocouple wires are available for internal bussing and wiring of CRA Linear Housing Assemblies and AR_ Radiant Panels to external control systems.

These duplex thermocouple wires have color coded fiberglass insulation over each lead within an overall fiberglass insulation jacket.

Type	Wire Style	100 Foot Spool	250 Foot Spool
K	20 ga. solid	TCWR-1025	TCWR-1029
K	20 ga. stranded	TCWR-1034	TCWR-1036
J	20 ga. solid	TCWR-1028	TCWR-1032
J	20 ga. stranded	TCWR-1033	TCWR-1035
With Stainless Steel Overbraid			
K	20 ga. stranded	TCWR-1049	TCWR-1053
J	20 ga. stranded	TCWR-1047	TCWR-1051

See page 14-107 and 15-4 for additional thermocouple wire and specifications.

For bare wire and sleeving consult Tempco.

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 7-26 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) 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 13-52

Standard Ratings of Modular 12" × 12" CRP Radiant Panels – 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	120V-240V No T/C	120V-240V 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

NOTES: All dual voltage heaters have two windings (parallel connected for the lower voltage & series connected for the higher voltage).

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 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 13-52

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

Aluminized Steel Housing with NEMA 1 Terminal Box (4" square by 2.13" 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 2.13" 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

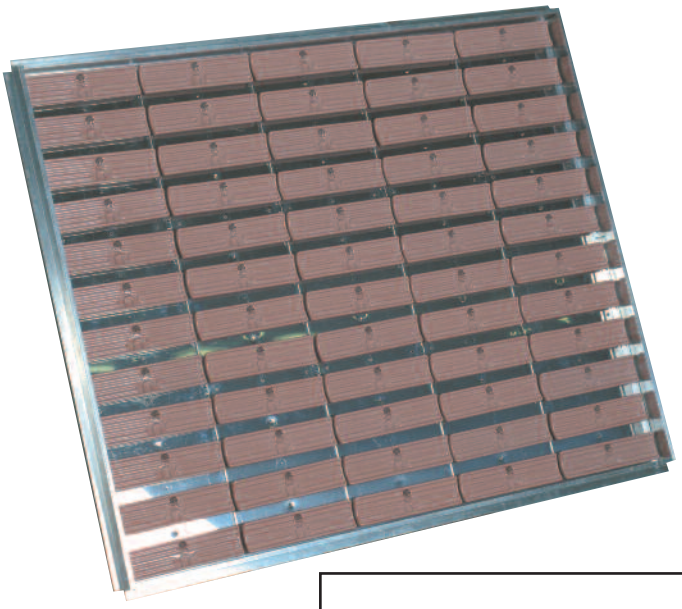
DANGER: Hazard of Fire. These heaters are not for use in atmospheres where flammable vapors, gases or liquids are present as defined in the National Electrical Code. Where solvents, water, etc. are being evaporated from the process it is necessary to provide substantial quantities of ventilating air 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.

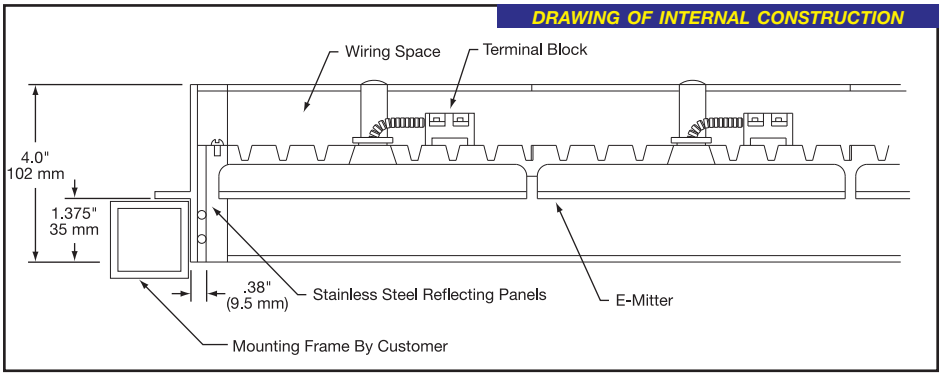
Installation: ***Do not mount CRP Panel Heaters closer than 6 inches to any structural material that does not have at least a 200°C (392°F) continuous temperature rating.***

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



Design Features

- *Custom Engineered/Manufactured*
- *Lightweight extruded aluminum outer housing*
- *Each heater's power leads are connected to an individual ceramic terminal block*
- *NCC or Nickel wire with heat resistant insulation is used for wiring between terminal blocks (see pages 7-21 through 7-23)*
- *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*



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 7-29.
CRM E-Mitter panel size can be found on page 7-30.
CRC and CRZ E-Mitter panel sizes can be found on page 7-31.
CRL E-Mitter panel sizes can be found on page 7-32.
CRH and CRG E-Mitter panel sizes can be found on page 7-33.
CRD E-Mitter panel sizes can be found on page 7-35.

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 7-36

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.

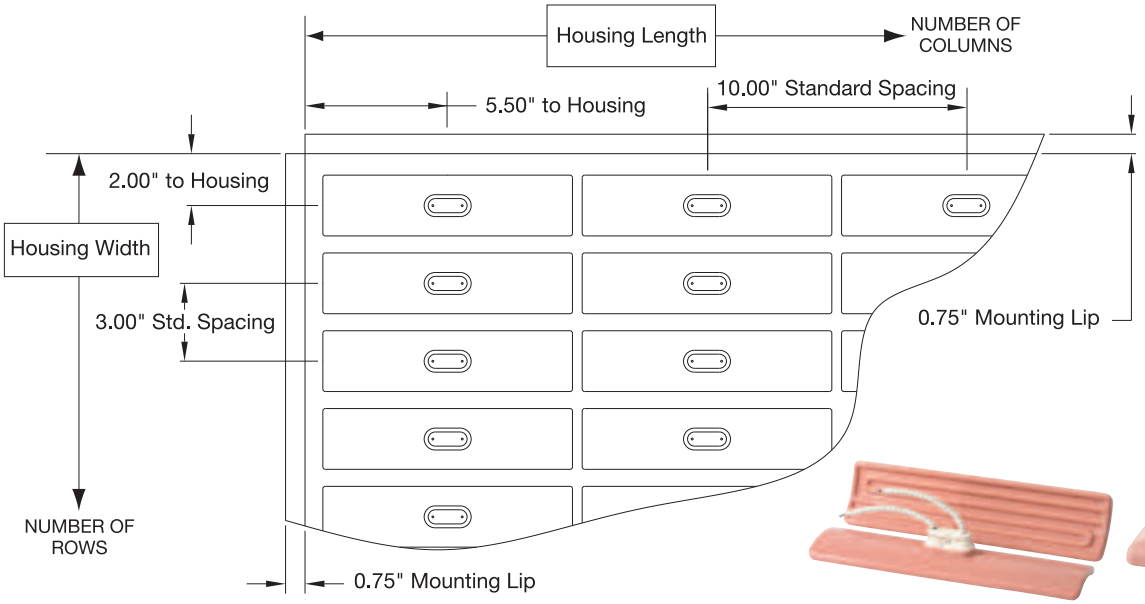
Series CRB and CRN E-Mitter Panel Arrays
Standard Style ARA Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (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 × length) are in inches. For overall dimensions add 0.75" 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 2.50" × 10.00".
- 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").

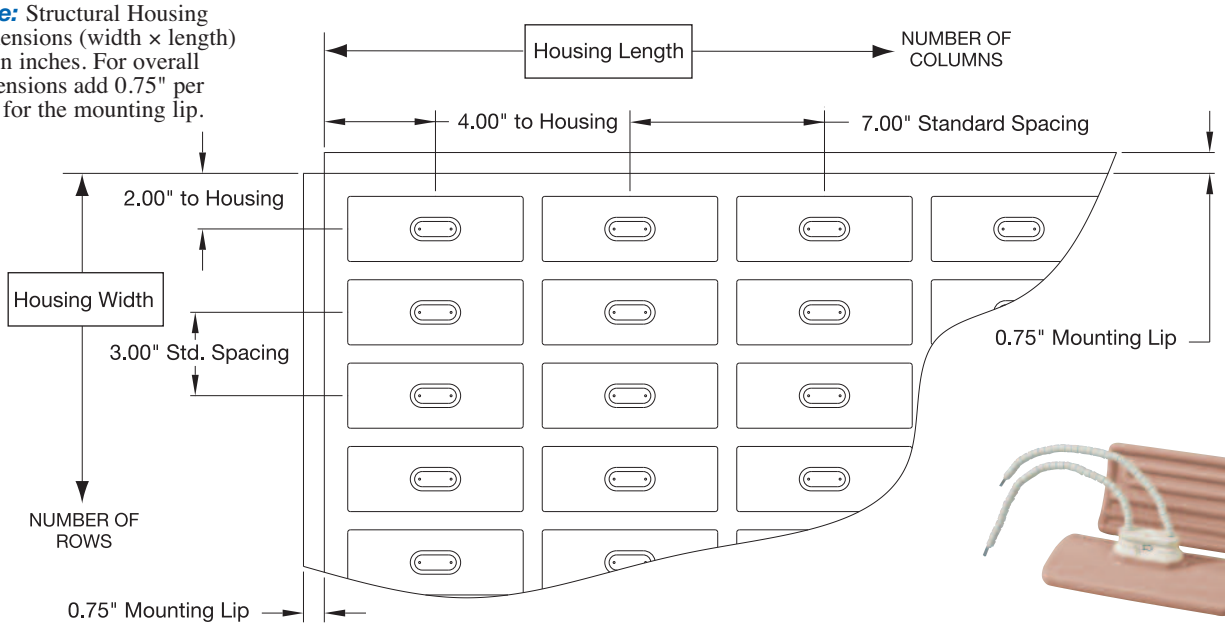
We welcome your inquiries.
Take advantage of Tempco's economical approach to manufacturing panels.

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 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (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 × length) are in inches. For overall dimensions add 0.75" 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 2.50" × 7.00".
- 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").

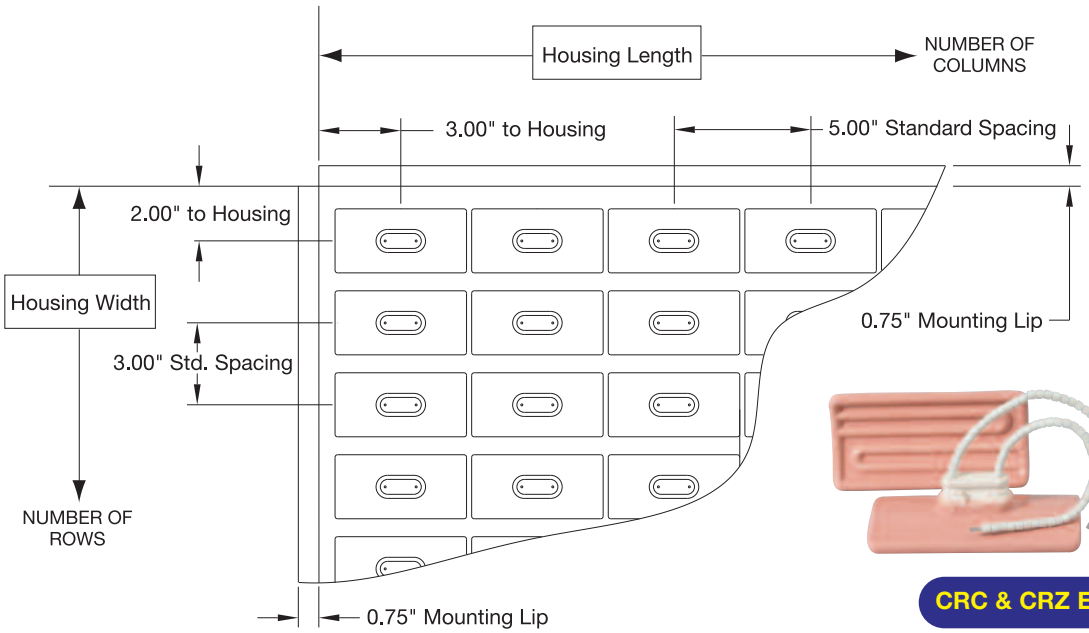
Consult us with your requirements.
There is no substitute for our experience.

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 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (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 × length) are in inches.
For overall dimensions add 0.75" per side for the mounting lip.



CRC & CRZ E-Mitters (60 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 CRC and CRZ heaters is 2.50" × 5.00".
- 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.

Series CRL E-Mitter Panel Arrays

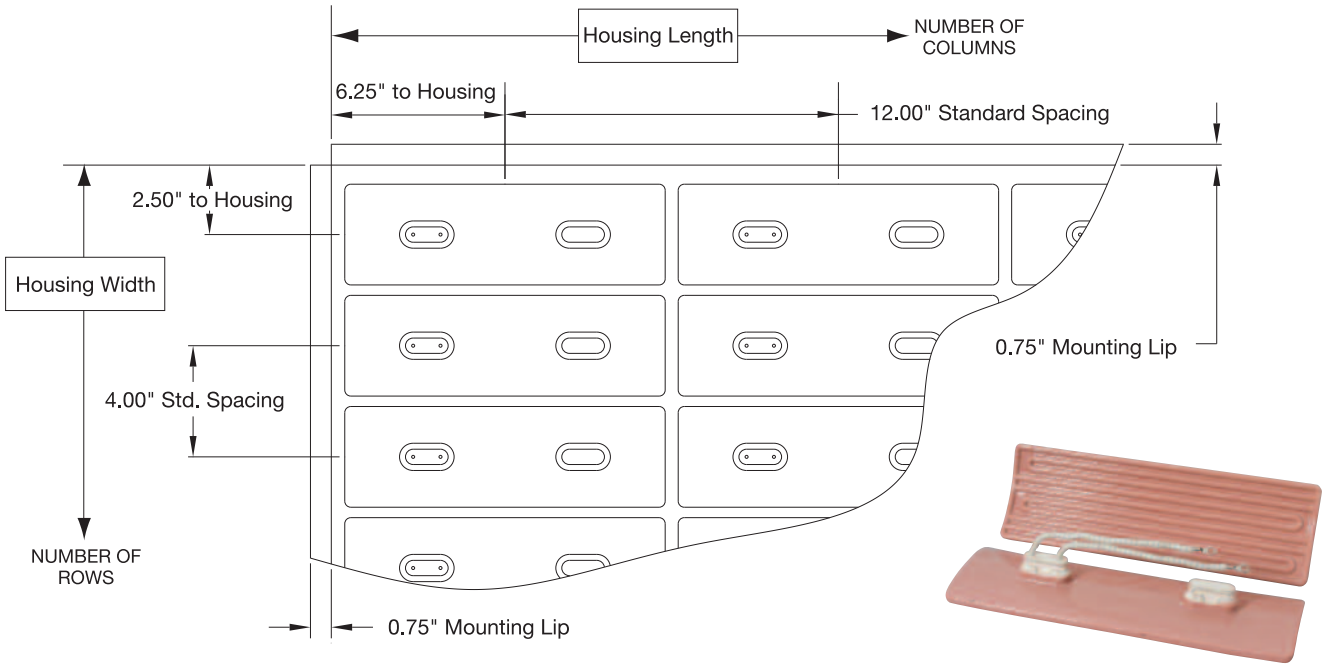
Standard Style ARA Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (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 × length) are in inches. For overall dimensions add 0.75" 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 4.00" × 12.00".
- 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").

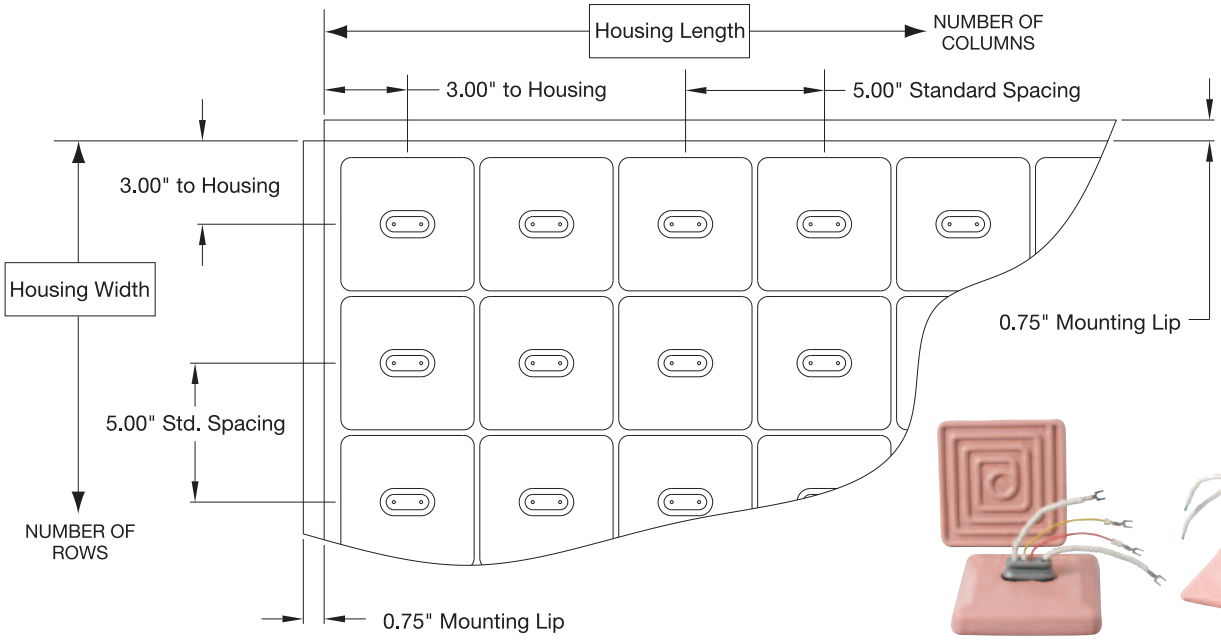
Consult us with your requirements
There is no substitute for our experience.

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 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (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 × length) are in inches.
For overall dimensions add 0.75" 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 5.00" × 5.00".
- 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").

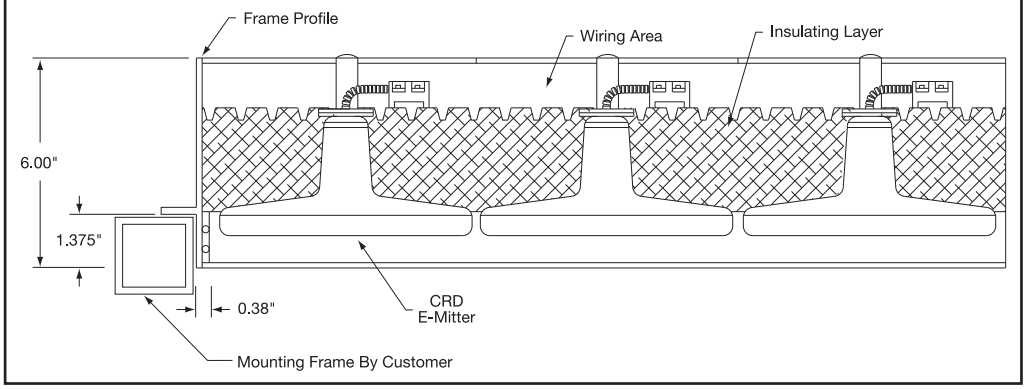
We welcome your inquiries.
Take advantage of Tempco's economical approach to manufacturing panels.

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 Style CRD E-Mitters, pages 7-10 and 7-11.*
- *Each heater's power leads are connected to an individual ceramic Terminal Block.*
- *NCC or Nickel wire with heat resistant insulation is used for 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.*

DRAWING OF INTERNAL CONSTRUCTION



The housing for the CRD heaters is the same construction as all ARA 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

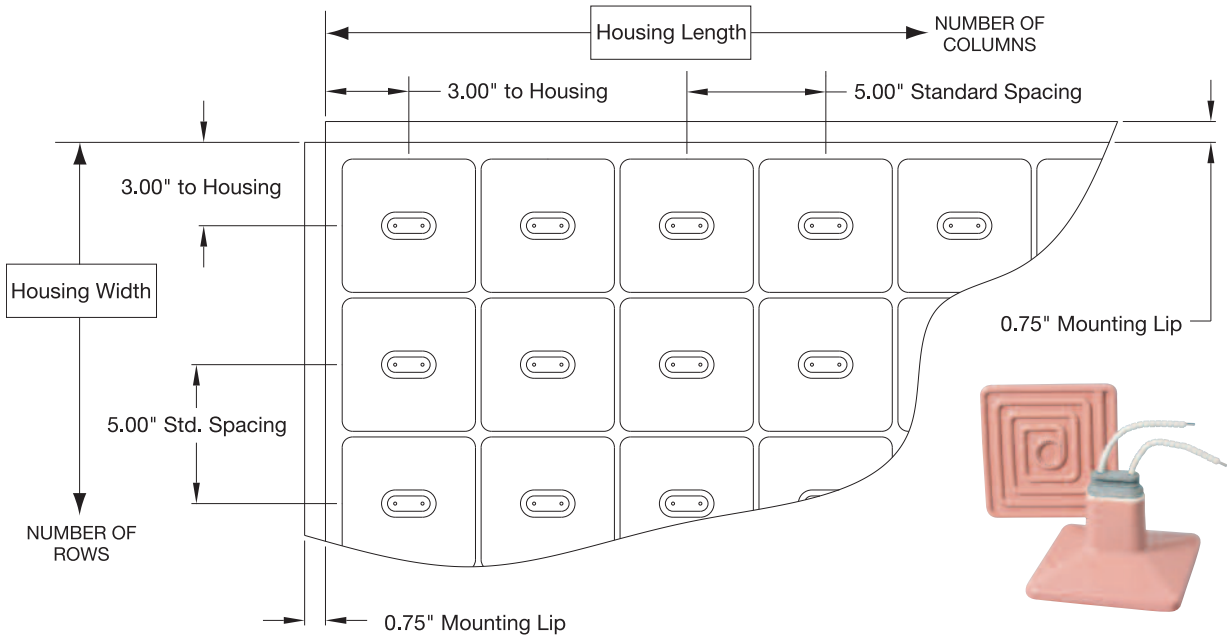
Refer to the worksheet on page 7-36

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 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (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 × length) are in inches.
For overall dimensions add 0.75" 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 5.00" × 5.00".
- 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 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 0.75" 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 ❒ CRG ❒ CRN ❒ CRZ ❒ CRD ❒ CRH ❒ CRL ❒ CRM
- 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 spade terminals if factory wired)

  Special terminals 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 _____

_____

_____

ARA Array Housing Assemblies for Any Style Ceramic E-Mitter

17.5 KW 380V 4-Zone
CRH E-Mitters

9 KW 480V 3-Zone
3 × 3 CRB E-Mitters

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

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

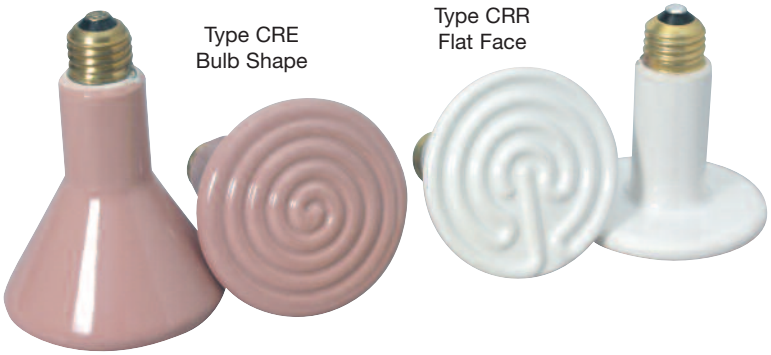
Power/Temperature Control Panels

Note: See pages 13-56 through 13-63 for more information on Power and Temperature Control Panels.

Design Features

- *Solid state 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*

Type CRE & CRR Edison Screw-In Bulb E-Mitters



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*
- *Preventing moisture accumulation and freezing in electrical control boxes*
- *Preventing moisture accumulation, mildew and freezing in clothes lockers*
- *Resistor Banks*
- *Agricultural*
- *Agency Approval:* c UL us

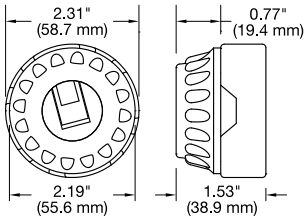
Design Features

- *Provides safe, clean, radiant heat anywhere*
- *Easy installation*
- *Not affected by vibration— high mechanical strength*
- *Good resistance to atmospheric contamination*
- *Does not generate visible light— only heat*
- *Reversible color change feature*
- *3.5 to 7µm infrared radiation peak wavelength*

Screw-In Base

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

Part Number: CRK00016



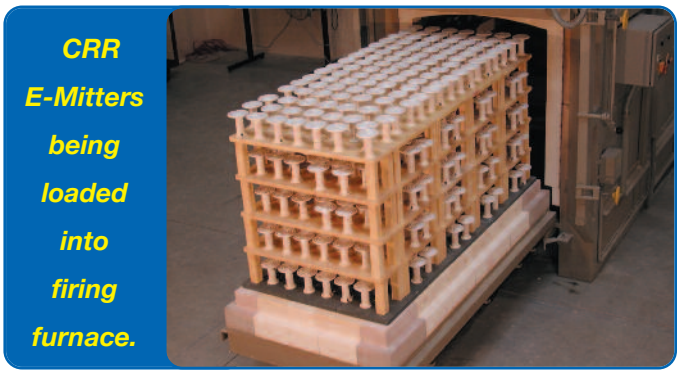
Type CRE & CRR E-Mitters

Edison Screw-In Bulb E-Mitters

The CRE and CRR Style E-Mitters are hollow ceramic heaters 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 & CRR 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.



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 stock list that fills your requirements.

Optional metamorphing 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

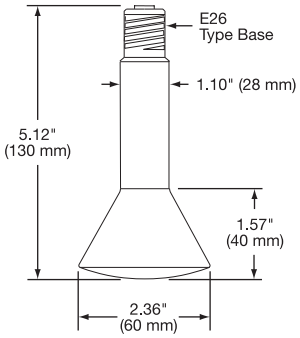
Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** will design and manufacture a CRE & CRR Bulb Style Ceramic Infrared Heater to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

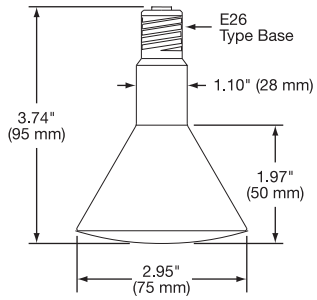
- ❑ **Size:** Overall dimensions or Series Code
- ❑ **Colors:** Standard colors are metamorphing rose and white; optional colors are metamorphing yellow and straight black
- ❑ **Wattage:** Description of process and temperature required

View Product Inventory @ www.tempco.com

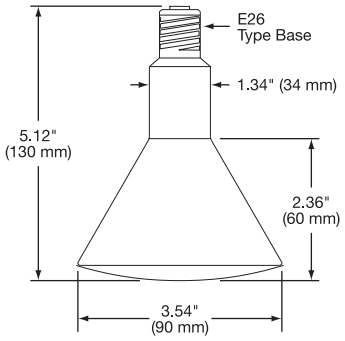
Type CRE Edison Screw-In Bulb E-Mitters



CRE 60 mm



CRE 75 mm

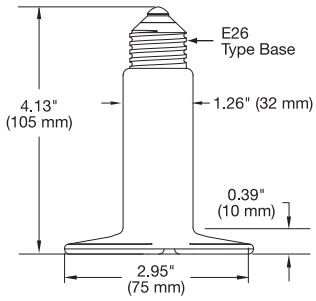


CRE 90 mm

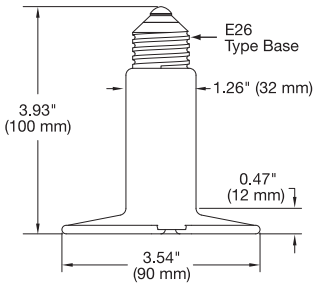
Standard (Non-Stock) CRE E-Mitters

Diameter	Wattage	Voltage	Color	Watt Density (W/in²)	Watt Density (W/cm²)	*Surface Temperature (Typical) °F	*Surface Temperature (Typical) °C	Part Number
60mm	60	120	Rose to Grey	13.26	6.45	842	450	CRE10014
	60	120	White	13.26	6.45	842	450	CRE00014
	100	120	Rose to Grey	22.60	10.76	887	477	CRE10015
	100	120	White	22.60	10.76	887	477	CRE00015
75mm	60	120	Rose to Grey	8.49	1.32	662	350	CRE10012
	60	120	White	8.49	1.32	662	350	CRE00012
	100	120	Rose to Grey	14.15	2.19	788	420	CRE10013
	100	120	White	14.15	2.19	788	420	CRE00013
90mm	150	120	Rose to Grey	15.59	2.41	842	450	CRE10008
	150	120	White	15.59	2.41	842	450	CRE00008
	250	120	Rose to Grey	22.98	4.02	986	530	CRE10002
	250	120	White	22.98	4.02	986	530	CRE00002

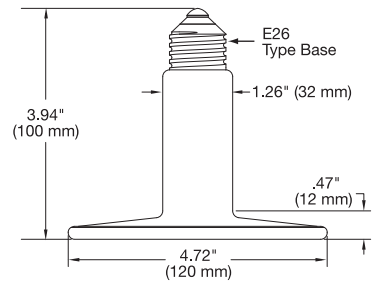
Type CRR Edison Screw-In Bulb E-Mitters



CRR 75 mm



CRR 90 mm



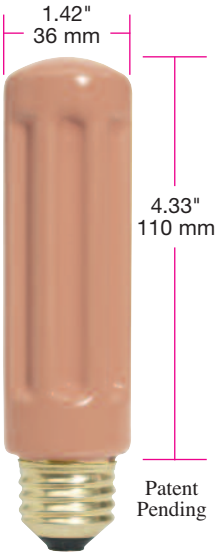
CRR 120 mm

Standard (Non-Stock) CRR E-Mitters (Color — White)

Diameter	Wattage	Watt Density (W/in²)	Watt Density (W/cm²)	*Surface Temperature (Typical) °F	*Surface Temperature (Typical) °C	Part Number 120V
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.

Stock CRT E-Mitters



Series CRT — Tube Shaped E-Mitter

Tempco's Edison Screw-In Bulb Series CRT E-Mitter is a hollow, tube-shaped ceramic heater ideally suited for wide area heating.

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

Typical Applications

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

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

Stock Items Are Shown In RED

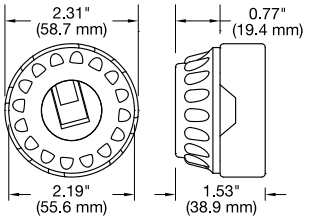
Wattage	*Surface Temperature (Typical) °F	°C	Part Number 120V	240V
50	464	240	CRT10100	—
75	567	297	CRT10101	CRT10106
100	671	355	CRT10102	CRT10107
150	824	440	CRT10103	CRT10108
200	937	503	CRT10104	CRT10109
250	1049	565	CRT10105	CRT10110

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

Screw-In Base

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

Part Number: CRK00016



Ordering Information

Standard Heaters

Order by Part Number for Stock heaters.

Custom Engineered/Manufactured Heaters

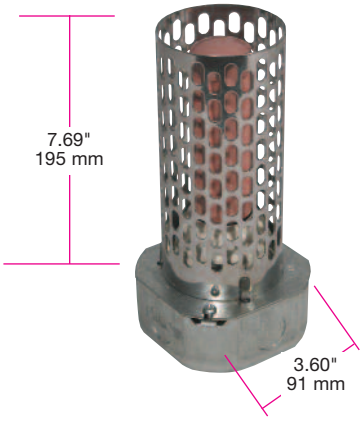
Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** can manufacture a CRT E-Mitter to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

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

View Product Inventory @ www.tempco.com

EHC Ceramic E-Mitter Enclosure Heaters



Typical Applications

- *Traffic Signal Control Boxes*
- *Automatic Teller Machines (ATMs)*
- *Outdoor Electrical Power Enclosures*
- *Control Panels*
- *Control Valve Housings*
- *Switch Gear*
- *Clothing Lockers*

Tempco enclosure heaters are the answer to all your enclosure heater needs. Our heaters are designed to help electric, electronic, pneumatic, hydraulic and mechanical equipment perform at top capacity by protecting them against low temperatures, condensation and corrosion. Tempco offers many different styles of heaters that can be used in enclosure heating applications. Our most popular styles are displayed below.

EHC Enclosure Heaters with NEMA 1 Housing

Watts	Volts	Color	Part Number	Replacement Heater Bulb
50	120	Rose to Grey	EHC10100	CRT10100
75	120	Rose to Grey	EHC10101	CRT10101
75	240	Rose to Grey	EHC10106	CRT10106
100	120	Rose to Grey	EHC10102	CRT10102
100	240	Rose to Grey	EHC10107	CRT10107
150	120	Rose to Grey	EHC10103	CRT10103
150	240	Rose to Grey	EHC10108	CRT10108
200	120	Rose to Grey	EHC10104	CRT10104
200	240	Rose to Grey	EHC10109	CRT10109
250	120	Rose to Grey	EHC10105	CRT10105
250	240	Rose to Grey	EHC10110	CRT10110

See page 11-114 for help in sizing and determining the best enclosure heater for your application.

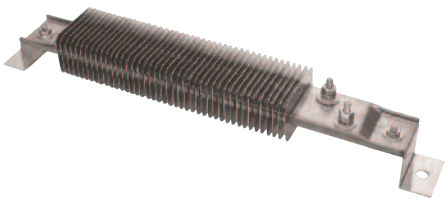
EHA — Remote Thermostats for Enclosure Heaters

See Page 9-18 for details

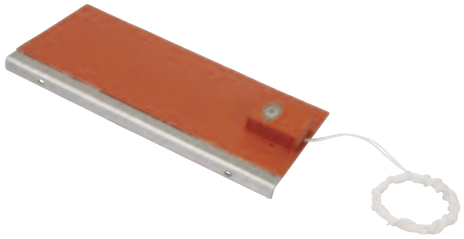
Stock EHA Remote Thermostats

Opens °F	Closes °F	Part Number
60±5	40±7	EHA00001
140±5	110±10	EHA00002
180±5	150±10	EHA00003

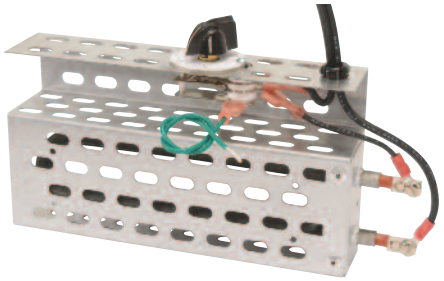
Other Types of Enclosure Heaters



Finned Strip Heater
See Page 8-14

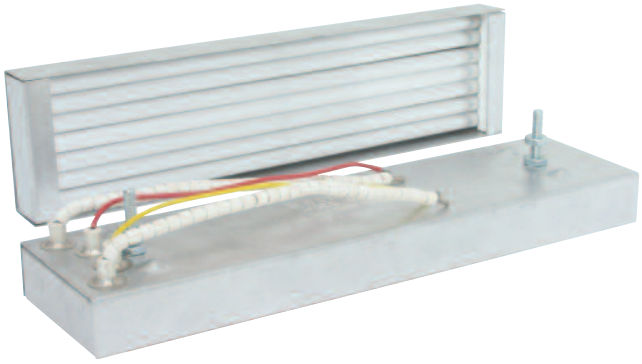


Silicone Rubber Heater
See Page 9-18

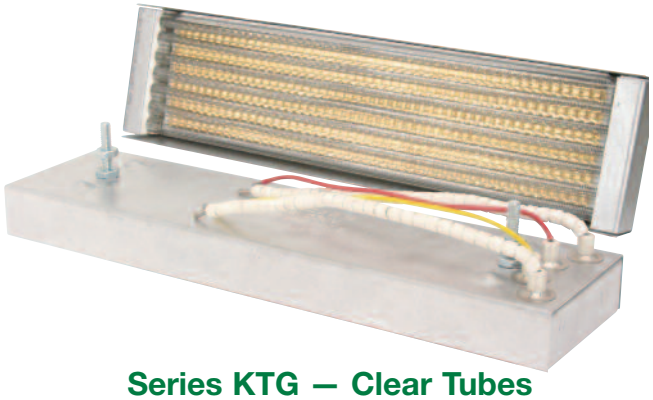


Tubular Heater
See Page 11-115

High Intensity Medium Wave Quartz Mini-Tube Infrared Heaters
KTE (Translucent Tubes) & KTG (Clear Tubes with Gold Coated Ceramic Backing)



Series KTE — Translucent Tubes



Series KTG — Clear Tubes with Gold Coated Ceramic Backing

Up to 95% reflective efficiency using 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).*
- ✳ *Standard winding pattern gives uniform heating over entire face of heater. (Consult factory for custom or high intensity winding patterns and/or sizes.)*
- ✳ *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 ARV 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*

Ordering Information

Standard Heaters

Order by Part Number for Standard heaters.

Custom Engineered/Manufactured KTE Heaters

An electric heater can be very application specific; for sizes not listed, **TEMPCO** will design and manufacture a KTE or KTG E-Mitter or complete system to meet your requirements.

Standard lead time is 3 weeks.

Please Specify the following:

- ❑ **Housing Length**
- ❑ **Housing Width**
- ❑ **Mounting 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 7-20 through 7-23

6 Standard KTE & KTG Housing Sizes Available

Series KTE1 & KTG1
9.75" × 2.46" (247.7 × 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" (123.8 × 62.5 mm)
Available in Two Constructions
— Translucent Tubes (KTE2)
— Clear Tubes with Hi-Efficiency Gold Coated Ceramic Backing (KTG2)

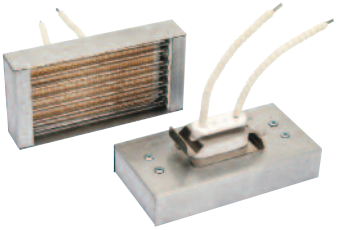
Series KTE3 & KTG3
7.31" × 2.46" (185.7 × 62.5 mm)
Available in Two Constructions
— Translucent Tubes (KTE3)
— Clear Tubes with Hi-Efficiency Gold Coated Ceramic Backing (KTG3)

Series KTE4 & KTG4
14.63" × 2.46" (371.5 × 62.5 mm)
Available in Two Constructions
— Translucent Tubes (KTE4)
— Clear Tubes with Hi-Efficiency Gold Coated Ceramic Backing (KTG4)

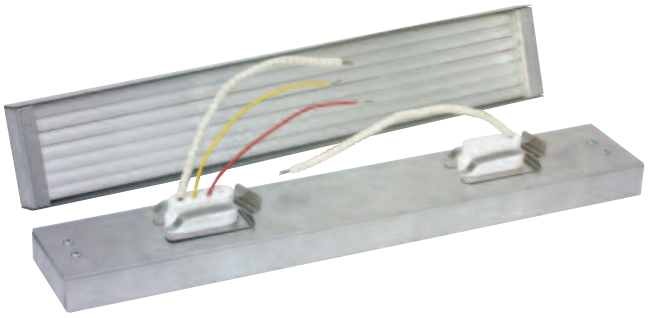
Series KTE5
19.50" × 2.46" (495.3 × 62.5 mm)
Available with Translucent Tubes only

Series KTE6 & KTG6
4.88" Square (123.8 mm)
— Translucent Tubes (KTE6)
— Clear Tubes with Hi-Efficiency Gold Coated Ceramic Backing (KTG6)

2 Universal Mounting Styles (C & S) Available



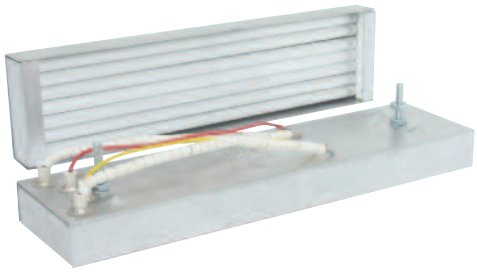
Style C – Single Ceramic Header with Leads
(Shown with Clear Tubes with Hi-Efficiency Gold Coated Ceramic Backing)



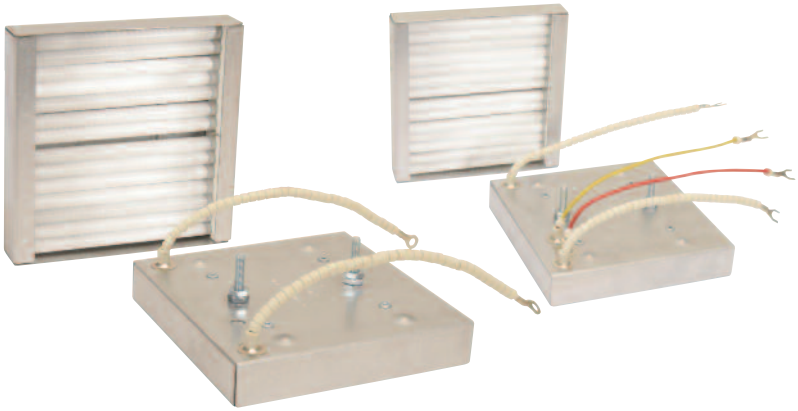
Style C – Two Ceramic Headers with Leads
(Shown with Translucent Tubes and T/C)

INTERCHANGEABLE MOUNTING DESIGN

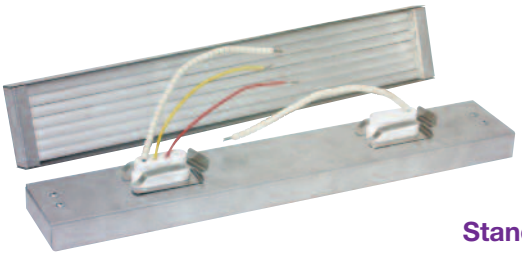
Style C KTE and KTG E-Mitters have a Standard Ceramic Mounting Head and are interchangeable with CRC, CRB, CRN and CRZ Ceramic E-Mitters.



Style S – Two 10-32 Studs × 1" on centerline
(Shown with Translucent Tubes and T/C)



KTE & KTG Series Style C



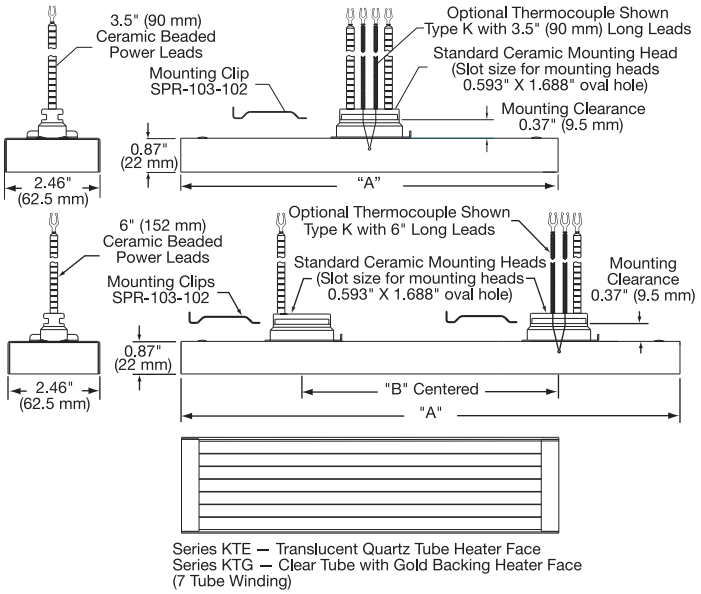
Series Style C (Ceramic Header with Leads)
High Intensity Quartz Mini-Tube Infrared Heaters
KTE (Translucent Tubes)
& KTG (Clear Tubes with Gold Coated Ceramic Backing)

Standard (Non-Stock) Sizes and Ratings

Heaters listed have ceramic bead insulated leads (single head 3.5", dual head 6"), #8-10 spade terminals, and one-piece spring clips for mounting in 20 or 22 gauge sheet metal.

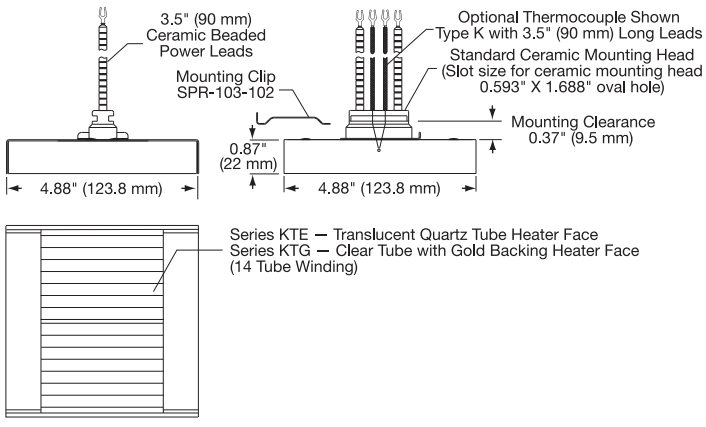
Wattage	Volts	Drawing	"A" Dim. in	"A" Dim. mm	"B" Dim. in	"B" Dim. mm	Translucent Tubes: Part Number without Thermocouple	Translucent Tubes: Part Number with Optional Type K Thermocouple	Gold Coated Ceramic Backing: Part Number without Thermocouple	Gold Coated Ceramic Backing: Part Number with Optional Type K Thermocouple
125	220/240	C1 (Single Head)					KTE20015	KTE20016	KTG20011	KTG20012
200	220/240	C1 (Single Head)					KTE20017	KTE20018	KTG20013	KTG20014
250	220/240	C1 (Single Head)	4.88	123.8	N/A	N/A	KTE20019	KTE20020	KTG20015	KTG20016
325	220/240	C1 (Single Head)					KTE20021	KTE20022	KTG20017	KTG20018
500	220/240	C1 (Single Head)					KTE20023	KTE20024	KTG20019	KTG20020
185	220/240	C1 (Single Head)					KTE30011	KTE30012	KTG30011	KTG30012
300	220/240	C1 (Single Head)					KTE30013	KTE30014	KTG30013	KTG30014
375	220/240	C1 (Single Head)	7.31	185.7	N/A	N/A	KTE30015	KTE30016	KTG30015	KTG30016
500	220/240	C1 (Single Head)					KTE30017	KTE30018	KTG30017	KTG30018
750	220/240	C1 (Single Head)					KTE30019	KTE30020	KTG30019	KTG30020
250	220/240	C1 (Single Head)					KTE10023	KTE10024	KTG10012	KTG10013
400	220/240	C1 (Single Head)					KTE10025	KTE10026	KTG10014	KTG10015
500	220/240	C1 (Single Head)	9.75	247.7	N/A	N/A	KTE10027	KTE10028	KTG10016	KTG10017
650	220/240	C1 (Single Head)					KTE10029	KTE10030	KTG10018	KTG10019
1000	220/240	C1 (Single Head)					KTE10031	KTE10032	KTG10020	KTG10021
375	220/240	C1 (Double Head)					KTE40011	KTE40012	KTG40011	KTG40012
600	220/240	C1 (Double Head)					KTE40013	KTE40014	KTE40013	KTE40014
750	220/240	C1 (Double Head)	14.63	371.5	7.40	188.1	KTE40015	KTE40016	KTG40015	KTG40016
1000	220/240	C1 (Double Head)					KTE40017	KTE40018	KTG40017	KTG40018
1500	220/240	C1 (Double Head)					KTE40019	KTE40020	KTG40019	KTG40020
500	220/240	C1 (Double Head)					KTE50011	KTE50012	—	—
800	220/240	C1 (Double Head)					KTE50013	KTE50014	—	—
1000	220/240	C1 (Double Head)	19.50	495.3	9.88	250.8	KTE50015	KTE50016	—	—
1500	220/240	C1 (Double Head)					KTE50017	KTE50018	—	—
2000	220/240	C1 (Double Head)					KTE50019	KTE50020	—	—
250	220/240	C2					KTE60011	KTE60012	KTG60011	KTG60012
400	220/240	C2					KTE60013	KTE60014	KTG60013	KTG60014
500	220/240	C2	See Drawing				KTE60015	KTE60016	KTG60015	KTG60016
650	220/240	C2					KTE60017	KTE60018	KTG60017	KTG60018
1000	220/240	C2					KTE60019	KTE60020	KTG60019	KTG60020

Drawing C1 – Single and Double Head Rectangular Heater

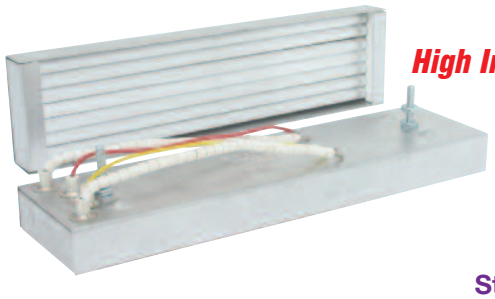


Series KTE — Translucent Quartz Tube Heater Face
Series KTG — Clear Tube with Gold Backing Heater Face
(7 Tube Winding)

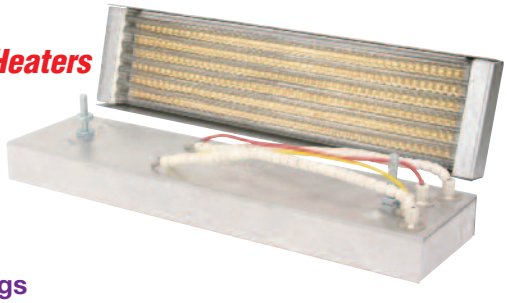
Drawing C2 – Single Head Square Heater



Series KTE — Translucent Quartz Tube Heater Face
Series KTG — Clear Tube with Gold Backing Heater Face
(14 Tube Winding)



Series Style S (Mounting Studs)
High Intensity Quartz Mini-Tube Infrared Heaters
KTE (Translucent Tubes)
& KTG (Clear Tubes with
Gold Coated Ceramic Backing)

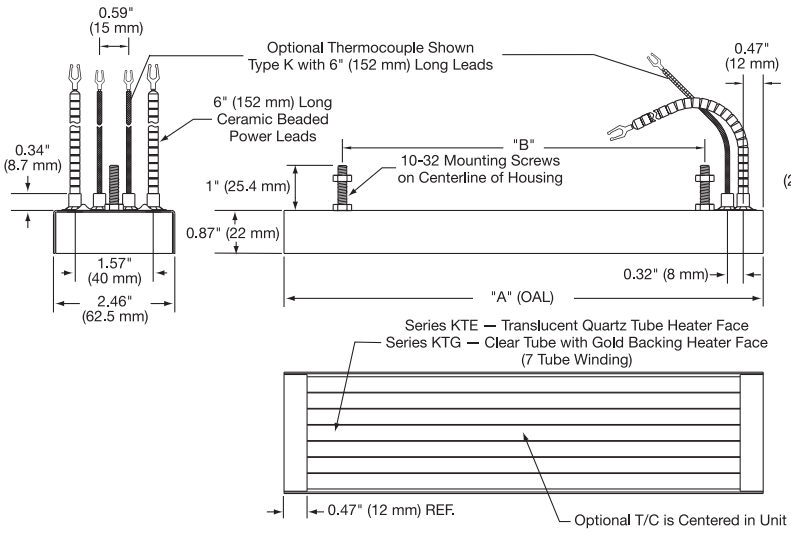


Standard (Non-Stock) Sizes and Ratings

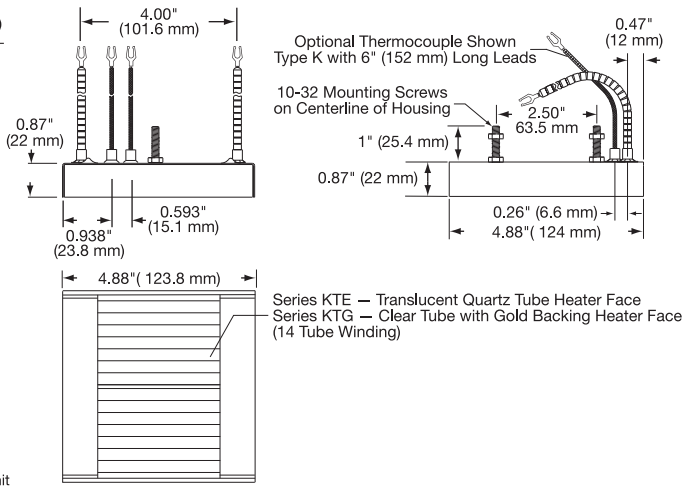
Heaters listed have 6" ceramic bead insulated leads with #8-10 spade terminals.

Wattage	Volts	Drawing	"A" Dim. in	"A" Dim. mm	"B" Dim. in	"B" Dim. mm	Translucent Tubes: Part Number without Thermocouple	Translucent Tubes: Part Number with Optional Type K Thermocouple	Gold Coated Ceramic Backing: Part Number without Thermocouple	Gold Coated Ceramic Backing: Part Number with Optional Type K Thermocouple
125	220/240	S1	4.88	123.8	2.50	63.5	KTE20001	KTE20002	KTG20001	KTG20002
200	220/240	S1					KTE20003	KTE20004	KTG20003	KTG20004
250	220/240	S1					KTE20005	KTE20006	KTG20005	KTG20006
325	220/240	S1					KTE20007	KTE20008	KTG20007	KTG20008
500	220/240	S1					KTE20009	KTE20010	KTG20009	KTG20010
185	220/240	S1	7.31	185.7	4.94	125.4	KTE30001	KTE30002	KTG30001	KTG30002
300	220/240	S1					KTE30003	KTE30004	KTG30003	KTG30004
375	220/240	S1					KTE30005	KTE30006	KTG30005	KTG30006
500	220/240	S1					KTE30007	KTE30008	KTG30007	KTG30008
750	220/240	S1					KTE30009	KTE30010	KTG30009	KTG30010
250	220/240	S1	9.75	247.7	7.38	187.3	KTE10001	KTE10002	KTG10002	KTG10003
400	220/240	S1					KTE10003	KTE10004	KTG10004	KTG10005
500	220/240	S1					KTE10005	KTE10006	KTG10006	KTG10007
650	220/240	S1					KTE10007	KTE10008	KTG10008	KTG10009
1000	220/240	S1					KTE10009	KTE10010	KTG10010	KTG10011
375	220/240	S1	14.63	371.5	12.25	311.2	KTE40001	KTE40002	KTG40001	KTG40002
600	220/240	S1					KTE40003	KTE40004	KTE40003	KTE40004
750	220/240	S1					KTE40005	KTE40006	KTG40005	KTG40006
1000	220/240	S1					KTE40007	KTE40008	KTG40007	KTG40008
1500	220/240	S1					KTE40009	KTE40010	KTG40009	KTG40010
500	220/240	S1	19.50	495.3	17.13	435.0	KTE50001	KTE50002	—	—
800	220/240	S1					KTE50003	KTE50004	—	—
1000	220/240	S1					KTE50005	KTE50006	—	—
1500	220/240	S1					KTE50007	KTE50008	—	—
2000	220/240	S1					KTE50009	KTE50010	—	—
250	220/240	S2	See Drawing				KTE60001	KTE60002	KTG60001	KTG60002
400	220/240	S2					KTE60003	KTE60004	KTG60003	KTG60004
500	220/240	S2					KTE60005	KTE60006	KTG60005	KTG60006
650	220/240	S2					KTE60007	KTE60008	KTG60007	KTG60008
1000	220/240	S2					KTE60009	KTE60010	KTG60009	KTG60010

Drawing S1 – Rectangular Heater



Drawing S2 – Square Heater



KTE Heater Specifications

KTE1 Series – 9.75" × 2.46" Housing
KTE6 Series – 4.88" Square 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

KTE2 Series – 4.88" × 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

KTE3 Series – 7.31" × 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

KTE4 Series – 14.63" × 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

KTE5 Series – 19.50" × 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

***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 compiled from standardized lab tests on different ratings and sizes of KTE heaters. Translucent tube testing showed that various reflector materials and surface conditions (bright, oxidized, etc.) had 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).

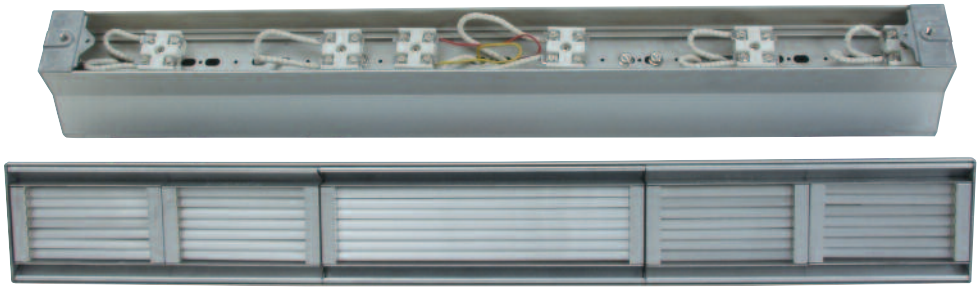
*****Peak Emitted Wavelength**

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.

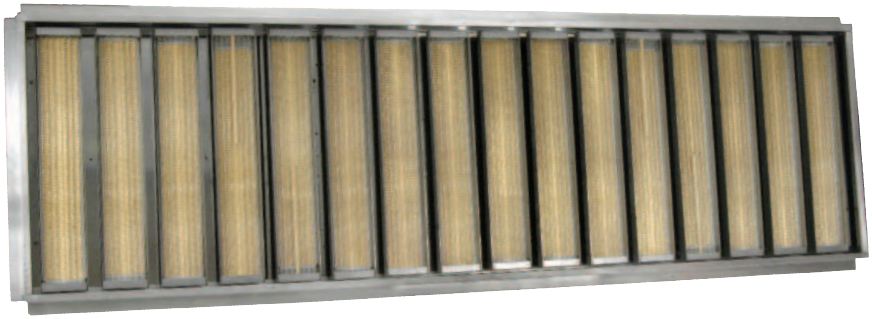
Custom CRA Linear Heater Assemblies for KTE and KTG E-Mitters Using Standard Components

Do It Yourself or let Tempco build an array to your exact specifications.

The CRK Linear Housings assembly (page 7-19) and other components on pages 7-16 through 7-23 for Ceramic E-Mitters are also used with KTE and KTG E-Mitters.



Custom ARV Array Housing Assemblies for KTE and KTG E-Mitters (see pages 7-48 through 7-51)



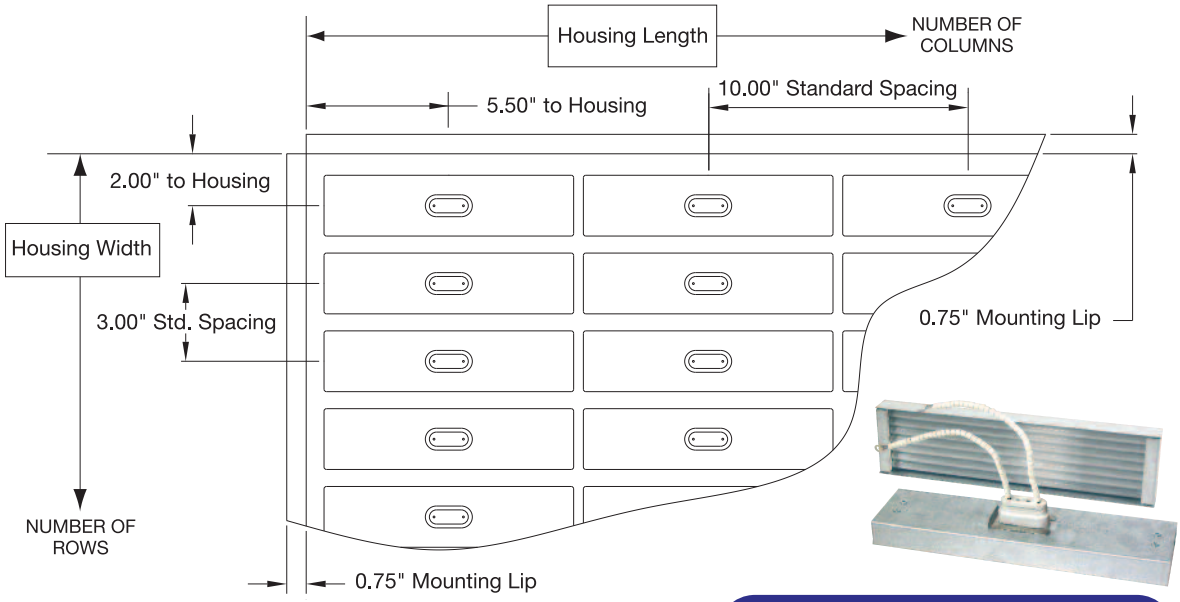
Series KTE1 E-Mitter Panel Arrays
Standard Style ARV Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (for the mounting lips).

Note: Structural Housing Dimensions (width × length) are in inches. For overall dimensions add 0.75" 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 3.00" × 10.00". 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).

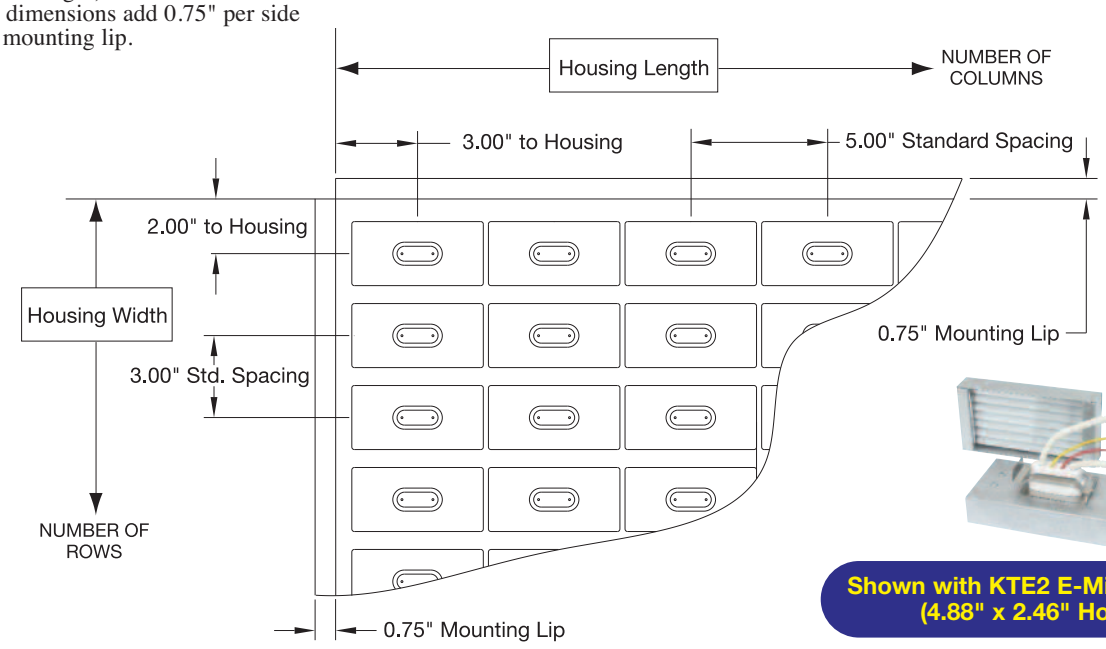
Consult us with your requirements.
There is no substitute for experience.

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

A) The Number of Rows will determine the Housing Width. For overall width add 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (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	—	—	Dimensions are in inches			—
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 × length) are in inches. For overall dimensions add 0.75" per side for the mounting lip.



Shown with KTE2 E-Mitters Style C (4.88" 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 3.00" × 5.00". 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).

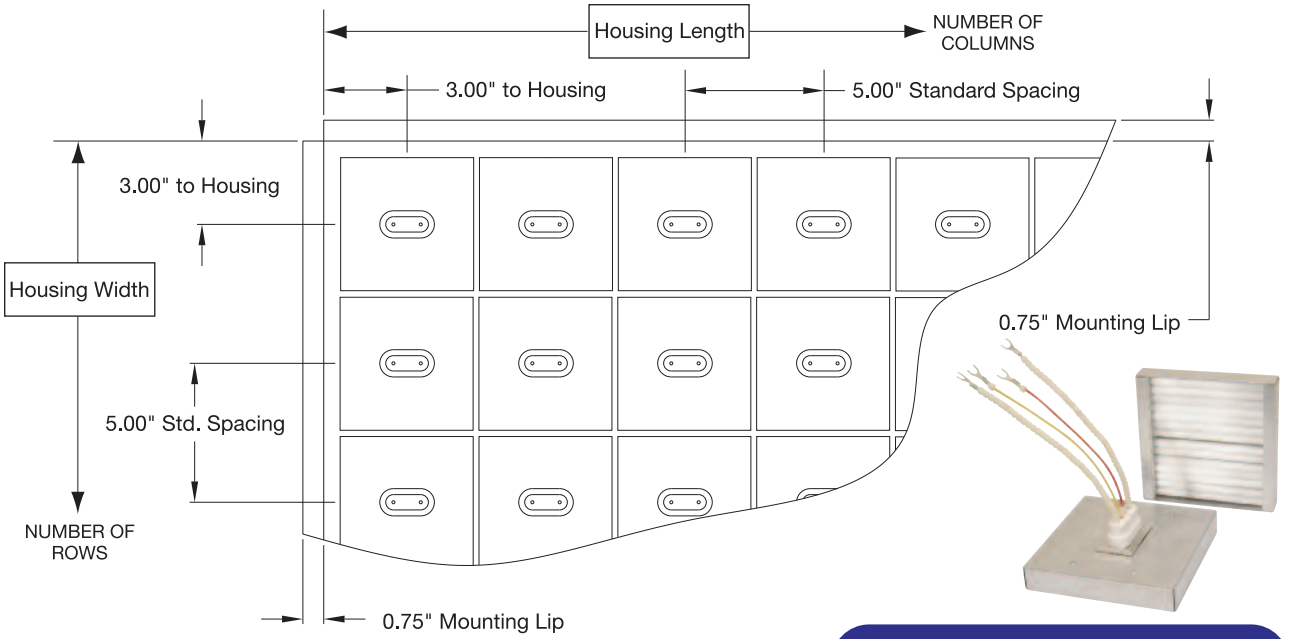
Consult us with your requirements.
There is no substitute for experience.

Series KTE6 and KTG6 E-Mitter Panel Arrays
Standard Style ARV Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (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 × length) are in inches.
For overall dimensions add 0.75" per side for the mounting lip.



Shown with KTE6 E-Mitters Style C (4.88" x 4.88" 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 KTE6 heaters is 5.00" × 5.00". Special narrow panels having a maximum 25 rows × 1, or 2 columns, and up to 8 rows × 9 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.

ARV 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 0.75" 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) ❒ KTE6 (4-7/8" Sq.)
- Heater Mounting Style ❒ C ❒ S
- Catalog Part Number _____ or Watts _____ Volts _____
- Standard K thermocouple or optional J _____ Quantity _____
- Heater lead configuration — Standard is 3.5" or 6" with spade terminal
  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 _____

_____

_____

Sealed IR Quartz Lamps

Design Features

- *Fast Filament Response*
- *High Power Densities possible — up to 200 watts per inch per filament*
- *Different filament temperatures available to suit different materials*
- *Optional white or gold reflective layer on lamps redirects heat towards target material*
- *Single or twin-tube construction*
- *Contour bending available*

Filament Temperature Ratings

Filament Type	Near Infrared (NIR)	Short Wave (SW)	Fast Response Medium Wave (FRMW) High Temperature	Fast Response Medium Wave (FRMW) Low Temperature
Filament Response	1 second	1 second	1-2 seconds	1-2 seconds
Filament Temperature	2900K/4800°F	2500K/4000°F	1900K/2900°F	1500K/2200°F
Approximate Peak Wavelength	1.0μm	1.2μm	1.6μm	2.0μm
Maximum watts/inch per Filament	200	200	100	100
Average Lifetime (Hours)	2000	5000	5000	5000

SPECIFICATIONS

Max. Temperature: 350°C — End Seal
900°C — Quartz Tube and optional White Ceramic Reflective Layer
800°C — Optional Gold Reflective Layer

Max. Voltage: 600 Volts depending on design

LAMP GLASS TYPES

Clear: Standard

Ruby: Reduces Glare

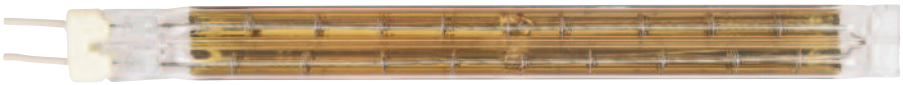
Translucent: Reduces Glare

Frosted: Reduces Glare

Gold Reflector: Redirects heat toward target for increased efficiency.

White Reflector: Redirects heat toward target for increased efficiency similar to gold, but will not degrade over time at high temperatures.

Custom Designs



Lamp Terminations

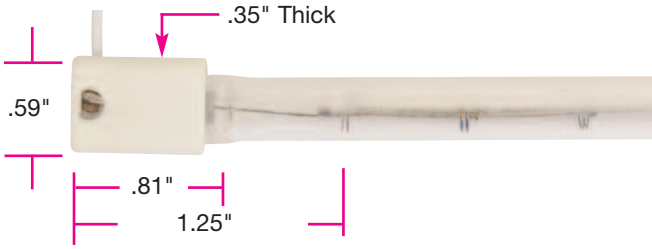
Select the termination style that meets your requirements.

Type R7s Recessed Single Contact

Type R7W R7S + Lead Wire

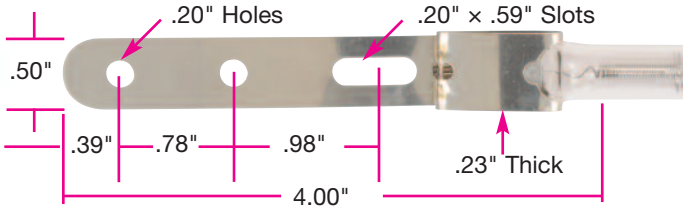
Type F Flat Ceramic + Lead Wire (No Cement)

Type FX Flat Ceramic + Lead Wire (Fixed with Cement)

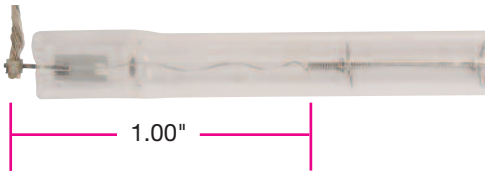


TYPE U Metal Clip + Lead Wire

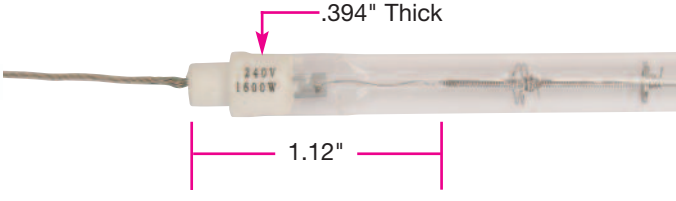
Type X Metal Tabs with Mounting Holes & Slots



Type W Lead Wire Only (Bare Wire Shown)



Type RC Round Ceramic



Common Industry Standard (Non–Stock) Lamps

Filament color temperature is 2500K and lead wire terminations have 145 mm (5-11/16") of uninsulated wire unless otherwise noted.

Wattage	Voltage	Overall Length (in)	Overall Length (mm)	Heated Length (in)	Heated Length (mm)	Base Type	Burning	Glass Type	Special Notes	Part Number
300	120	8.46	215.0	4.17	106.0	U	V	Clear		LMP00001
300	120	8.43	214.0	4.17	106.0	U	H	Translucent		LMP00002
375	120	8.69	220.6	5.06	128.6	R7s	V	Clear		LMP00003
500	120	8.50	216.0	5.06	128.6	R7s	H	Frosted		LMP00004
500	120	8.66	220.0	5.00	127.0	R7s	H	Translucent		LMP00005
500	120	8.69	220.6	4.84	123.0	R7s	V	Clear		LMP00006
500	120	8.81	223.8	4.84	123.0	U	H	Clear		LMP00007
500	240	8.69	220.6	5.06	128.6	R7W	H	Clear		LMP00008
500	240	8.96	227.5	6.50	165.0	Fx	H	Clear	Teflon® Insulated Lead Wire (with #10 Spade Terminal)	LMP00009
1000	208	13.63	346.2	10.06	255.5	R7s	H	Clear		LMP00010
1000	240	11.93	303.0	10.00	254.0	U	V	Clear		LMP00011
1000	240	13.63	346.2	10.06	255.5	R7s	H	Clear		LMP00012
1000	240	13.81	350.8	10.00	254.0	U	V	Clear		LMP00013
1000	240	13.82	351.0	10.71	272.0	U	H	Translucent		LMP00014
1000	240	13.98	355.0	10.71	272.0	Fx	V	White Reflector	Teflon® Insulated Lead Wire (with #10 Spade Terminal)	LMP00015
1000	240	19.09	485.0	10.71	272.0	X	H	White Reflector		LMP00016
1000	277	13.63	346.2	10.06	255.5	R7s	H	Clear		LMP00017
1200	144	8.81	223.8	6.18	157.0	U	V	Clear		LMP00018
1200	240	18.07	459.0	15.20	386.0	R7s	V	Clear		LMP00019
1350	115	12.48	317.0	10.08	256.0	RC	H	Clear	2750K Color Temperature	LMP00020
1500	240	9.13	232.0	6.89	175.0	W	H	Clear	228 mm (9") Bare Lead Wire	LMP00021
1600	208	19.65	499.0	16.02	407.0	R7s	H	Translucent		LMP00022
1600	208	19.76	502.0	16.02	407.0	RC	H	Clear		LMP00023
1600	208	19.80	503.0	16.02	407.0	U	H	Translucent		LMP00024
1600	240	19.63	498.6	16.06	407.9	R7s	H	Clear		LMP00025
1600	240	19.80	503.0	16.02	407.0	U	H	Translucent		LMP00026
1600	240	19.81	503.2	15.75	400.0	U	V	Clear		LMP00027
1600	277	19.65	499.0	16.02	407.0	R7s	V	Clear		LMP00028
1600	277	19.81	503.2	16.02	407.0	U	V	Clear		LMP00029
2000	230	21.67	550.4	19.57	497.0	R7s	H	Clear		LMP00030
2000	240	13.78	350.0	11.73	298.0	R7s	H	Clear		LMP00031
2000	240	13.82	351.0	10.00	254.0	U	H	Clear		LMP00032
2000	240	13.74	349.0	11.02	280.0	W	V	Clear	#10 Ring Terminal	LMP00033
2000	240	13.86	352.0	11.50	292.0	W	H	Clear	228 mm (9") Bare Lead Wire	LMP00034
2000	240	13.94	354.0	11.42	290.0	Fx	H	White Reflector		LMP00035
2000	240	14.06	357.0	11.02	280.0	Fx	V	White Reflector	Teflon® Insulated Lead Wire (with #10 Spade Terminal)	LMP00036
2000	240	19.09	485.0	11.02	280.0	X	V	Clear		LMP00037
2000	400	24.53	623.0	16.14	410.0	X	V	Clear		LMP00038
2500	240	13.86	352.0	11.50	292.0	W	H	Clear	228 mm (9") Bare Lead Wire	LMP00039
2500	400	14.06	357.0	11.02	280.0	F	H	White Reflector	Teflon® Insulated Lead Wire (with #10 Spade Terminal)	LMP00040
2500	480	28.62	727.0	25.00	635.0	R7s	H	Translucent		LMP00041
2500	480	28.63	727.2	25.06	636.5	R7s	V	Clear		LMP00042
2500	480	28.78	731.0	25.00	635.0	RC	H	Clear		LMP00043
2500	480	28.81	731.8	24.87	631.8	U	V	Clear		LMP00044
2500	480	28.82	732.0	25.00	635.0	U	H	Translucent		LMP00045
2500	575	28.82	732.0	25.00	635.0	U	H	Clear		LMP00046
2500	600	28.78	731.0	25.00	635.0	RC	V	Clear		LMP00047
3000	400	35.94	913.0	27.56	700.0	X	H	Clear		LMP00048
3650	480	41.69	1059.0	37.99	965.0	U	V	Clear		LMP00049
3650	480	41.81	1062.0	37.72	958.0	RC	H	Clear		LMP00050
3800	570	41.81	1062.0	37.99	965.0	U	V	Clear		LMP00051
3800	570	41.81	1062.0	37.99	965.0	RC	V	Clear		LMP00052
3800	575	40.63	1032.0	37.06	941.3	R7s	H	Clear		LMP00053
4900	480	52.81	1341.3	49.02	1245.0	RC	V	Clear		LMP00054
5800	480	63.82	1621.0	60.00	1524.0	RC	V	Clear		LMP00055

Terminations Key

F — Flat ceramic (no cement)
Fx — Flat ceramic (fixed with cement)
U — Metal sleeve + wire
X — Metal tab w/holes & slot
R7s — Recessed single contact
R7W — R7s w/lead wire
RC — Round ceramic + lead wire
W — Lead wire only - no base

Burning Positions Key

H — Horizontal use only
V — Horizontal or vertical use

Worksheet for Sealed IR Quartz Lamps

Ordering Information
To process your order
please specify the following information.

1.) Heater Specifications:

- Filament Temperature: ❒ Standard FRMW = 1500K ❒ High Temperature FRMW = 1900K
  ❒ Standard Halogen = 2500K ❒ NIR Halogen = 2900K ❒ Other _____
- Tube Cross Section: ❒ Single Round Tube ❒ Twin Bore Tube
- Tube Shape ❒ Straight ❒ Special Bend Configuration
- Tube Color: ❒ Clear (Standard) ❒ Ruby ❒ Translucent ❒ Frosted Ruby ❒ Frosted (Sandblasted) Clear
- Maximum Overall Length (Inches) _____
- Heated Length (Inches) _____
- Built-In Reflector: ❒ No Reflector ❒ White Reflector ❒ Gold Reflector

2.) Electrical requirements:

- Voltage: ❒ 120 ❒ 240 ❒ 277 ❒ 480 ❒ Other _____
- Wattage _____

3.) Termination Types:

- Single Tube Bases ❒ R7s ❒ R7W ❒ RC ❒ X ❒ F ❒ FX ❒ U ❒ Other _____
- Twin Tube Bases ❒ Ceramic with straight exit leads (Standard) ❒ Other _____
- Lead Wire Type ❒ Bare Wire (Standard) ❒ Teflon®@200°C ❒ Fiberglass@250°C ❒ Mica@450°C
- Lead Length 5.7" (Standard)_____ (Note: Type R7s and X do not have leads)
- Terminal Options ❒ None (Standard) ❒ #10 Ring Terminal ❒ #10 Spade Terminal ❒ Other _____

4.) Panel wiring & control options:

❒ Tempco to supply array panel

❒ 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 _____

_____

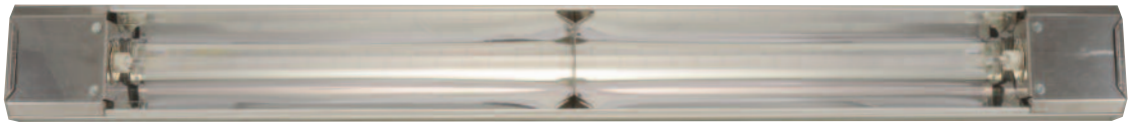
_____

QRH Single Quartz Lamp Radiant Heater Assemblies

Designed for use in applications that require instant on/off response with rapid heat-up and cooldown rates. These heater assemblies are designed to operate in the short wavelength range of 2.5-1.2 microns (1600 to 4000°F peak emitter temperatures).

These Universal 2000 Modular Housing assemblies utilize T3 (10mm) LMP sealed lamps.

These rugged short wavelength units contain double ended lamps having quick connect RSC/R7s bases for easy lamp access without disassembly of housing or removing heater from installation. The Quartz IR heat lamps are mounted at the focal point of a polished aluminum reflector within the housing. These units are available in a variety of sizes and power combinations.



Design Features

- *Direct Retrofit into existing NEMA 1 applications*
- *Rugged Universal 2000 anodized aluminum housing*
- *Wattage range of 375W to 3800W in standard designs*
- *110-600V voltages available depending on heated length*
- *Power density range of 65-220 w/in available; contact Tempco*
- *RSC/R7s quick connect lamp terminations (8 amps maximum per lamp)*
- *Maximum lamp length 41 inches, minimum 8 inches*
- *Fast response, immediate on/off, 20-40 sec for full heat-up*
- *Full cooldown in less than 3-6 minutes*
- *Single end wiring option available*
- *Utilizes standard TRH removable guard designs*
- *Custom dual lamp units up to 48" OAL housing length are available*

Installation Notes:

These units are for horizontal installation only.

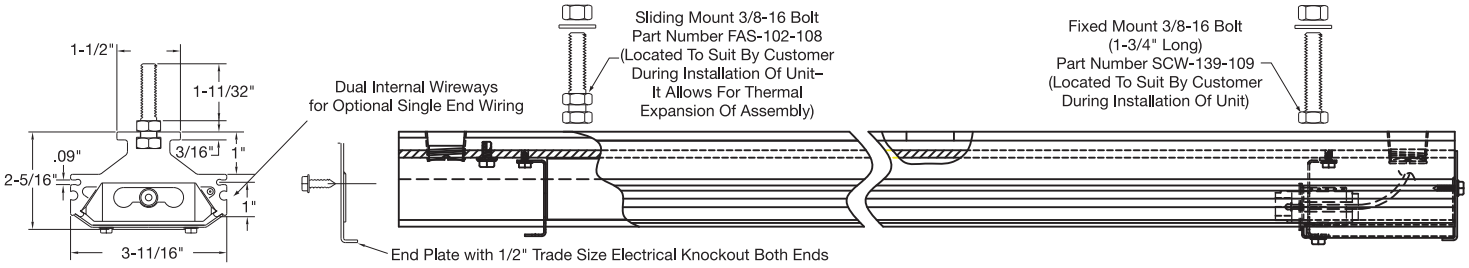
Lamp sockets are prewired in terminal enclosures with 16ga 600V rated conductors. Wires or connectors used for line connections inside junction boxes should be rated 200°C or higher, and sized per NEC/NFPA for unit voltage and amperage ratings.

Wiring used inside the internal wireways as crossover wiring must be rated 450°C or higher. Termination temperature at the exposed lamp cold ends must not exceed 650°F (343°C). Lamps should be shielded from direct visual observation due to their intense brightness when operating.

Initial inrush current will be 10 to 15 times the steady state current. Choose appropriate fuses for this heater assembly. Lamps should be operated within +/- 10% of rated voltage with minimal cycling to ensure long life. Operating outside this voltage range may cause internal degasification and discoloration of the lamp sheath, promoting premature element failure. When using copper wiring for field wiring, use only nickel plated or nickel clad conductors. Unplated or silver plated copper must not be used.

Standard Design (Non–Stock) QRH1 Series Single T3 Lamp Double End RSC Termination

Wattage	Volts	Housing Overall Length in	Housing Overall Length mm	Lamp Heated Length in	Lamp Heated Length mm	Lamp watts/inch	Part Number without Guard	Part Number with Guard	Replacement Lamp Part Number	Replacement Protective Wire Guard	Replacement Reflectors Part Number
375	115/120	16	406	5.06	128.5	74.0	QRH10001	QRH10010	LMP00003	GRD-104-125	SMPR-1111
500	115/120	16	406	5.06	128.5	98.8	QRH10002	QRH10011	LMP00006	GRD-104-125	SMPR-1111
1000	208	21	533	9.81	249.2	102.0	QRH10003	QRH10012	LMP00010	GRD-104-126	SMPR-1112
1000	220/240	21	533	9.81	249.2	102.0	QRH10004	QRH10013	LMP00012	GRD-104-126	SMPR-1112
1000	277	21	533	9.81	249.2	102.0	QRH10005	QRH10014	LMP00017	GRD-104-126	SMPR-1112
1600	220/240	27	686	16.00	406.4	100.0	QRH10006	QRH10015	LMP00025	GRD-104-127	SMPR-1113
1600	277	27	686	16.00	406.4	100.0	QRH10007	QRH10016	LMP00028	GRD-104-127	SMPR-1113
2500	460/480	36	914	25.06	636.5	99.8	QRH10008	QRH10017	LMP00042	GRD-104-107	SMPR-1122
3800	550/575	48	1219	37.00	939.8	102.7	QRH10009	QRH10018	LMP00053	GRD-104-108	SMPR-1123



CAUTION

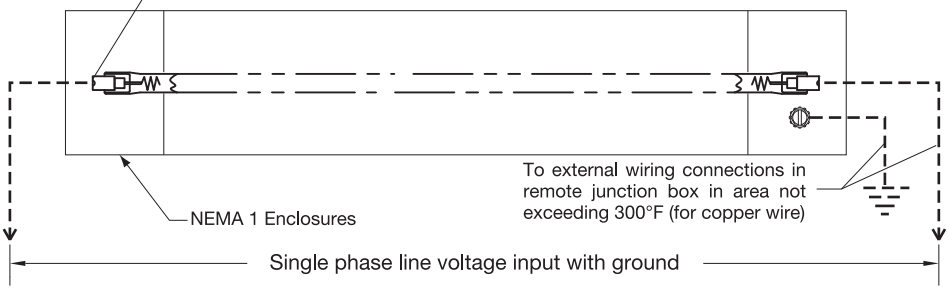
Danger: Hazard of Fire Do not mount heater closer than 6" to any combustible or structural material that does not have at least a 200°C continuous temperature rating.

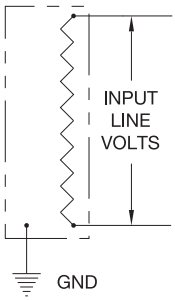
These heaters are not for use in atmospheres where flammable or combustible vapors, dust, gases, or liquids are present as defined in the National Electrical Code. Where solvents, water vapor or other VOCs are being evaporated from the process, it is necessary to provide substantial quantities of ventilating air to remove all resulting vapors.

Standard Double-End Wiring

NOTE:
Allow for element movement when wiring inside this end.

Attach properly rated line input wires to both element ends using the nickel-plated steel ring crimp connectors provided. Solid or stranded conductors can be used.





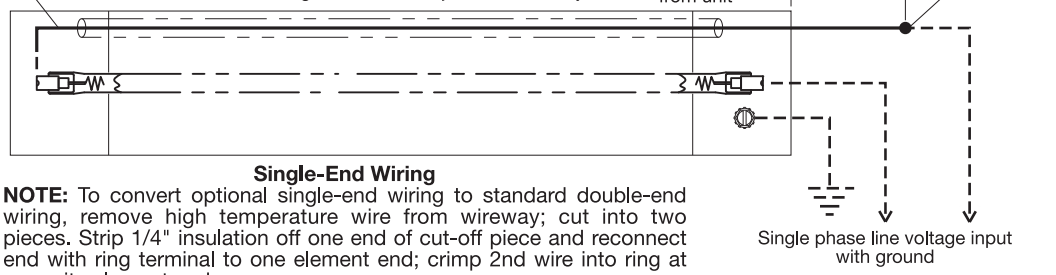
Optional Single End-Wiring

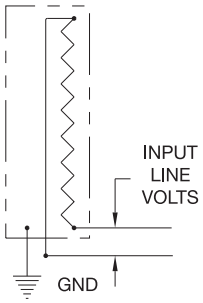
Single return wire rated for 842°F (450°C), 600V is supplied in internal wireway for line input at ground lug end.

External wiring connection in remote junction box in area not exceeding 300°F (for copper wire)

CAUTION: Do not cut or connect to this wire inside QRH housing. For connection to field wiring within external junction box only.

Wireway conductor extends 12" from unit

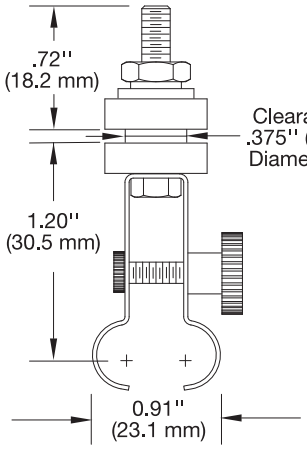




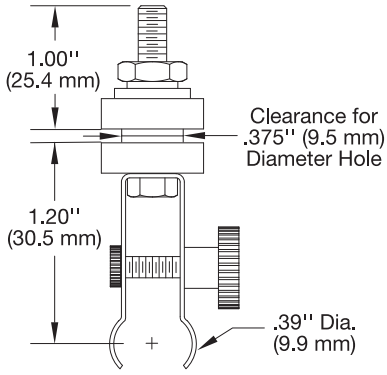
Single-End Wiring

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 at opposite element end.

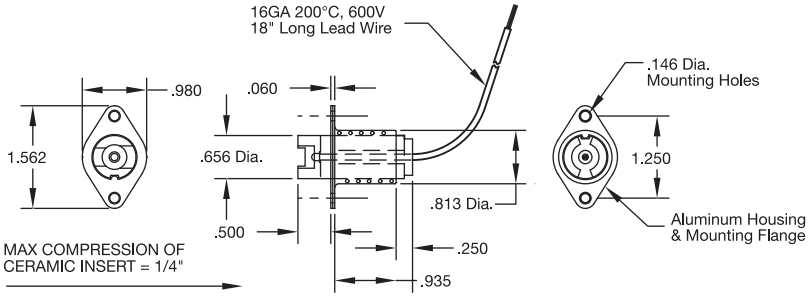
Lamp Accessories

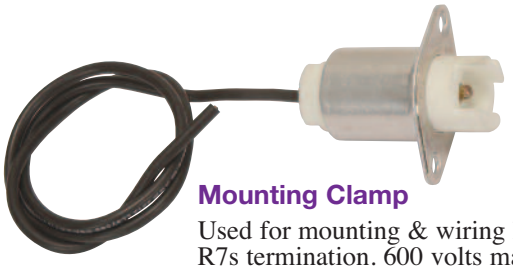


Mounting Clamp
11 mm × 23 mm
Part Number: CRK00087



Mounting Clamp
10 mm
Part Number: CRK00059



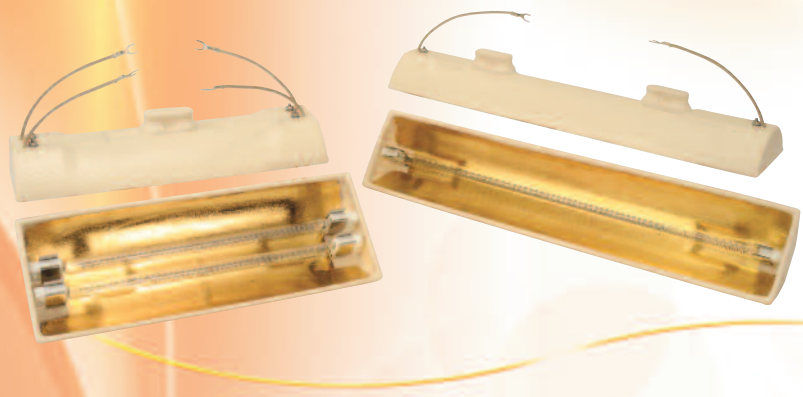


Mounting Clamp
Used for mounting & wiring lamps with R7s termination. 600 volts maximum. 350°C maximum operating temperature.
Part Number: LMP-103-101

Wiring Options

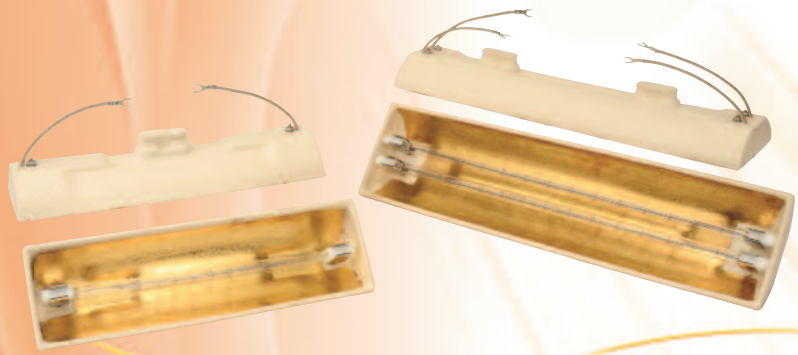
Series QRH Heaters can be prewired with plain leads, stainless steel armor cable, galvanized armor cable, stainless steel wire braid or SJO cable. For additional information See Wiring Options on page 7-17.

VIRTUAL SOLAR VS GLOW® Infrared Heaters



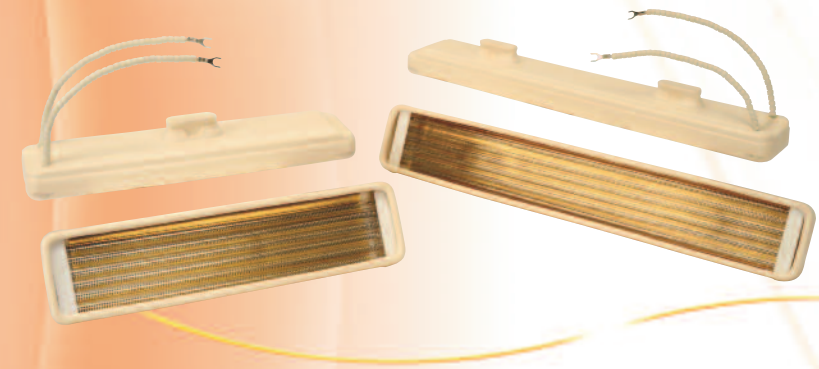
Series VSA

- *Short Wave IR*
- *2500K Filament Temperature*
- *Tungsten in Halogen-Filled Lamp*
- *150 – 2500 Watts*
- *See Page 7-59*



Series VSC

- *Medium Wave IR*
- *1500K Filament Temperature*
- *Star-Wound Tungsten in Evacuated Lamp*
- *75 – 1300 Watts*
- *See Page 7-60*



Series VSR

- *Medium Wave IR*
- *950K Wire Temperature*
- *Fe-Cr-Al Resistance Wire in Air*
- *125 – 1500 Watts*
- *See Page 7-61*

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

View Product Inventory @ www.tempco.com

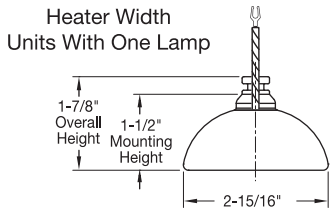
VSA Series High Density Short Wave

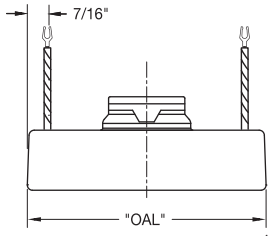
Design Features

- *Gold Coated Ceramic Reflector*
- *Short Wave Infrared Radiation up to 220 watts per linear inch*
- *Fast Response, Immediate ON/OFF, Time: 20-40 seconds for full heat-up*
- *All Ceramic Housing Construction*
- *Standard Lamp Voltages: 120 & 230/240*
- *All units are double-ended construction*

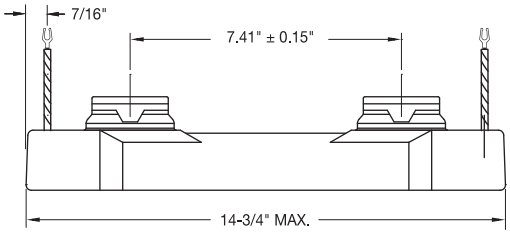
Typical Semiconductor Industry Applications

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

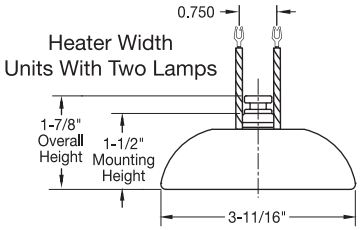




Heater Length
Series 122, 183 and 245



Heater Length
Series 367



One-Piece Mounting Clips Standard
Two-Piece Wave Mounting Clips Optional
See page 7-14 for details.

Standard (Non-Stock) VSA Series

VS Glow heaters listed have 10" mica insulated leads and a one-piece spring clip for mounting.

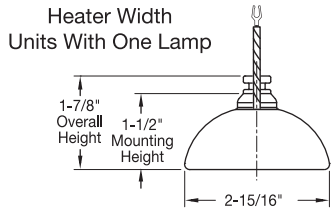
Series	Maximum Overall Length (in)	Maximum Overall Length (mm)	Heated Length (in)	Heated Length (mm)	Width (in)	Width (mm)	Wattage	Voltage	Part Number	Number of Lamps	Replacement Lamp Part Number
122	4.90	124.5	1.77	45	2.89	73.5	150	120	VSA00322	1	LMP00056
					2.89	73.5	225	120	VSA00323	1	LMP00057
					2.89	73.5	275	120	VSA00324	1	LMP00058
					3.67	93.1	450	120	VSA00325	2	LMP00057
183	7.36	187.0	4.17	106	2.89	73.5	300	120	VSA00326	1	LMP00059
					2.89	73.5	475	120	VSA00327	1	LMP00060
					2.89	73.5	600	120	VSA00328	1	LMP00061
					3.67	93.1	950	120	VSA00329	2	LMP00060
245	9.82	249.5	6.65	168	2.89	73.5	500	120	VSA00330	1	LMP00062
					2.89	73.5	750	120	VSA00331	1	LMP00063
					2.89	73.5	1000	120	VSA00332	1	LMP00064
					3.67	93.1	1500	120	VSA00333	2	LMP00063
					2.89	73.5	500	230/240	VSA00334	1	LMP00065
					2.89	73.5	750	230/240	VSA00335	1	LMP00066
					2.89	73.5	1000	230/240	VSA00336	1	LMP00067
					3.67	93.1	1500	230/240	VSA00337	2	LMP00066
367	14.74	374.5	11.38	289	2.89	73.5	800	120	VSA00338	1	LMP00068
					2.89	73.5	1250	120	VSA00339	1	LMP00069
					2.89	73.5	1500	120	VSA00340	1	LMP00070
					3.67	93.1	2500	120	VSA00341	2	LMP00069
					2.89	73.5	800	230/240	VSA00342	1	LMP00071
					2.89	73.5	1250	230/240	VSA00343	1	LMP00072
					2.89	73.5	1500	230/240	VSA00344	1	LMP00073
					3.67	93.1	2500	230/240	VSA00345	2	LMP00072

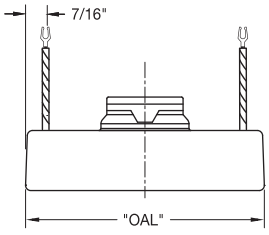
VS Glow Infrared Heaters

VSC Series High Density Medium Wave

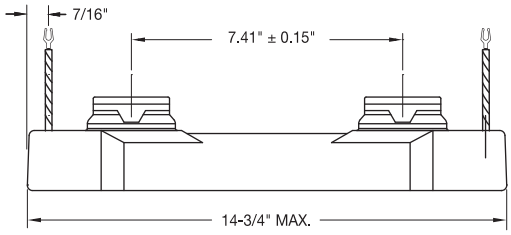
Design Features

- *Gold Coated Ceramic Reflector*
- *Medium wave Infrared Radiation up to 116 watts per linear inch*
- *Fast Response, Immediate ON/OFF, Time: 20-40 seconds for full heat-up*
- *All Ceramic Housing Construction*
- *Standard lamp voltages: 120 & 230/240*
- *All units are double-ended construction*

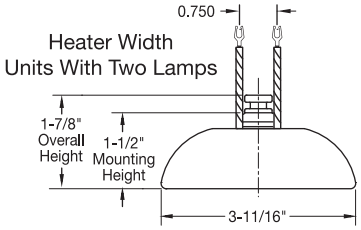




Heater Length
Series 122, 183 and 245



Heater Length
Series 367



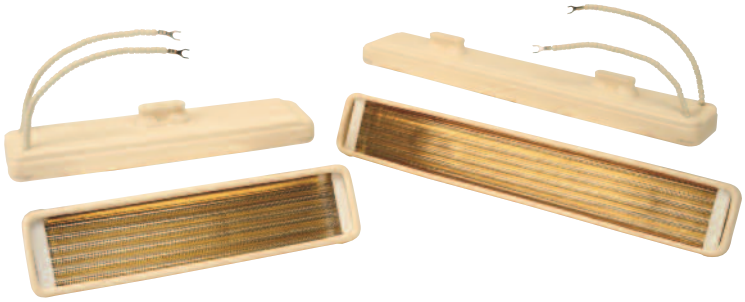
One-Piece Mounting Clips Standard
Two-Piece Wave Mounting Clips Optional
See page 7-14 for details.

Standard (Non-Stock) VSC Series

VS Glow heaters listed have 10" mica insulated leads and a one-piece spring clip for mounting.

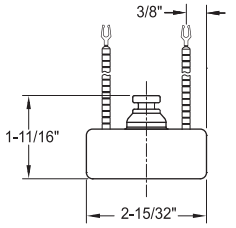
Series	Maximum Overall Length (in)	Maximum Overall Length (mm)	Heated Length (in)	Heated Length (mm)	Width (in)	Width (mm)	Wattage	Voltage	Part Number	Number of Lamps	Replacement Lamp Part Number
122	4.90	124.5	1.77	45	2.89	73.5	75	120	VSC00135	1	LMP00074
					2.89	73.5	125	120	VSC00136	1	LMP00075
					2.89	73.5	150	120	VSC00137	1	LMP00076
					3.67	93.1	250	120	VSC00138	2	LMP00075
183	7.36	187.0	4.17	106	2.89	73.5	150	120	VSC00139	1	LMP00077
					2.89	73.5	250	120	VSC00140	1	LMP00078
					2.89	73.5	300	120	VSC00141	1	LMP00079
					3.67	93.1	500	120	VSC00142	2	LMP00078
245	9.82	249.5	6.65	168	2.89	73.5	250	120	VSC00143	1	LMP00080
					2.89	73.5	400	120	VSC00144	1	LMP00081
					2.89	73.5	500	120	VSC00145	1	LMP00082
					3.67	93.1	800	120	VSC00146	2	LMP00081
					2.89	73.5	250	230/240	VSC00147	1	LMP00083
					2.89	73.5	400	230/240	VSC00148	1	LMP00084
					2.89	73.5	500	230/240	VSC00149	1	LMP00085
					3.67	93.1	800	230/240	VSC00150	2	LMP00084
367	14.74	374.5	11.38	289	2.89	73.5	400	120	VSC00151	1	LMP00086
					2.89	73.5	650	120	VSC00152	1	LMP00087
					2.89	73.5	800	120	VSC00153	1	LMP00088
					3.67	93.1	1300	120	VSC00154	2	LMP00087
					2.89	73.5	400	230/240	VSC00155	1	LMP00089
					2.89	73.5	650	230/240	VSC00156	1	LMP00090
					2.89	73.5	800	230/240	VSC00157	1	LMP00091
					3.67	93.1	1300	230/240	VSC00158	2	LMP00090

VSR Series Medium Wave

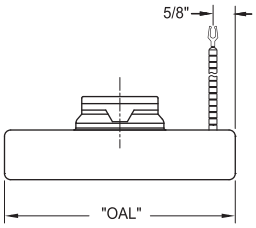


Design Features

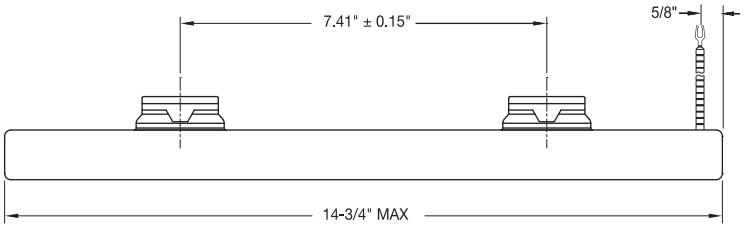
- *All Ceramic Housing Construction*
- *Capable of delivering medium and long wavelengths in any voltage from 120 to 480 volts*
- *Available in clear tubes*
- *24-K gold reflective surface*
- *Optional Type K thermocouple available*



Heater Width



Heater Length
Series 122, 183 and 245



Heater Length Series 367

One-Piece Mounting Clips Standard
Two-Piece Wave Mounting Clips Optional
See page 7-14 for details.

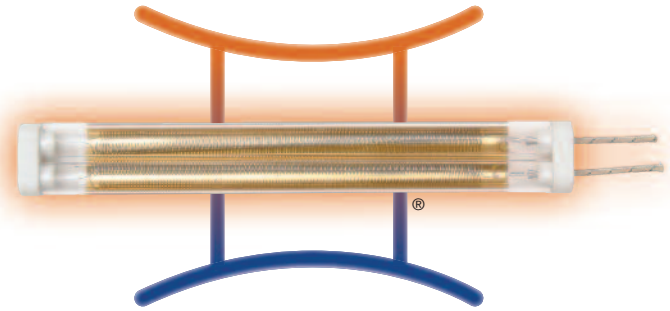
Standard (Non-Stock) VSR Series

VS Glow heaters listed have 6" ceramic bead insulated leads with #8-10 spade terminals and a one-piece spring clip for mounting.

Series	Maximum Overall Length (in)	(mm)	Wattage	Voltage	Part Number
122	4.90	124.5	125	230	VSR20001
			200	230	VSR20002
			250	230	VSR20003
			325	230	VSR20004
			500	230	VSR20005
183	7.36	187.0	185	230	VSR30001
			300	230	VSR30002
			375	230	VSR30003
			500	230	VSR30004
			750	230	VSR30005
245	9.82	249.5	250	230	VSR10001
			400	230	VSR10002
			500	230	VSR10003
			650	230	VSR10004
			1000	230	VSR10005
367	14.74	374.5	375	230	VSR40001
			600	230	VSR40002
			750	230	VSR40003
			1000	230	VSR40004
			1500	230	VSR40005

What's New At Tempco

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: 42/51/63.5 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)*

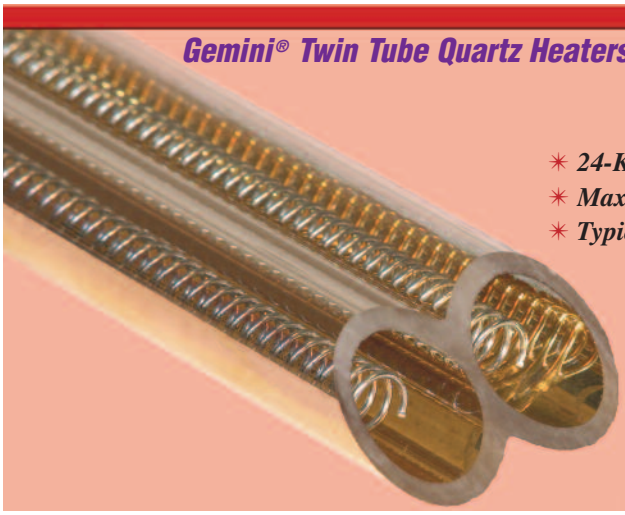
Complete Infrared Heat Technology for Every Industrial and Commercial Application Under the Sun

Gemini Series – Managing the Power of the Sun in a More Convenient Package

Medium Wave Infrared E-Mitters

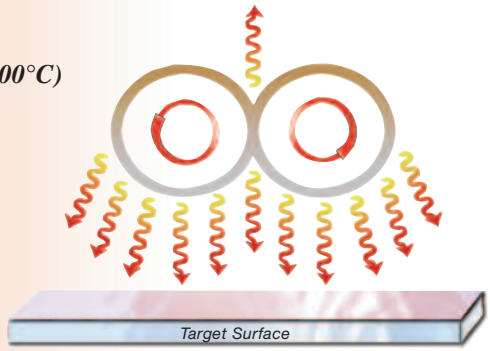
Tempco has developed specialized coatings to control the directional nature of the infrared energy emitted from the Gemini twin bore heaters. High levels of energy reflection are achieved by selectively bonding an integral high temperature coating to the half-hemisphere of the quartz tube surfaces facing 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° E-Mitter 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

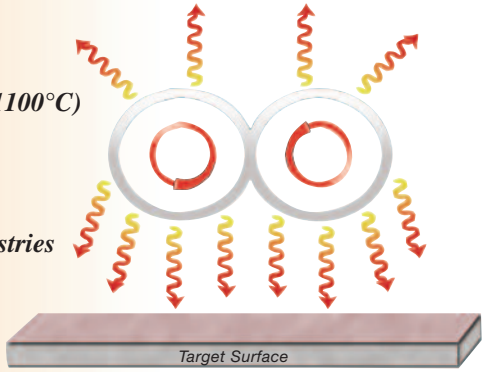
- *24-Karat Gold Back Coating*
- *Maximum Coil Temp 1472°F (800°C)*
- *Typical Applications:*
  - *Glass Processing Industry*
  - *Paper and Textile Industries*
  - *Plastics Industry*



Gemini® Twin Tube Quartz Heaters with White Ceramic Back Coating

75% Heat Reflection toward working surface

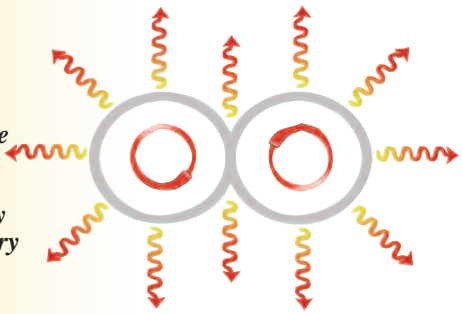
- *White Proprietary Formula Reflective Back Coating*
- *Maximum Coil Temp. 2012°F (1100°C)*
- *Typical Applications:*
  - *Stress Relieving of Metal Components*
  - *Drying Foils*
  - *Paper and Textile Industries*



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

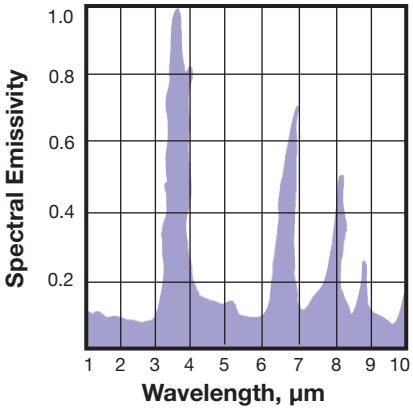
360° Heat Radiation

- *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*



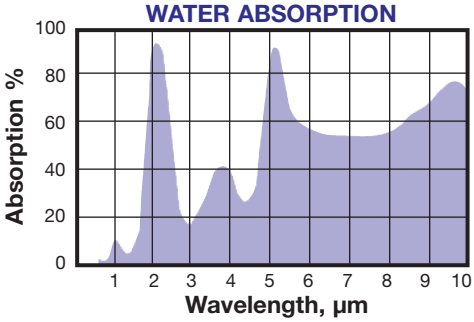
Medium Wave Infrared E-Mitters

SPECTRAL EMISSIVITY OF PET FILM



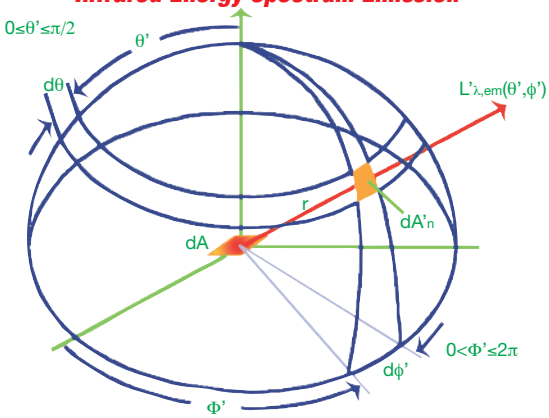
WAVELENGTH CONTROL – The very low heat transmission losses through the clear quartz material of the twin bore heaters allow Tempco's engineers to carefully design the peak emitted wavelength of these heaters to match the peak absorption wavelength for a given material or application. By modifying the temperature of the E-mitter, its peak emitted wavelength will change according to Wien's displacement law (see page 7-101). All E-mitters will emit a range of wavelengths above and below their peak value. (See spectrum graph on page 7-97.) 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 E-mitter in all possible directions with a non-uniform wavelength distribution.

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.

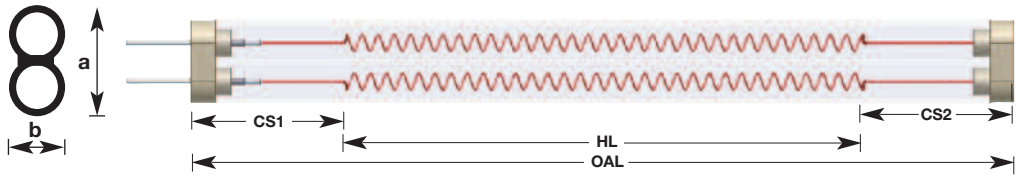
Electrical Ratings			
Twin Bore Tube Size	**17 × 8 mm**	**23 × 11 mm**	**33 × 15 mm**
Maximum Power Density (per unit length)	42 w/in (16.5 w/cm)	51 w/in (20 w/cm)	63.5 w/in (25 w/cm)
Maximum Voltage	480V	480V	600V
Maximum Amperage per circuit	9.5A	13.5A	20A

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

Medium Wave Infrared E-Mitters

Wire Leads for Standard Configuration are 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



Dimensional Specifications

Twin Tube Size Dimensions (a x b)	17 × 8 mm (.67 × .31 in)	23 × 11 mm (.91 × .43 in)	33 × 15 mm (1.30 × .59 in)
Maximum Length (OAL)	2000 mm (78.75 in)	2000 mm (78.75 in)	3000 mm (118 in)
Minimum Lead End Cold Length (Standard CS1) (both ends of double end units)	50 mm (1.96 in)	50 mm (1.96 in)	50 mm (1.96 in)
Minimum Blind End Cold Length (Standard CS2) (single ended units only)	50 mm (1.96 in)	50 mm (1.96 in)	50 mm (1.96 in)
Overall Length (OAL) Tolerance	± 2.5 mm (0.10 in)		
Heated Length (HL) Tolerance	±6.5 mm (0.26 in)		

Consult factory for closer tolerances.

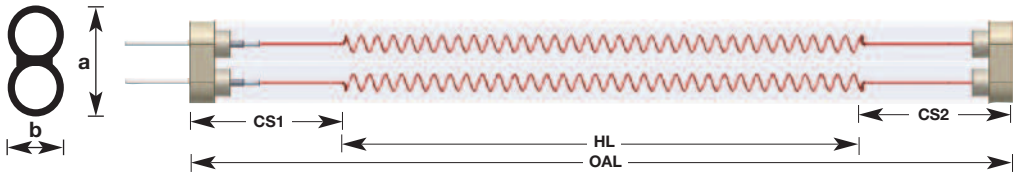
Exceptional Clear Quartz Twin Bore Material with Proven Application Results

- ***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***
- ***And much more***

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

Leads for Standard Configuration are 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 @ 230 Volts Coatings Gold	White	None	Linear Power Watts per inch	Configuration Style	Lead Exit Angle
0.71	18	0.31	8	15.7	400	11.8	300	500	GEM00001	GEM10001	GEM20001	42.4	A	0°
0.87	22	0.39	10	23.6	600	19.7	500	1000	GEM00002	GEM10002	GEM20002	50.8	A	0°
1.30	33	0.59	15	35.4	900	31.5	800	2000	GEM00003	GEM10003	GEM20003	63.5	A	0°
1.30	33	0.59	15	43.3	1100	39.4	1000	2500	GEM00004	GEM10004	GEM20004	63.5	A	0°
0.87	22	0.39	10	51.2	1300	47.2	1200	2500	GEM00005	GEM10005	GEM20005	53.0	A	0°
1.30	33	0.59	15	55.9	1420	51.2	1300	3250	GEM00006	GEM10006	GEM20006	63.5	A	0°
1.30	33	0.59	15	63.0	1600	59.1	1500	3750	GEM00007	GEM10007	GEM20007	63.5	A	0°
1.30	33	0.59	15	66.9	1700	63.0	1600	4000	GEM00008	GEM10008	GEM20008	63.5	A	0°
1.30	33	0.59	15	70.9	1800	66.9	1700	4100	GEM00009	GEM10009	GEM20009	61.3	A	0°
1.30	33	0.59	15	75.6	1920	70.9	1800	4500	GEM00010	GEM10010	GEM20010	63.5	A	0°
1.30	33	0.59	15	83.5	2120	78.7	2000	5000	GEM00011	GEM10011	GEM20011	63.5	B	0°
1.30	33	0.59	15	102.4	2600	98.4	2500	6250	GEM00012	GEM10012	GEM20012	63.5	B	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	A	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	B	90°
1.30	33	0.59	15	102.4	2600	98.4	2500	6250	GEM00024	GEM10024	GEM20024	63.5	B	90°

Optional Winding Patterns

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.

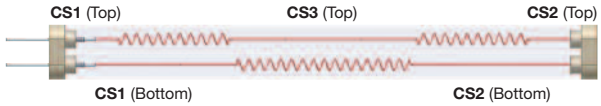
Single Ended Terminations

A (Standard)

C

E

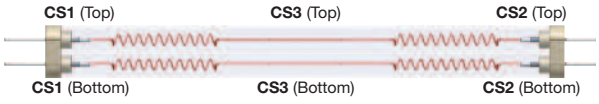
G



Double Ended Terminations

B (Standard)

D



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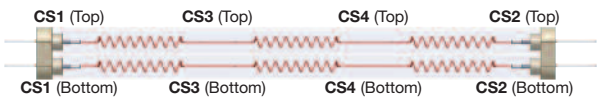
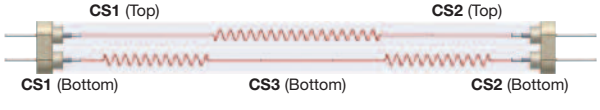
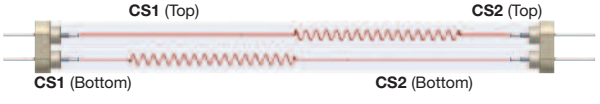


H



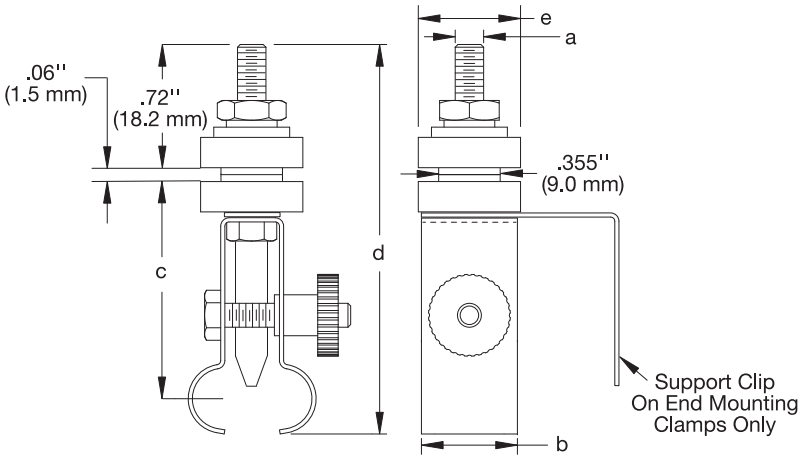
J



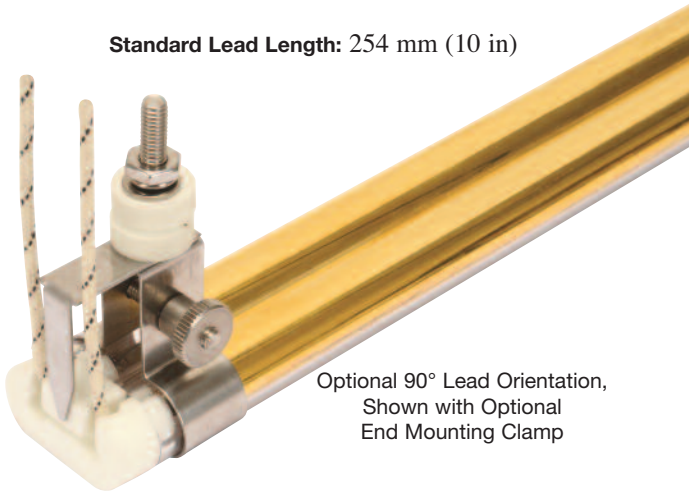
View Product Inventory @ www.tempco.com

Gemini Medium Wave Infrared E-Mitters

Lead configurations and lengths – 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 7-23. 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 Length: 254 mm (10 in)



Gemini Stainless Steel Clamp Specifications and Dimensions

Clamp Assembly Part Number	CRK00085	CRK00086	CRK00087	CRK00088	CRK00089	CRK00090
Fits Twin Tube Size	17 × 8 mm		23 × 11 mm		33 × 15 mm	
Clamp Location on Tube	Center	End	Center	End	Center	End
Clamps Required	OAL > 39.4" (1000 mm)	2 per heater	OAL > 59.1" (1500 mm)	2 per heater	OAL > 78.7" (2000 mm)	2 per heater
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)	1.20" (30.5 mm)		1.20" (30.5 mm)		1.41" (35.8 mm)	
Overall Clamp Height (d)	2.44" (62 mm)		2.48" (63.1 mm)		2.77" (70.3 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 7-66.

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.**

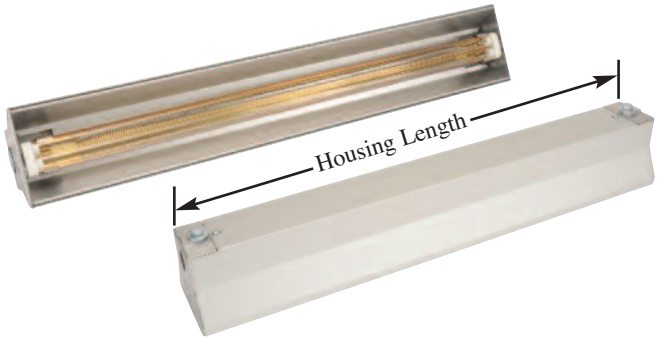
Please Specify the following:

- ❑ Reflective Coating — Gold, White Ceramic or None
- ❑ Twin Bore Tube Size (17 × 8 mm, 23 × 11 mm, or 33 × 15 mm)
- ❑ 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 7-23)
- ❑ Lead Wire Style/Length (Page 7-23)
- ❑ Winding Pattern (page 7-66, A-J or as required)
- ❑ Ceramic Bead Option (9" max. length)
- ❑ CRA Linear Housing Option (See page 7-68)
- ❑ Cold End Lengths (CE1 & CE2) See Winding Pattern page 7-66

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

CRA Linear Modular Housing Assemblies

These compact assemblies have one 33 × 15 mm twin bore Gemini quartz heater mounted in front of an aluminized steel reflector at a power density of 63.5 w/linear inch.



Design Features

- ✳ *Rapid heat-up/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*

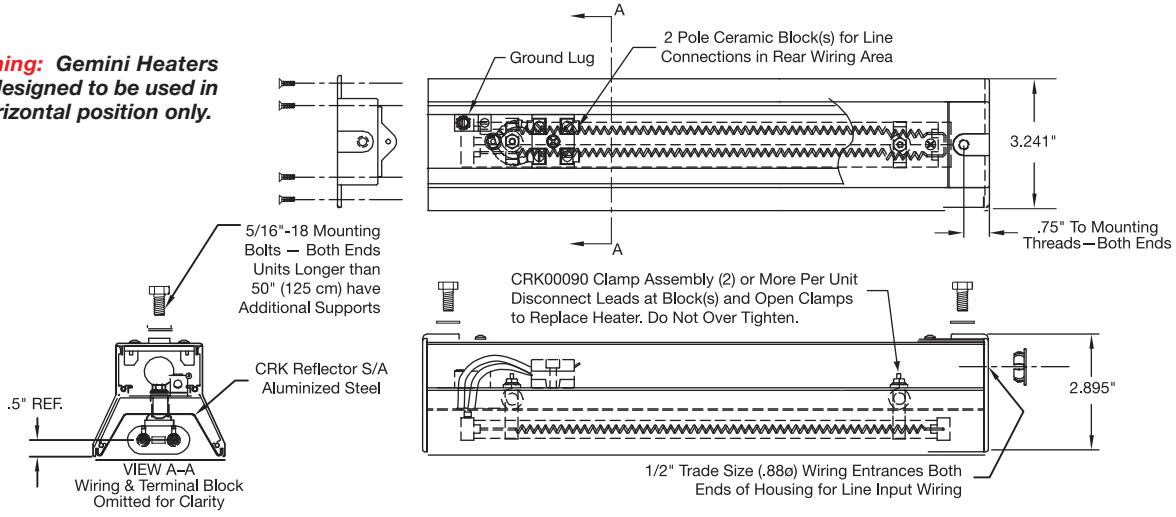
Standard (Non-Stock) and Stock Sizes and Electrical Ratings — 230V

Stock Items Are Shown In RED

Watts	Housing Length in	Housing Length mm	Heated Length (HL) in	Heated Length (HL) mm	Housing Assembly Part Number Heater Back Coating Gold	Housing Assembly Part Number Heater Back Coating White	Housing Assembly Part Number Heater Back Coating None	Replacement Heater Part Number Heater Back Coating Gold	Replacement Heater Part Number Heater Back Coating White	Replacement Heater Part Number Heater Back Coating None	Winding Pattern See Page 7-66
2000	36.19	919	31.5	800	CRA80001	CRA80015	CRA80024	GEM00015	GEM10015	GEM20015	A
2500	44.06	1119	39.4	1000	CRA80002	CRA80016	CRA80025	GEM00016	GEM10016	GEM20016	A
3250	56.63	1438	51.2	1300	CRA80003	CRA80017	CRA80026	GEM00018	GEM10018	GEM20018	A
3750	63.75	1619	59.1	1500	CRA80004	CRA80018	CRA80027	GEM00019	GEM10019	GEM20019	A
4000	67.69	1719	63.0	1600	CRA80005	CRA80019	CRA80028	GEM00020	GEM10020	GEM20020	A
4100	71.65	1820	66.9	1700	CRA80006	CRA80020	CRA80029	GEM00021	GEM10021	GEM20021	A
4500	76.38	1940	70.9	1800	CRA80007	CRA80021	CRA80030	GEM00022	GEM10022	GEM20022	A
5000	84.25	2140	78.7	2000	CRA80008	CRA80022	CRA80031	GEM00023	GEM10023	GEM20023	B
6250	103.13	2620	98.4	2500	CRA80009	CRA80023	CRA80032	GEM00024	GEM10024	GEM20024	B

CAUTION

***Warning:** Gemini Heaters are designed to be used in a horizontal position only.*

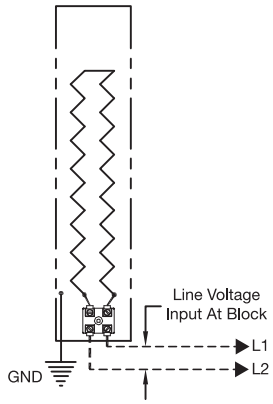


Ordering Information

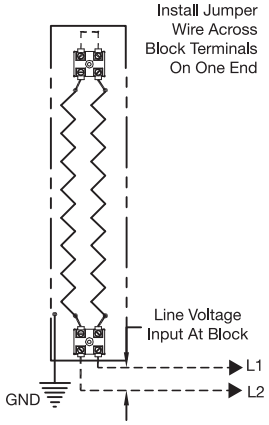
Select a Part Number from the Standard Sizes and Electrical Ratings table that meets your requirement.

Custom housings are available for any twin tube size (17 × 8 mm, 23 × 11 mm, and 33 × 15 mm; see page 7-67) 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.

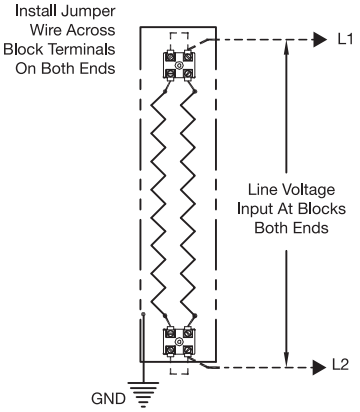
Wiring Diagrams for Gemini E-Mitter in a CRA Linear Housing



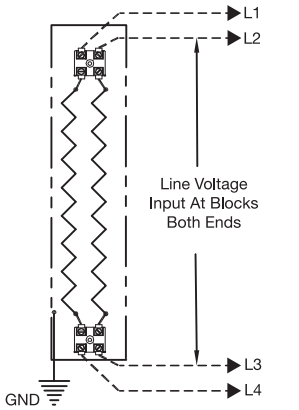
Single End Heater Wiring
Single Element



Double End Heater Wiring
Dual Element Series Wired



Double End Heater Wiring
Dual Element Parallel Wired

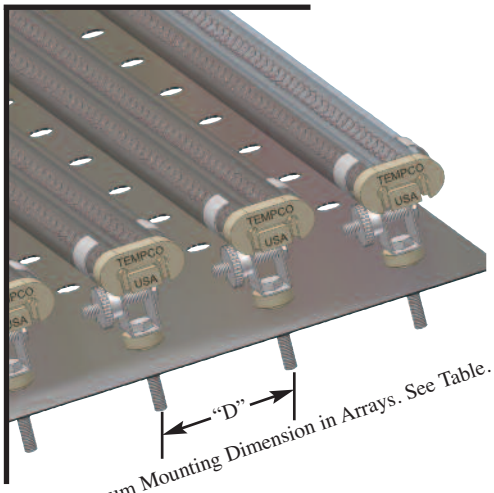


Double End Heater Wiring
Dual Circuit Individually Wired

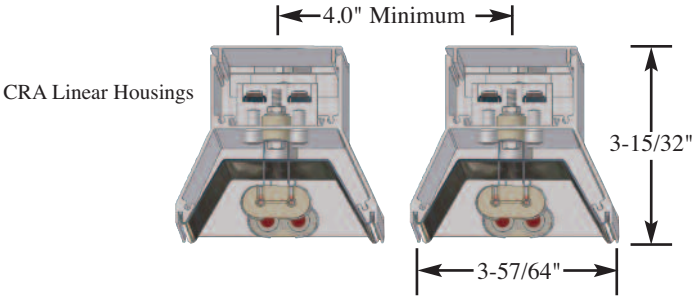
CAUTION

Warning: ***Hazard of Electrical Shock. Installation must be grounded to earth. Disconnect power before installing or servicing heater.***

Minimum Spacing Between Gemini Medium Wave Heaters



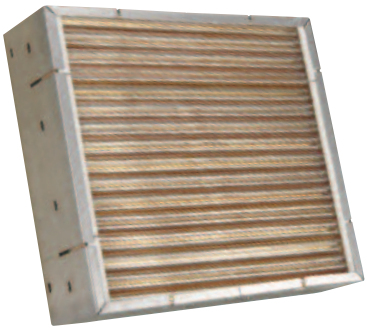
Minimum Mounting Dimension in Arrays. See Table.



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

Twin Bore Tube Size	17 x 8 mm	23 x 11 mm	33 x 15 mm
Minimum Center to Center Spacing of Heaters Mounted in ARG Arrays ("D Dim.")	1.43"	1.63"	2.00"
Minimum Center to Center Spacing of Heaters Mounted in CRA Linear Housings	4.00"	4.00"	4.00"

Type ARG Gemini Medium Wave Infrared E-Mitter Panel Arrays

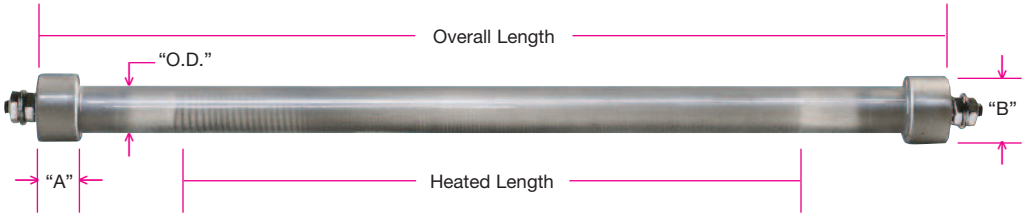


Custom panel arrays are available. Tempco will design and build to your specifications. Consult us with your requirements.

Radiant Process Heaters

KRD Radiant Quartz Heaters

Vitreous Silica Quartz Tube



Quartz Heater 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. They are ideally suited for processes that require wavelengths in the medium 4.0-2.4 micron band for efficient operation. These heaters are capable of generating full heat output in 80-100 seconds with a cool-down range of 180-225 seconds depending on the mass of the resistance coil and power density level.

They offer excellent life when used in either rapid cycling or continuous radiant heating applications.To achieve the best operating life, these quartz heaters should be operated with surface watt densities in the 35-40 watts per square inch range, not exceeding the maximum power densities specified below.

Construction Features

The heater consists of a helically wound resistance wire coil enclosed in a pure vitreous silica fused quartz tube with a translucent (semi-opaque) surface. The tubing is terminated at the ends with specially designed ceramic caps securely fastened with high temperature ceramic cement providing support for the field wiring screw terminals used for power connections.

The diffusion effect of the opaque quartz tube surface broadens the emitted wavelength range without creating objectionable glare due to emissions in the visible spectrum. Optimum design provides a clear red color on the translucent tube surface when operating at full line voltage. The emitted wavelength band is almost completely absorbed by the process and considered best for most industrial radiant 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: Up to 12" long ±1/8" Minimum
Over 12" long ±2%

QUARTZ HEATER SPECIFICATIONS — ELECTRICAL

Max. Volts: 480 Volts

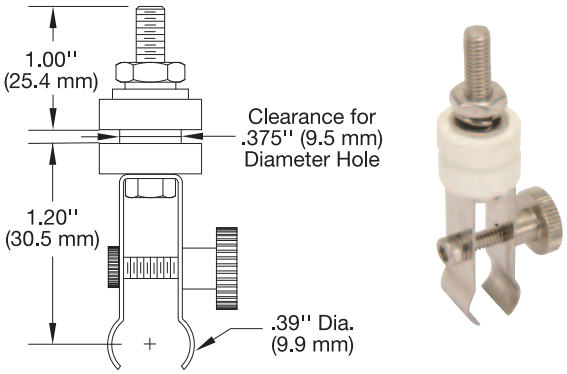
Max. Amperage: 20 Amps

Resistance Tolerance: +10%, –5%

Wattage Tolerance: +5%, –10%

Max Watt Density: 40 Watts/sq. in.

Mounting Clamp for 3/8 Quartz Tube OD



Mounting Clamp Part Number: CRK00059

Type ARK Vitreous Silica Quartz Tube Panel Arrays

Custom 4" high Type ARK panels with 1/2" diameter quartz elements are available. Tempco will design and build to your specifications. Consult us with your requirements.

Warning: Quartz Heaters are designed to be used in a Horizontal Position Only

View Product Inventory @ www.tempco.com

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).

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 7-67)

KRH Quartz Radiant Heaters

Quartz Sheath Medium Wave Radiant Heater Assemblies in a Universal 2000 Housing

Designed for use in applications that require rapid on/off response and fast heat-up and cooldown rates. These heater assemblies are designed to operate in the medium wavelength range of 4.0-2.4 microns (700 to 1715°F peak emitter temperatures).These Modular Housing assemblies utilize a .50 diameter translucent "milky white" vitreous quartz tube enclosing a high temperature resistance wire coil. The diffusion effect of the translucent quartz tube surface broadens the emitted infrared wavelength range obtained without objectionable glare due to low emissions in the visible spectrum. The units have either single or dual heaters mounted at the focal point of a polished aluminum reflector within the housing. These heater assemblies are available in a wide range of power densities. For housing dimensions and mounting details see page 7-75.

Design Features

- *Direct Retrofit into existing NEMA 1 applications*
- *Rugged Universal 2000 anodized aluminum housing*
- *Wattage range of 600W to 7200W in standard designs*
- *Voltages of 120-480V available depending on heated length*
- *Power densities up to 65w/in per heater (20 amps max/heater)*
- *Maximum Housing assembly length 84"; minimum 15"*
- *Fast response, 40-80 sec for full element heat-up*
- *Full cooldown in less than 4-8 minutes*
- *Single end wiring option available*
- *Multiple heat/dual voltage wiring options for dual heater units*
- *Utilizes standard TRH removable guard designs*
- *External power wiring options available*

Standard (Non–Stock) KRH1 Sizes & Ratings (55-60 w/in.) — Single Element Double End Termination

Wattage	Volts	Overall Length in	Overall Length mm	Heated Length in	Heated Length mm	Part Number without Guard	Part Number with Guard	Replacement Element Part Number	Replacement Protective Wire Guard	Replacement Reflector Set Part Number
600	120 208 240 277	18	457	9.75	248	KRH10001 KRH10002 KRH10003 KRH10004	KRH10030 KRH10031 KRH10032 KRH10033	KRD00266 KRD00267 KRD00252 KRD00268	GRD-104-104	SMPR-1018
900	120 208 240 277	24	610	15.75	401	KRH10005 KRH10006 KRH10007 KRH10008	KRH10034 KRH10035 KRH10036 KRH10037	KRD00269 KRD00270 KRD00271 KRD00272	GRD-104-105	SMPR-1019
1300	120 208 240 277 480	30	762	21.75	553	KRH10009 KRH10010 KRH10011 KRH10012 KRH10013	KRH10038 KRH10039 KRH10040 KRH10041 KRH10042	KRD00273 KRD00274 KRD00275 KRD00276 KRD00277	GRD-104-106	SMPR-1020
1600	208 240 277 480	36	914	27.75	705	KRH10014 KRH10015 KRH10016 KRH10017	KRH10043 KRH10044 KRH10045 KRH10046	KRD00278 KRD00279 KRD00280 KRD00281	GRD-104-107	SMPR-1021
2400	208 240 277 480	48	1219	39.75	1010	KRH10018 KRH10019 KRH10020 KRH10021	KRH10047 KRH10048 KRH10049 KRH10050	KRD00282 KRD00283 KRD00284 KRD00285	GRD-104-108	SMPR-1022
3000	208 240 277 480	60	1524	51.75	1315	KRH10022 KRH10023 KRH10024 KRH10025	KRH10051 KRH10052 KRH10053 KRH10054	KRD00286 KRD00287 KRD00288 KRD00289	GRD-104-109	SMPR-1023
3600	208 240 277 480	72	1829	63.75	1619	KRH10026 KRH10027 KRH10028 KRH10029	KRH10055 KRH10056 KRH10057 KRH10058	KRD00290 KRD00291 KRD00292 KRD00293	GRD-104-110	SMPR-1024

NOTES: See page 7-75 for housing dimensions and mounting details.
Shipped with Instruction Sheet IDP-129-104 for installation, wiring and maintenance information.

KRH Quartz Radiant Heater Assemblies

Quartz Sheath Medium Wave Radiant Heater Assemblies in a Universal 2000 Housing

Standard (Non–Stock) KRH2 Sizes & Ratings (110-120 w/in.) — Double Element Double End Termination

Wattage	Volts	Overall Length in	Overall Length mm	Heated Length in	Heated Length mm	Part Number without Guard	Part Number with Guard	Replacement Element Part Number	Replacement Protective Wire Guard	Replacement Reflector Set Part Number
1200	120 208 240 277	18	457	9.75	248	KRH20001 KRH20002 KRH20003 KRH20004	KRH20030 KRH20031 KRH20032 KRH20033	KRD00266 KRD00267 KRD00252 KRD00268	GRD-104-104	SMPR-1018
1800	120 208 240 277	24	610	15.75	401	KRH20005 KRH20006 KRH20007 KRH20008	KRH20034 KRH20035 KRH20036 KRH20037	KRD00269 KRD00270 KRD00271 KRD00272	GRD-104-105	SMPR-1019
2600	120 208 240 277 480	30	762	21.75	553	KRH20009 KRH20010 KRH20011 KRH20012 KRH20013	KRH20038 KRH20039 KRH20040 KRH20041 KRH20042	KRD00273 KRD00274 KRD00275 KRD00276 KRD00277	GRD-104-106	SMPR-1020
3200	208 240 277 480	36	914	27.75	705	KRH20014 KRH20015 KRH20016 KRH20017	KRH20043 KRH20044 KRH20045 KRH20046	KRD00278 KRD00279 KRD00280 KRD00281	GRD-104-107	SMPR-1021
4800	208 240 277 480	48	1219	39.75	1010	KRH20018 KRH20019 KRH20020 KRH20021	KRH20047 KRH20048 KRH20049 KRH20050	KRD00282 KRD00283 KRD00284 KRD00285	GRD-104-108	SMPR-1022
6000	208 240 277 480	60	1524	51.75	1315	KRH20022 KRH20023 KRH20024 KRH20025	KRH20051 KRH20052 KRH20053 KRH20054	KRD00286 KRD00287 KRD00288 KRD00289	GRD-104-109	SMPR-1023
7200	208 240 277 480	72	1829	63.75	1619	KRH20026 KRH20027 KRH20028 KRH20029	KRH20055 KRH20056 KRH20057 KRH20058	KRD00290 KRD00291 KRD00292 KRD00293	GRD-104-110	SMPR-1024

NOTES: See page 7-75 for housing dimensions and mounting details.

The Quartz elements are supplied at the same rated voltage as the overall assembly to be wired in parallel.

120V or 240V rated assemblies can be used at twice the rated voltage by wiring the elements in series. (120/240V or 240/480V)

Shipped with Instruction Sheet IDP-129-104 for installation, wiring and maintenance information.

Installation Notes:

Series KRH units are for Horizontal mounting only. KRD elements have T2, 10-32 terminals at both ends for field wiring connections. See page 7-71 for details. Wiring used in the junction boxes must be rated 250°C or higher, sized per NEC/NFPA for unit voltage and current carrying capacity. Use only 450°C rated wiring in internal wireways for single end or multiple heat options. When using copper wire for field wiring, use only nickel plated or nickel clad conductors.

Unplated or silver plated copper must not be used. See page 7-82 & 7-83 for wiring options. Do not mount heater housing closer than 6" to any combustible or structural material that does not have at least a 200°C continuous temperature rating.

Danger: Hazard of fire. These heaters are not for use in atmospheres where flammable or combustible vapors, dust, gases, or liquids are present as defined in the National Electrical Code. Where solvents, water vapor or other VOCs are being evaporated from the process, it is necessary to provide substantial quantities of ventilating air to remove all resulting vapors.

Wiring Options

Series KRH Heaters can be prewired with plain leads, stainless steel armor cable, galvanized armor cable, stainless steel wire braid or SJO cable. For additional information See Wiring Options on page 7-17.

TUBULAR RADIANT HEATER ASSEMBLIES

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

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.

Their unique design offer 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

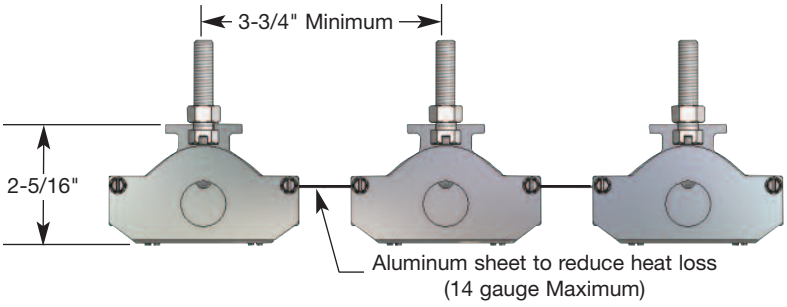
The Universal 2000 Radiant Heater stands apart from all other similar products. Its rugged construction, enhanced design features and flexibility in installation allow it to be used in applications requiring a single unit or to be used as modules creating various configurations for process radiant heating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

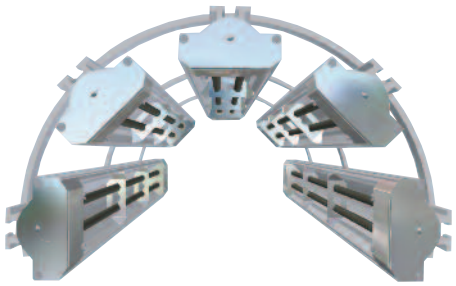
Universal 2000 Radiant Heaters are available in a full range of standard construction variations, physical dimensions and electrical ratings. They are also available in custom engineered/manufactured units up to 132" (3353 mm) for series TRH1, 4 and 6. TRH3 and 5 series units are available up to 120" (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.

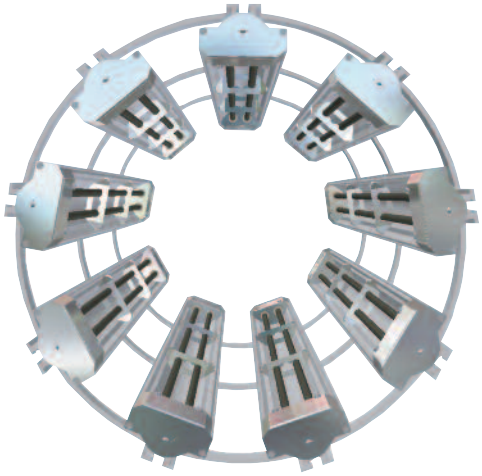
Design Features

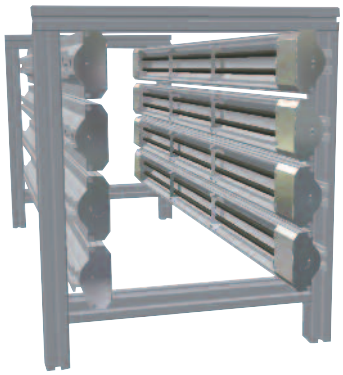
- ***Direct retrofit to existing applications***
- ***Rugged anodized extruded aluminum housing***
- ***Polished aluminum reflector (replaceable)***
- ***Incoloy® sheath tubular heaters (replaceable)***
- ***Element Support brackets (replaceable)***
- ***Sliding mounting bolts (replaceable)***
- ***Dual 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***

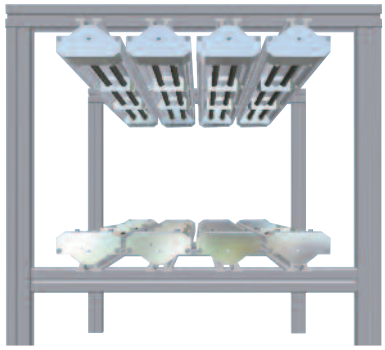
Typical Installations











Ordering Information

Catalog Heaters

Part Numbers in red are in stock for immediate delivery. Non-Stock Part Numbers are standard designs.

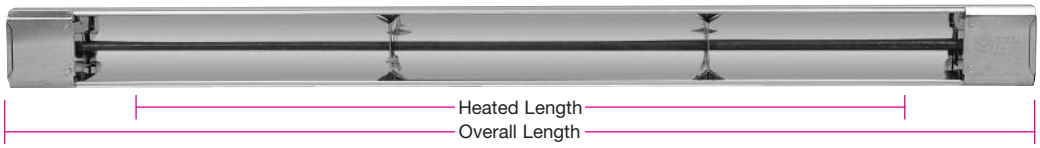
Custom Engineered/Manufactured Heaters

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

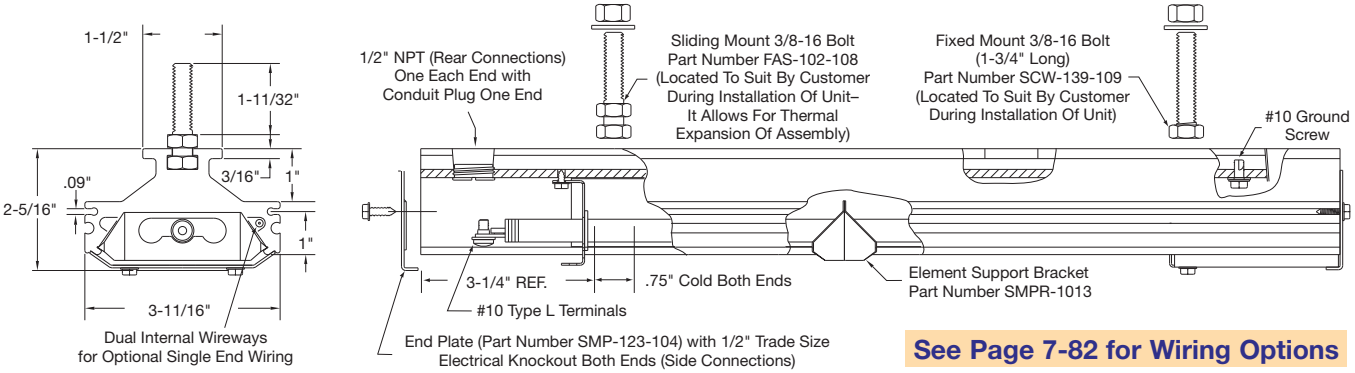
TRH1 Series — Single Straight Element Double End Termination



Standard (Non-Stock) Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number without Wire Guard	Part Number with Protective Wire Guard	Replacement Heating Element	Replacement Protective Wire Guard	Replacement Reflector Set
600	120 208 240 277	18	10	TRH10001 TRH10002 TRH10003 TRH10004	TRH10040 TRH10046 TRH10047 TRH10048	THE09100 THE09101 THE09102 THE09103	GRD-104-104	SMPR-1018
800	120 208 240 277	24	16	TRH10005 TRH10006 TRH10007 TRH10008	TRH10049 TRH10050 TRH10051 TRH10052	THE09104 THE09105 THE09106 THE09107	GRD-104-105	SMPR-1019
1100	120 208 240 277 480	30	22	TRH10009 TRH10010 TRH10011 TRH10012 TRH10013	TRH10053 TRH10054 TRH10055 TRH10056 TRH10057	THE09108 THE09109 THE09110 THE09111 THE09112	GRD-104-106	SMPR-1020
1300	208 240 277 480	36	28	TRH10014 TRH10015 TRH10016 TRH10017	TRH10058 TRH10059 TRH10060 TRH10061	THE09113 THE09114 THE09115 THE09116	GRD-104-107	SMPR-1021
1800	208 240 277 480	48	40	TRH10018 TRH10019 TRH10020 TRH10021	TRH10062 TRH10063 TRH10064 TRH10065	THE09117 THE09118 THE09119 THE09120	GRD-104-108	SMPR-1022
2500	208 240 277 480	60	51	TRH10022 TRH10023 TRH10024 TRH10025	TRH10066 TRH10067 TRH10068 TRH10069	THE09121 THE09122 THE09123 THE09124	GRD-104-109	SMPR-1023
3000	208 240 277 480	72	63	TRH10026 TRH10027 TRH10028 TRH10029	TRH10070 TRH10071 TRH10072 TRH10073	THE09125 THE09126 THE09127 THE09128	GRD-104-110	SMPR-1024
3600	208 240 277 480	84	75	TRH10030 TRH10031 TRH10032 TRH10033	TRH10044 TRH10074 TRH10075 TRH10076	THE09129 THE09130 THE09131 THE09132	GRD-104-111	SMPR-1025

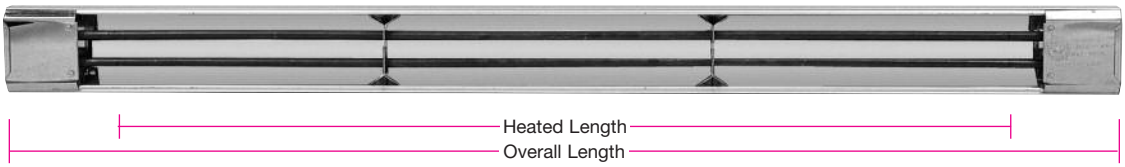
Optional Heating Element Protective Guard
Prevents accidental direct contact with heating element.



See Page 7-82 for Wiring Options

See Page 7-84 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

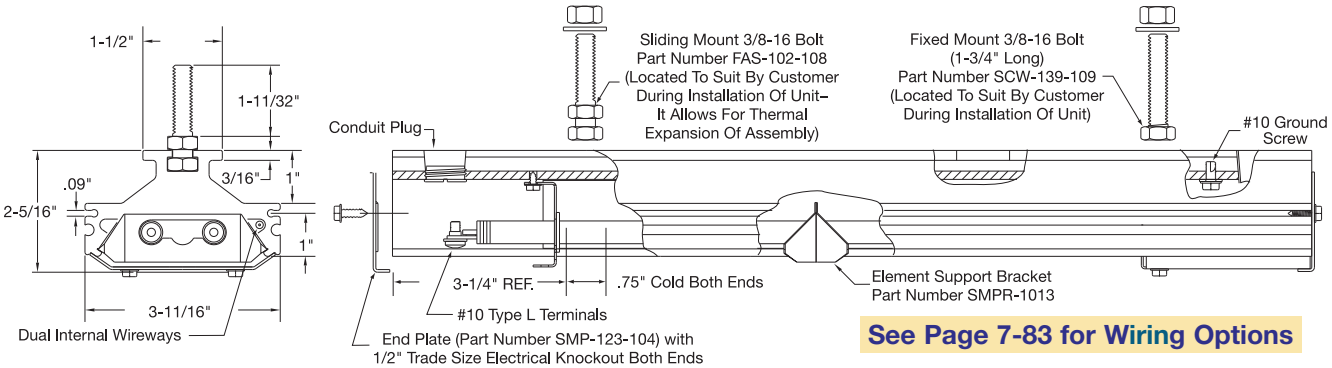
TRH2 Series — Dual Straight Element Double End Termination



Standard (Non-Stock) Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number without Wire Guard	Part Number with Protective Wire Guard	Replacement Heating Element	Replacement Protective Wire Guard	Replacement Reflector Set
1200	120 208 240 277	18	10	TRH20001 TRH20002 TRH20003 TRH20004	TRH20054 TRH20055 TRH20056 TRH20057	THE09100 THE09101 THE09102 THE09103	GRD-104-104	SMPR-1018
1600	120 208 240 277	24	16	TRH20005 TRH20006 TRH20007 TRH20008	TRH20058 TRH20059 TRH20060 TRH20061	THE09104 THE09105 THE09106 THE09107	GRD-104-105	SMPR-1019
2200	120 208 240 277 480	30	22	TRH20009 TRH20010 TRH20011 TRH20012 TRH20013	TRH20062 TRH20063 TRH20064 TRH20065 TRH20066	THE09108 THE09109 THE09110 THE09111 THE09112	GRD-104-106	SMPR-1020
2600	208 240 277 480	36	28	TRH20014 TRH20015 TRH20016 TRH20017	TRH20067 TRH20068 TRH20069 TRH20070	THE09113 THE09114 THE09115 THE09116	GRD-104-107	SMPR-1021
3600	208 240 277 480	48	40	TRH20018 TRH20019 TRH20020 TRH20021	TRH20071 TRH20072 TRH20073 TRH20074	THE09117 THE09118 THE09119 THE09120	GRD-104-108	SMPR-1022
5000	208 240 277 480	60	51	TRH20022 TRH20023 TRH20024 TRH20025	TRH20075 TRH20050 TRH20076 TRH20077	THE09121 THE09122 THE09123 THE09124	GRD-104-109	SMPR-1023
6000	208 240 277 480	72	63	TRH20026 TRH20027 TRH20028 TRH20029	TRH20078 TRH20079 TRH20080 TRH20081	THE09125 THE09126 THE09127 THE09128	GRD-104-110	SMPR-1024
7200	208 240 277 480	84	75	TRH20030 TRH20031 TRH20032 TRH20033	TRH20082 TRH20083 TRH20084 TRH20085	THE09129 THE09130 THE09131 THE09132	GRD-104-111	SMPR-1025

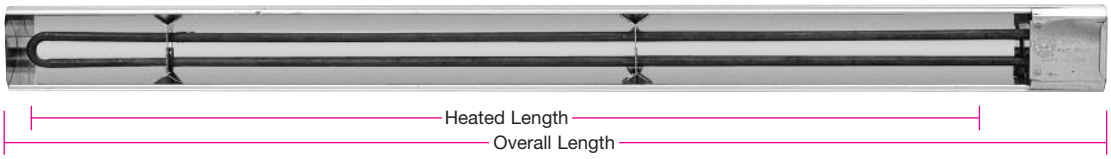
Note: Tubular elements are supplied at the same rated voltage as the overall assembly and are wired in parallel. 120 or 240V rated assemblies can be used at twice the rated voltage by wiring the elements in series (120/240V or 240/480V).



See Page 7-83 for Wiring Options

See Page 7-84 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

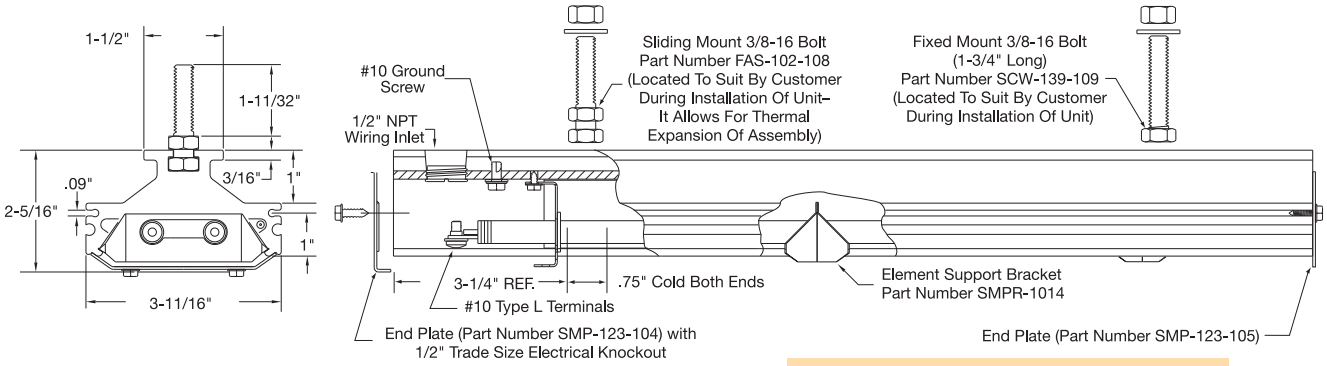
TRH3 Series — Single Hairpin Element Bend Single End Termination



Standard (Non-Stock) and Stock Sizes and Electrical Ratings

Stock Items Are Shown In RED

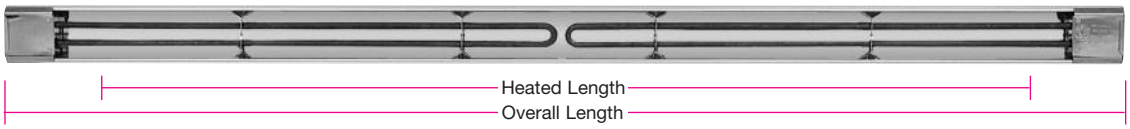
Wattage	Volts	Overall Length in.	Heated Length in.	Part Number without Wire Guard	Part Number with Protective Wire Guard	Replacement Heating Element	Replacement Protective Wire Guard	Replacement Reflector
800	120 208 240 277	12	7	TRH30001 TRH30002 TRH30003 TRH30004	TRH30036 TRH30037 TRH30038 TRH30039	THE09133 THE09134 THE09135 THE09136	GRD-104-112	SMPR-1028
1200	120 208 240 277	18	13	**TRH30005** TRH30006 **TRH30007** TRH30008	**TRH30040** TRH30041 **TRH30042** TRH30043	**THE09137** THE09138 **THE09139** THE09140	GRD-104-113	SMPR-1029
1800	208 240 277 480	24	19	TRH30009 **TRH30010** TRH30011 TRH30012	TRH30044 **TRH30045** TRH30046 TRH30047	THE09141 **THE09142** THE09143 THE09144	GRD-104-114	SMPR-1030
2500	208 240 277 480	30	25	TRH30013 TRH30014 TRH30015 TRH30016	TRH30048 TRH30049 TRH30050 TRH30051	THE09145 THE09146 THE09147 THE09148	GRD-104-115	SMPR-1031
3000	208 240 277 480	36	31	TRH30017 **TRH30018** TRH30019 TRH30020	TRH30052 **TRH30053** TRH30054 TRH30035	THE09149 **THE09150** THE09151 THE09152	GRD-104-116	SMPR-1032
3600	208 240 277 480	48	43	TRH30021 **TRH30022** TRH30023 **TRH30024**	TRH30055 **TRH30056** TRH30057 **TRH30058**	THE09153 **THE09154** THE09155 **THE09156**	GRD-104-117	SMPR-1033
5000	208 240 277 480	60	55	TRH30025 **TRH30026** TRH30027 **TRH30028**	TRH30059 **TRH30060** TRH30061 TRH30062	THE09157 **THE09158** THE09159 **THE09160**	GRD-104-118	SMPR-1034
6000	208 240 277 480	72	67	TRH30030 **TRH30031** TRH30032 **TRH30033**	TRH30064 **TRH30065** TRH30066 **TRH30067**	THE10305 **THE10306** THE10307 **THE10308**	GRD-104-124	SMPR-1095



See Page 7-84 for Wiring Options

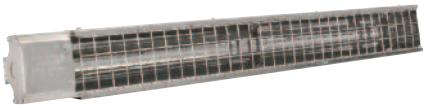
See Page 7-84 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

TRH4 Series — Dual Hairpin Element Bend Double End Termination



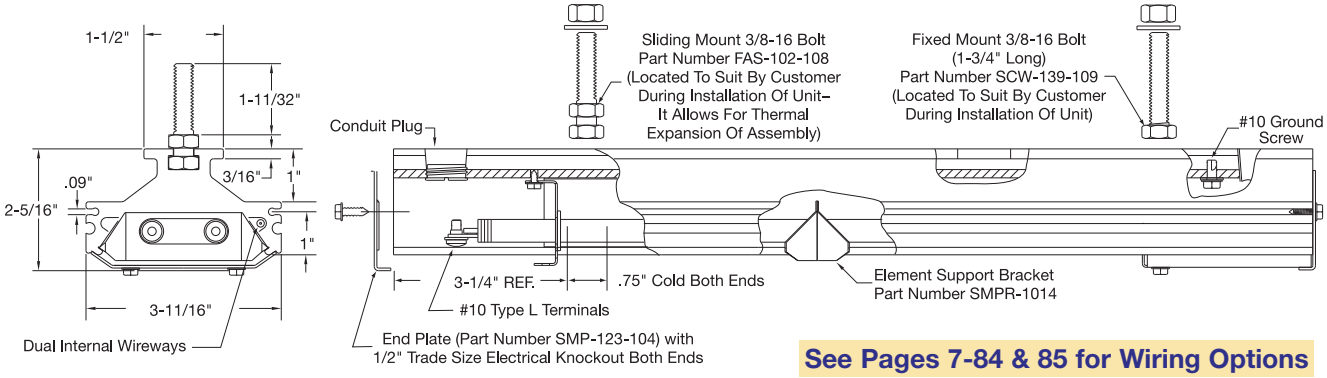
Standard (Non-Stock) Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number without Wire Guard	Part Number with Protective Wire Guard	Replacement Heating Element	Replacement Protective Wire Guard	Replacement Reflector Set
6000	208 240 277 480	72	64	TRH40001 TRH40002 TRH40003 TRH40004	TRH40019 TRH40020 TRH40021 TRH40022	THE09161 THE09162 THE09163 THE09164	GRD-104-119	SMPR-1070
7200	208 240 277 480	84	76	TRH40005 TRH40006 TRH40007 TRH40008	TRH40023 TRH40024 TRH40025 TRH40026	THE09165 THE09166 THE09167 THE09168	GRD-104-120	SMPR-1069
8000	208 240 277 480	96	88	TRH40009 TRH40010 TRH40011 TRH40012	TRH40027 TRH40028 TRH40029 TRH40030	THE09169 THE09170 THE09171 THE09172	GRD-104-121	SMPR-1071
9000	208 240 277 480	108	100	TRH40013 TRH40014 TRH40015 TRH40016	TRH40031 TRH40032 TRH40033 TRH40034	THE09173 THE09174 THE09175 THE09176	GRD-104-122	SMPR-1072



Heater with Protective Guard
Helps prevent accidental direct contact with heating element.

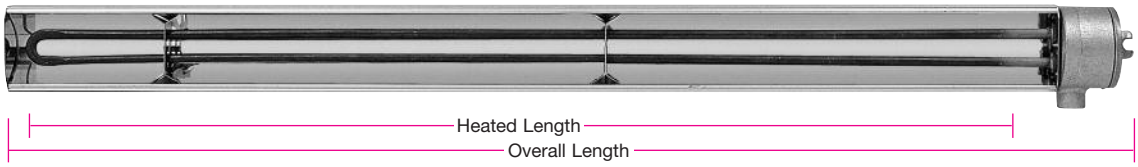
Note: Tubular elements are supplied at the same rated voltage as the overall assembly and are wired in parallel. 120 or 240V rated assemblies can be used at twice the rated voltage by wiring the elements in series (120/240V or 240/480V).



See Pages 7-84 & 85 for Wiring Options

See Page 7-84 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

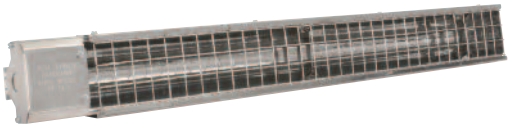
TRH5 Series — Single Hairpin Element Liquid Tight Single End Termination



Standard (Non-Stock) and Stock Sizes and Electrical Ratings

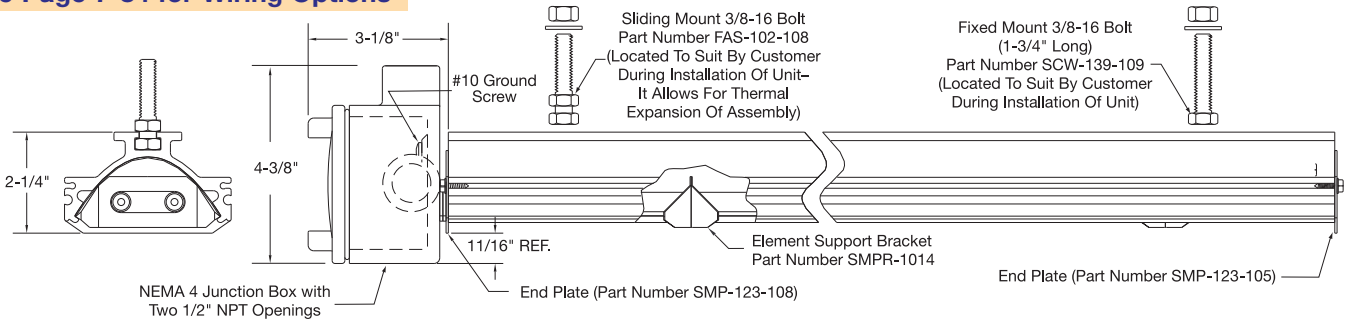
Stock Items Are Shown In RED

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number without Wire Guard	Part Number with Protective Wire Guard	Replacement Heating Element	Replacement Protective Wire Guard	Replacement Reflector Set
800	120 208 240 277	12	7	TRH50001 TRH50002 TRH50003 TRH50004	TRH50040 TRH50041 TRH50042 TRH50043	THE09177 THE09178 THE09179 THE09180	GRD-104-112	SMPR-1035
1200	120 208 240 277	18	13	**TRH50005** TRH50006 **TRH50007** TRH50008	**TRH50044** TRH50045 **TRH50046** TRH50047	**THE09181** THE09182 **THE09183** THE09184	GRD-104-113	SMPR-1036
1800	208 240 277 480	24	19	TRH50009 **TRH50010** TRH50011 TRH50012	TRH50048 **TRH50049** TRH50050 TRH50051	THE09185 **THE09186** THE09187 THE09188	GRD-104-114	SMPR-1037
2500	208 240 277 480	30	25	TRH50013 TRH50014 TRH50015 TRH50016	TRH50052 TRH50053 TRH50054 TRH50055	THE09189 THE09190 THE09191 THE09192	GRD-104-115	SMPR-1038
3000	208 240 277 480	36	31	TRH50017 **TRH50018** TRH50019 TRH50020	TRH50056 **TRH50057** TRH50058 TRH50038	THE09193 **THE09194** THE09195 THE09196	GRD-104-116	SMPR-1039
3600	208 240 240 480	48	43	TRH50021 **TRH50022** TRH50023 **TRH50024**	TRH50059 **TRH50060** TRH50061 **TRH50062**	THE09197 **THE09198** THE09199 **THE09200**	GRD-104-117	SMPR-1040
5000	208 240 277 480	60	55	TRH50025 **TRH50026** TRH50027 **TRH50028**	TRH50063 **TRH50064** TRH50065 **TRH50066**	THE09201 **THE09202** THE09203 **THE09204**	GRD-104-118	SMPR-1041
6000	208 240 277 480	72	67	TRH50033 **TRH50034** TRH50035 **TRH50036**	TRH50073 **TRH50074** TRH50075 **TRH50076**	THE10301 **THE10302** THE10303 **THE10304**	GRD-104-124	SMPR-1094



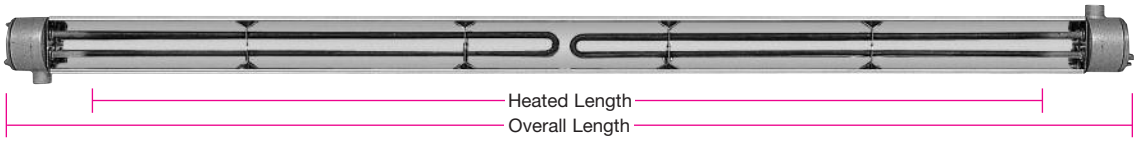
Heater with Protective Guard
Helps prevent accidental direct contact with heating element.

See Page 7-84 for Wiring Options



See Page 7-84 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

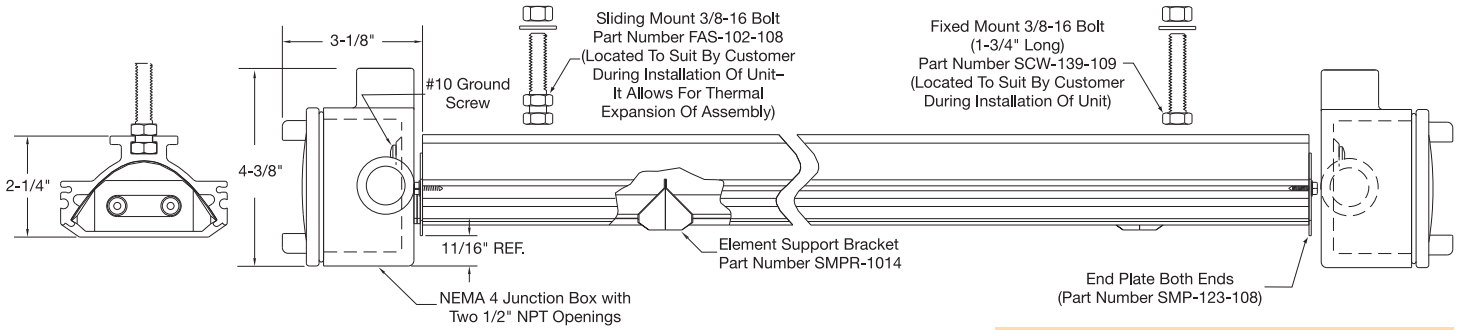
TRH6 Series — Dual Hairpin Element Liquid Tight Double End Termination



Standard (Non-Stock) Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number without Wire Guard	Part Number with Protective Wire Guard	Replacement Heating Element	Replacement Protective Wire Guard	Replacement Reflector Set
6000	208 240 277 480	72	64	TRH60001 TRH60002 TRH60003 TRH60004	TRH60020 TRH60021 TRH60022 TRH60023	THE09205 THE09206 THE09207 THE09208	GRD-104-119	SMPR-1047
7200	208 240 277 480	84	76	TRH60005 TRH60006 TRH60007 TRH60008	TRH60024 TRH60025 TRH60026 TRH60027	THE09209 THE09210 THE09211 THE09212	GRD-104-120	SMPR-1048
8000	208 240 277 480	96	88	TRH60009 TRH60010 TRH60011 TRH60012	TRH60028 TRH60029 TRH60030 TRH60031	THE09213 THE09214 THE09215 THE09216	GRD-104-121	SMPR-1049
9000	208 240 277 480	108	100	TRH60013 TRH60014 TRH60015 TRH60016	TRH60032 TRH60033 TRH60034 TRH60035	THE09217 THE09218 THE09219 THE09220	GRD-104-122	SMPR-1050

Note: Tubular elements are supplied at the same rated voltage as the overall assembly and are 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 7-84 for Wiring Options

See Page 7-84 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" diameter knockouts 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 7-23 and Section 15.

Notes: 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 7-23 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 7-86 and 7-87.

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.

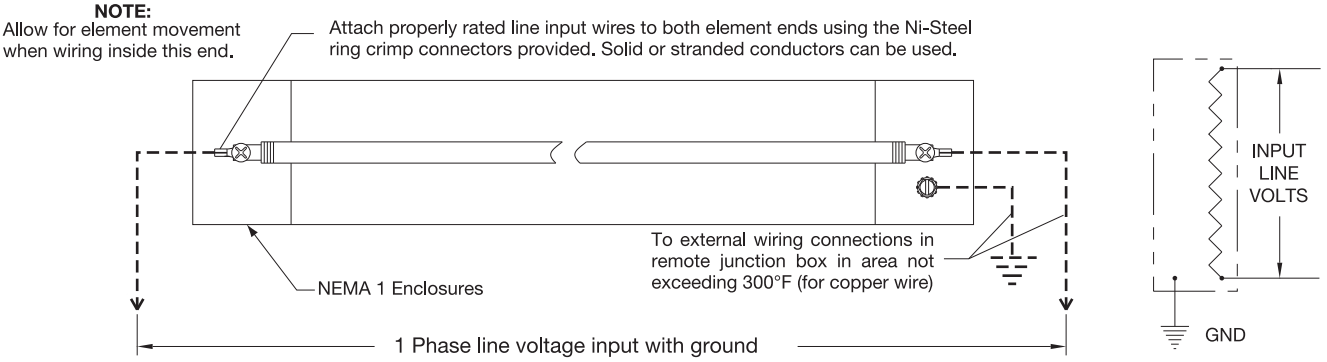
Voltage Rating should be equal to the operating voltage of the installation.

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

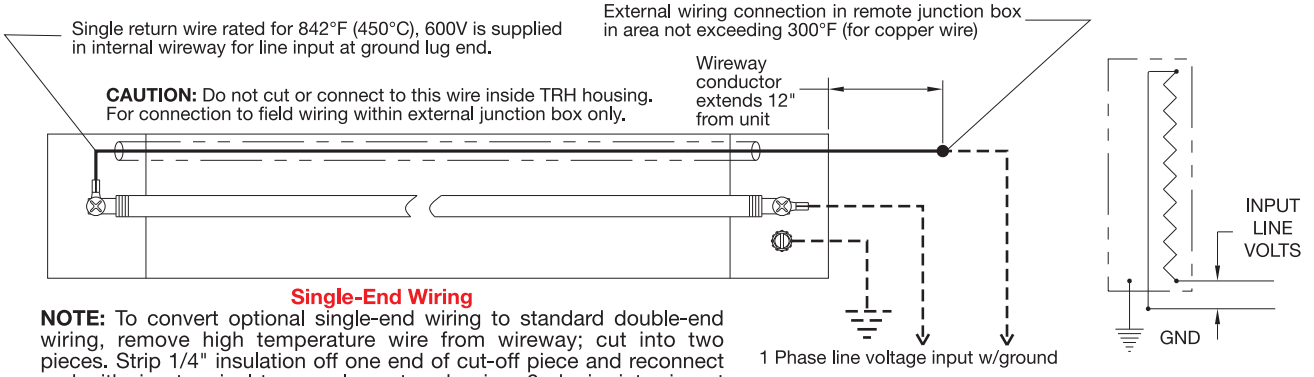
Do not use silver plated or unplated copper wire conductors.

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 7-76) Standard Double-End Wiring



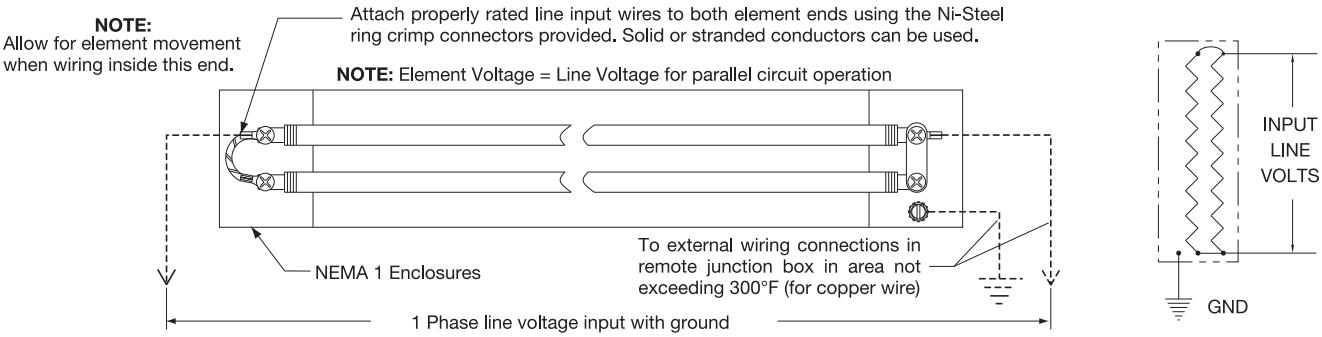
TRH1 (page 7-76) Optional Single End-Wiring



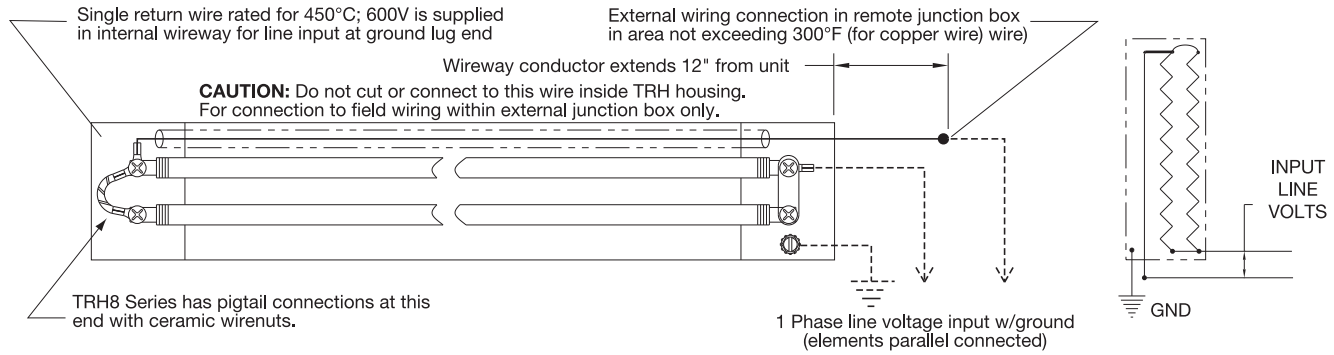
Single-End Wiring

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 at opposite element end.

TRH2 (page 7-77) Standard Double-End Wiring



TRH2 (page 7-77) Optional Single-End Wiring



TRH2 (page 7-77) Multiple Heat/Dual Voltage Wiring

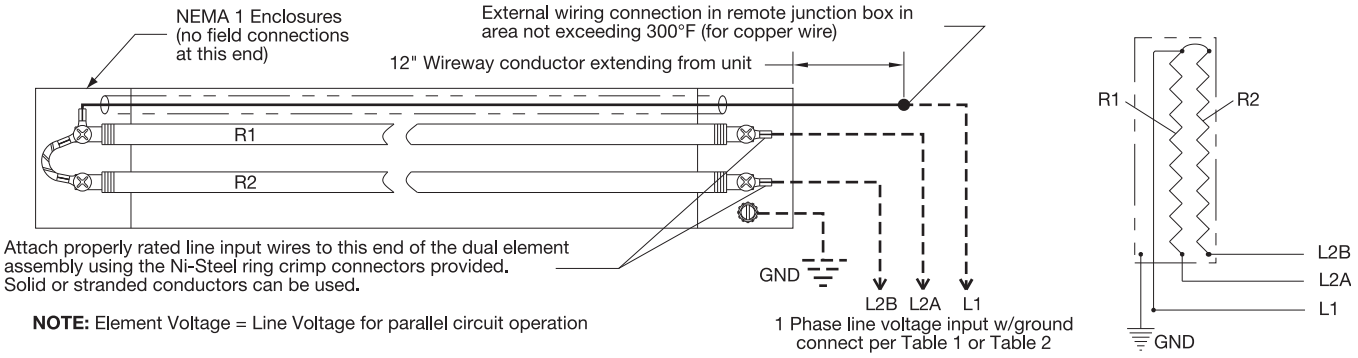


TABLE 1

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

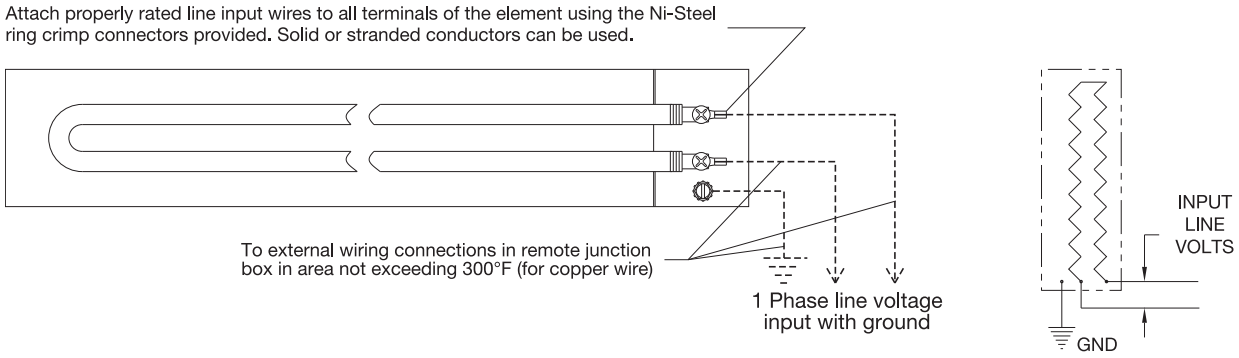
DANGER: Fire Hazard. Radiant Process Heaters with NEMA 1 electrical housings are not to be used in applications where flammable vapors, gases or liquids are present as defined in the National Electrical Code.

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.

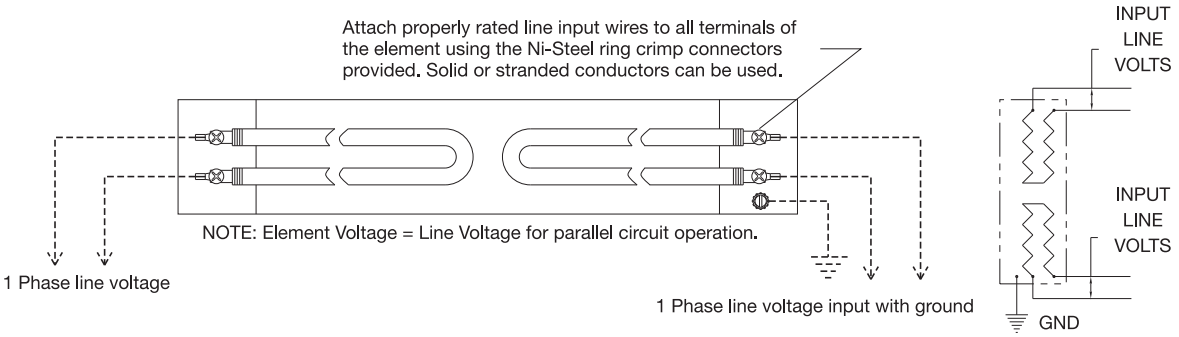
Universal 2000 TRH Wiring Options

TRH3 (page 7-78) and TRH5 (page 7-80) Standard Single-End Wiring



TRH4 (page 7-79) and TRH6 (page 7-81) Standard Double-End Wiring

NOTE: This is the only option available for TRH 6 series.



Wiring Options

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

Stainless steel armor cable — 18" armor cable over 24" leads
Galvanized armor cable — 18" armor cable over 24" leads
Stainless steel wire braid — 18" wire braid over 24" leads
Fiberglass leads (450°C rating) — 12" long plain leads
If longer leads and/or longer armor cable are required, specify when ordering.

Prewired with 24" SJO Cable
(includes ground wire)

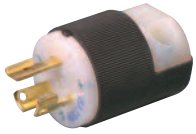
- 16 ga. cable (Up to 15 Amps)
- 14 ga. cable (Up to 22 Amps Max.)
- 12 ga. cable (Up to 28 Amps Max.)
- Max. terminal box temperature 194°F (90°C)
- If longer cable is required, specify when ordering.

Stock Heavy Duty Quick Disconnect Plugs and Connectors

Reference	NEMA P or R	Max. Amps	Volts	Plug Part Number	Connectors (Female) Part Number
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

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

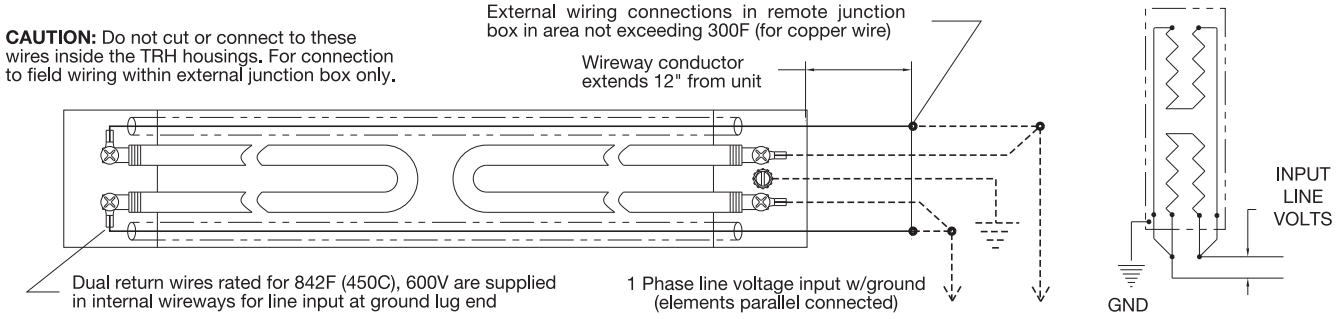

P3


P6


P7

All Items Available from Stock

TRH4 (page 7-79) Optional Single-End Wiring



TRH4 (page 7-79) Multiple Heat/Dual Voltage Wiring

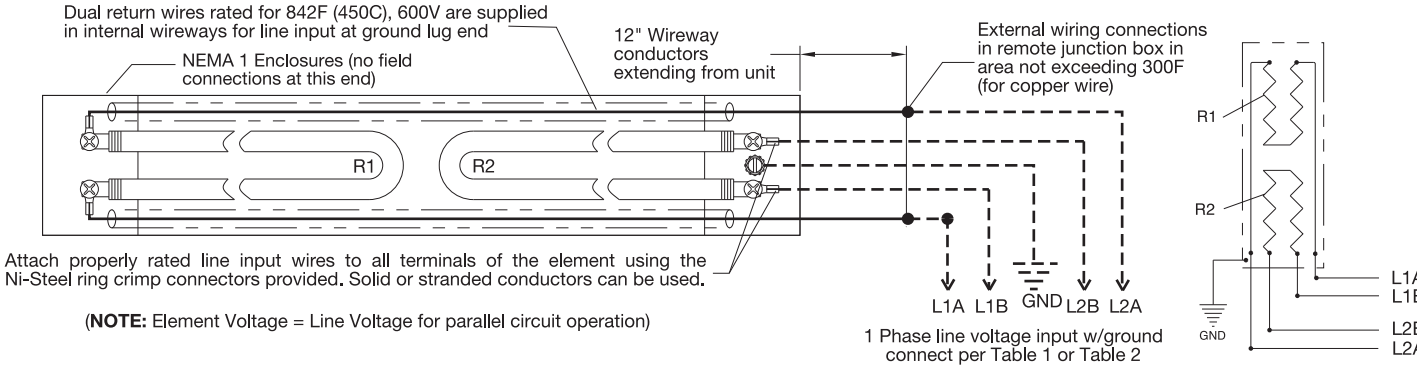


TABLE 1

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

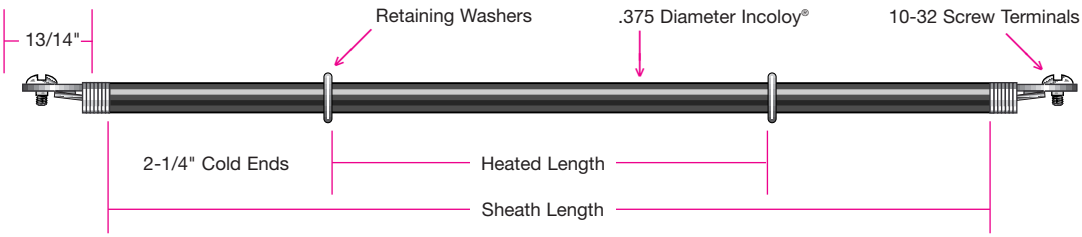
Dual Voltage Connections (for 240/480V or 120/240V rated units)

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

Type ART Tubular Radiant Heater Arrays

Tempco can design and manufacture a custom tubular heater array to your specifications. Call for details.

Standard Universal Heater Replacements



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

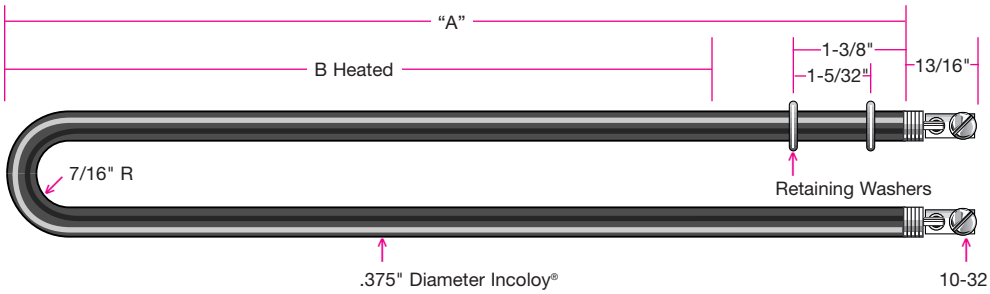
Watts	Volts	Overall Length in.	Heated Length in.	Cold Ends in.	Watlow® No.	Chromalox® Catalog No.	PCN	TEMPCO Part Number
400	120	10¼	7¼	1½	RDN10E1	RTU-2063AX35	147766	THE04300
650	120	16⅝	13⅜	1½	RDN16L1	RTU-2063AX29	147774	THE04301
800	120	21 1/16	16 13/16	2⅛	RDN21B1	RTU-2083A	106112	THE04302
800	208	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.

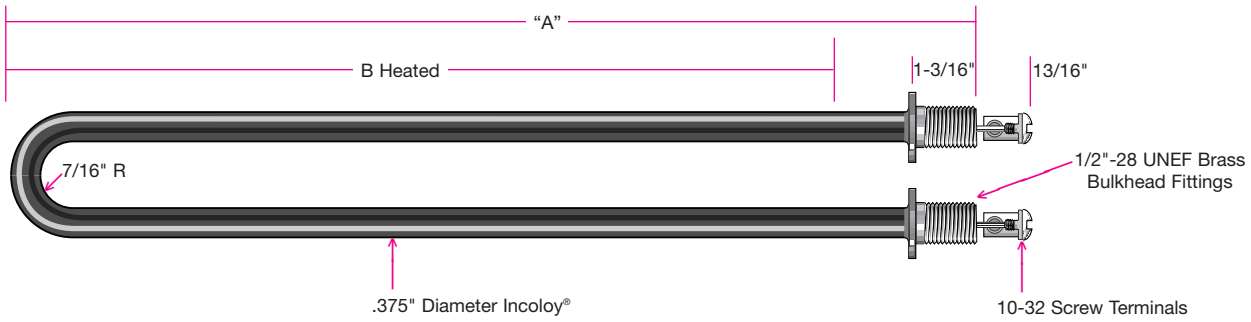
Standard lead time is 2 to 3 weeks.

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

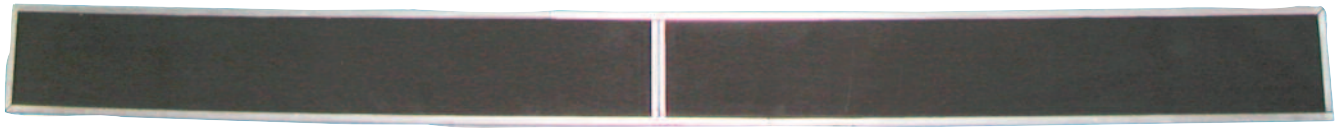
Watts	Volts	Overall "A" Dim. in.	Heated "B" Dim. in.	Watlow® No.	Chromalox® Catalog No.	Chromalox® PCN	TEMPCO Part Number
800	120	10 1/2	8 3/8	RDN21B1B	UTU-2LT	106673	THE04353
800	240	10 1/2	8 3/8	RDN21B10B	UTU-2LT	106681	THE04354
1100	120	13 9/16	11 3/8	RDN27C1B	UTU-3LT	106690	THE04355
1100	240	13 9/16	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 Medium Wave Panel Heaters

4 *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/in^2) with optional thermowell only or including a type J or K thermocouple.

Ordering information and product selection can be found on pages 7-89 through 7-95.

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 RPB Black Quartz Composite Face

High Emissivity Coating

(See page 7-90)

Style RPG Black Glass Face

Cleanable Glass Surface

(See page 7-91)

Style RPW High Temperature Ceramic Glass Face

Highest Watt Density

(See page 7-92)

Style RPM Metal Face

Cleanable Metal Surface

(See page 7-93)

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 standard housing is made of heavy gauge aluminized steel. Optional housing materials include 304 Stainless Steel.

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

Options available include: Standard quartz tube thermowell and clamp on the short side, standard Type K or J 1/8" diameter thermocouple probes and various back mounted thermowell/thermocouple combinations described on page 7-95.

DANGER: Fire Hazard

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.

Design Features

- ***Available in convenient standard building block sizes***
- ***Standard mounting screw studs (1/4-20 × 1"L) on the back side***
- ***Available in four emitter face styles***
- ***Can be ordered with standard side mounted thermowell, clamp bracket and/or Type J or K thermocouple***
- ***3 different back mounted thermowell/thermocouples are available***
- ***Does not require external reflectors, which require maintenance***
- ***Voltages available include 120, 240, 480 VAC, 1 or 3 phase, dual voltage and custom***
- ***Maximum watt densities from 25 to 40 watts /in²***
- ***Multiple zones and distributed wattage in the same panel heater***
- ***Uniform infrared heating coverage***
- ***Stainless Steel power screw terminals***

Note:
Not hermetically sealed.

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

If a thermowell is selected, specify the type from page 7-95

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 4 weeks.***

Please Specify the following:

- ❑ Construction Style (RPB, RPG, RPW or RPM)
- ❑ Length and Width
- ❑ Watts, Volts and Phase
- ❑ Thermowell Type only
- ❑ Thermowell and Type K or J Thermocouple

Style RPB Black Quartz Composite Face Infrared Panel Heaters

Design Features

- *Panel heater can be mounted in any direction*
- *High temperature black quartz composite face*
- *High temperature black coating*
- *Precision wound resistance wire*
- *Heavy gauge aluminized steel enclosure box standard Optional: 304 Stainless Steel*
- *Optional: quartz thermowell tube Standard: side mount with clamp Optional-3 back mounted styles*
- *Refractory blanket insulation*
- *Stainless Steel power screw terminals*
- *Mounting screw studs Standard: 1/4-20 × 1"L*
- *Electrical junction box, standard*

Construction Characteristics

Tempco Style RPB 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. A uniform pattern across the face is milled out in the high temperature ceramic fiberboard, and the resistance coil is cemented in place. Refractory blanket insulation backs up the fiberboard face assembly.

Tempco Style RPB Radiant Heaters can transmit up to 79.5% of the input energy and can be positioned as close as 2 to 4" from the material being heated.

Typical Applications

- *Thermoforming*
- *Paint Drying*
- *Ink Drying*
- *Curing of Plastic Coatings*
- *Silk Screen Painting*
- *Food Warming*
- *Laminating*

SPECIFICATIONS

Maximum Size: In addition to the standard sizes listed below; custom sizes up to 30"W × 84"L can be manufactured.

Thickness: Standard — 3", Optional — 1.5" to 5"

Maximum Watt Density: 25 Watts/in²

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

Maximum Face Temperature: 900°C (1652°F)

Wavelength Range: Between 2.5 and 6.0 microns (μm)

Distributed Wattage and Zoning: Yes, dependent on size

Infrared / Convection Radiant Panels

RPB Radiant Panels can also be supplied for combination radiant/convection applications. Holes are drilled in a uniform pattern in the face of the panel to allow air flow from the rear plenum. A 3" hole is typically provided in the rear panel for mounting a blower or ductwork. Submit your requirements to Tempco.

Standard (Non-Stock) Sizes and Ratings of Style RPB Black Face Infrared Heaters

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

Available Thermowell/Thermocouple types and descriptions can be found on page 7-95.

For the part numbers below, if a thermowell is specified, the standard Side Mount Thermowell with Clamp is supplied.

Width		Length		15W/in²				25W/in²			
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__
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__
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 RPG High Temperature Glass Face Infrared Panel Heaters

Design Features

- *Panel heater can be mounted in any direction*
- *High temperature transparent red/black glass emitter face*
- *Precision wound resistance wire*
- *Milled ceramic fiberboard to hold resistance wire, cemented in place*
- *Heavy gauge aluminized steel enclosure box standard*
  Optional: 304 Stainless Steel
- *Optional: quartz thermowell tube*
  Standard: side mount with clamp
  Optional-3 back mounted styles
- *Refractory blanket insulation*
- *Stainless Steel power screw terminals*
- *Mounting screw studs*
  Standard: 1/4-20 × 1"L
- *Electrical junction box, standard*

Construction Characteristics

The Tempco Style RPG Radiant Panel Heater has a red/black high temperature ceramic glass for the exterior radiant surface. The RPG Radiant Panel Heater is the ideal heater when a cleanable surface is required, such as for the bottom heaters of a thermoforming oven.

Behind the glass, a 1" thick ceramic fiberboard is milled out to support the helically wound iron/chromium/aluminum alloy based resistance element. The resistance coils are placed into the precision machined grooves in the fiberboard and cemented into place. Ceramic cloth is placed between the glass and the resistance coil.

Tempco Style RPG Radiant Heaters can transmit up to 78.5% of the input energy and can be positioned as close as 2 to 4" from the material being heated.

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

Maximum Size: In addition to the standard sizes listed below; custom sizes up to 34"W × 36"L can be manufactured.

Thickness: Standard — 3", Optional — 1.5" to 5"

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)

Maximum Face Temperature: 750°C (1382°F)

Wavelength Range: Between 2.5 and 6.0 microns (μm)

Distributed Wattage and Zoning: Yes, dependent on size

Standard (Non-Stock) Sizes and Ratings of Style RPG High Temperature Glass Infrared Heaters

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

Available Thermowell/Thermocouple types and descriptions can be found on page 7-95.

For the part numbers below, if a thermowell is specified, the standard Side Mount Thermowell with Clamp is supplied.

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	1440	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 RPW Very High Temperature Ceramic Glass Face Infrared Panel Heaters

Design Features

- *Panel heater can be mounted in any direction*
- *High temperature white translucent glass emitter surface*
- *Precision wound resistance wire*
- *Milled ceramic fiberboard to hold resistance wire, cemented in place*
- *Heavy gauge aluminized steel enclosure box standard*
  Optional: 304 Stainless Steel
- *Optional: quartz thermowell tube*
  Standard: side mount with clamp
  Optional-3 back mounted styles
- *Refractory blanket insulation*
- *Stainless Steel power screw terminals*
- *Mounting screw studs*
  Standard: 1/4-20 × 1"L
- *Electrical junction box, standard*

Construction Characteristics

Tempco Style RPW Radiant Panel Heaters use a very high temperature ceramic glass for the emitter surface. The RPW Radiant Panel Heater is the perfect heater when a cleanable surface is required at a higher watt density

Behind the very high temperature glass, a 1" thick ceramic fiber refractory board is milled out in a uniform pattern to accept the helically wound iron/chromium/aluminum alloy resistance element. The resistance coils are set into the precision machined grooved board and cemented into place. A ceramic cloth is placed between the very high temperature glass and the resistance coils.

Tempco Style RPW Radiant Heaters can transmit up to 78.5% of the power input as infrared energy.

Typical Applications

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

SPECIFICATIONS

Maximum Size: In addition to the standard sizes listed below; custom sizes up to 24"W × 24"L can be manufactured.

Thickness: Standard — 3", Optional — 1.5" to 5"

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)

Maximum Face Temperature: 800°C (1472°F)

Wavelength Range: Between 2.5 and 6.0 microns (μm)

Distributed Wattage and Zoning: Yes, dependent on size

Standard (Non-Stock) Sizes and Ratings of Style RPW Very High Temperature Glass Infrared Heaters

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

Available Thermowell/Thermocouple types and descriptions can be found on page 7-95.

For the part numbers below, if a thermowell is specified, the standard Side Mount Thermowell with Clamp is supplied.

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__

Style RPM Metal Face Infrared Panel Heaters

Design Features

- *Panel heater can be mounted in any direction*
- *Metal emitter face Stainless steel with black finish*
- *Precision wound resistance wire*
- *Milled ceramic fiberboard to hold resistance wire, cemented in place*
- *Heavy gauge aluminized steel enclosure box standard Optional: 304 Stainless Steel*
- *Optional: quartz thermowell tube Standard: side mount with clamp Optional-3 back mounted styles*
- *Refractory blanket insulation*
- *Stainless Steel power screw terminals*
- *Mounting screw studs Standard: 1/4-20 × 1"L*
- *Electrical junction box, standard*

Construction Characteristics

Tempco Style RPM Radiant Panel Heaters have a stainless steel metal with a black finish for the emitter surface. The RPM Radiant Panel Heater is a good heater when a cleanable surface and a robust design is required.

The ceramic fiber refractory board is milled out in a uniform pattern to accept the helically wound iron/chromium/aluminum alloy resistance element. The resistance coils are set into the precision machined grooved board and cemented into place. A ceramic cloth is placed between the metal face and the resistance coils.

Tempco Style RPM Radiant Heaters can transmit up to 65.0% of the power input as infrared energy. They can be positioned as close as 2 to 4" from the material being heated.

Typical Applications

- *Thermoforming*
- *Paint Drying*
- *Ink Drying*
- *Curing of Plastic Coatings*
- *Silk Screen Painting*
- *Food Warming*
- *Heat Setting*
- *Film Shrinking*
- *Blister Packaging*

SPECIFICATIONS

Maximum Size: In addition to the standard sizes listed below, custom sizes up to 24"W × 48"L can be manufactured.

Thickness: Standard — 3", Optional — 1.5" to 5"

Maximum Watt Density: 15 Watts/in²

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

Maximum Face Temperature: 700°C (1292°F)

Wavelength Range: Between 3.0 and 6.0 microns (μm)

Distributed Wattage and Zoning: Yes, dependent on size

Standard (Non-Stock) Sizes and Ratings of Style RPM Metal Face (SS) Infrared Heaters

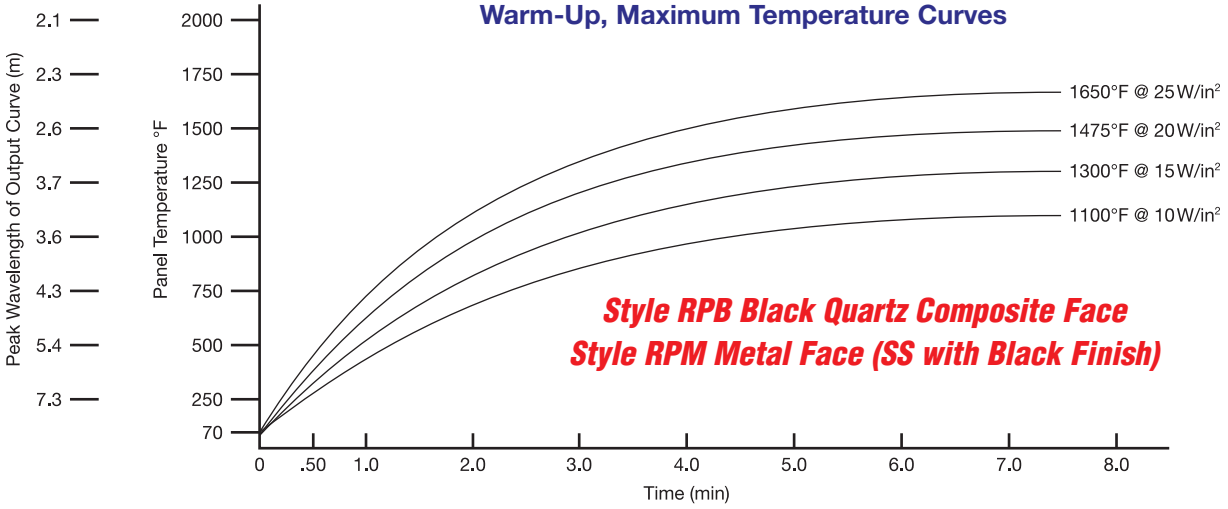
To complete the part numbers below, include the designated number that applies to the following options:
0 = Plain, no thermowell or T/C **1** = Thermowell only **2** = Thermowell and type K T/C **3** = Thermowell and type J T/C
Available Thermowell/Thermocouple types and descriptions can be found on page 7-95.
For the part numbers below, if a thermowell is specified, the standard Side Mount Thermowell with Clamp is supplied.

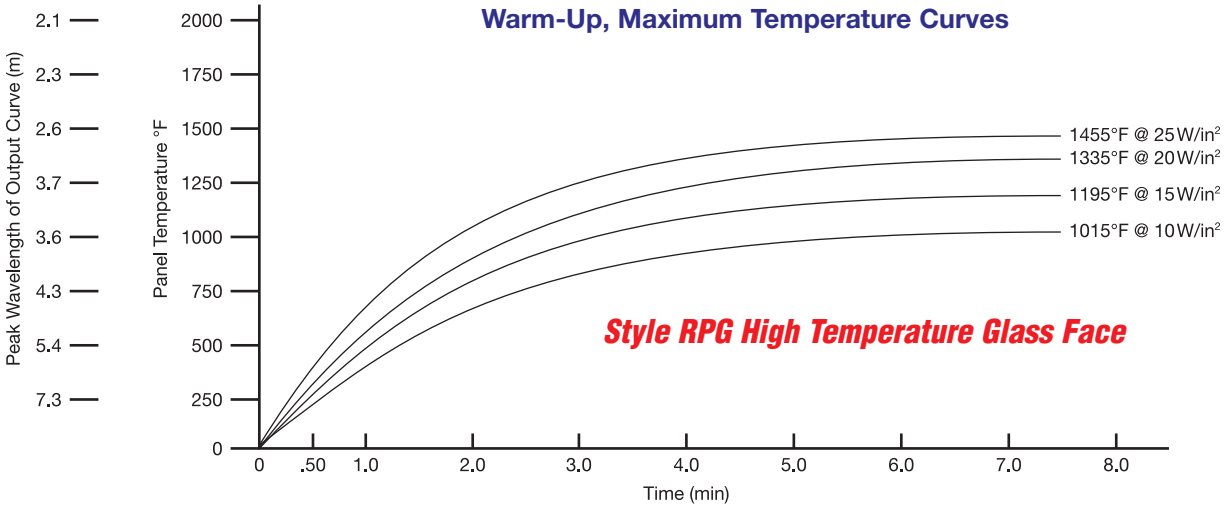
Width		Length		10W/in²				15W/in²			
in	mm	in	mm	Watts	Volts	Ph.	Part Number	Watts	Volts	Ph.	Part Number
6	152	12	305	720	120	1	RPM0101__	1080	120/240	1	RPM0201__
6	152	18	457	1080	120/240	1	RPM0102__	1620	240	1	RPM0202__
6	152	24	610	1440	120/240	1	RPM0103__	2160	240/480	1	RPM0203__
12	305	12	305	1440	120/240	1	RPM0104__	2160	240/480	1	RPM0204__
12	305	18	457	2160	240/480	1	RPM0105__	3240	240/480	1	RPM0205__
12	305	24	610	2880	240/480	1	RPM0106__	4320	240/480	1	RPM0206__
16	406	24	610	3840	240/480	1	RPM0107__	5760	240/480	1	RPM0207__
24	610	24	610	5760	240	1	RPM0108__	8640	480	1	RPM0208__

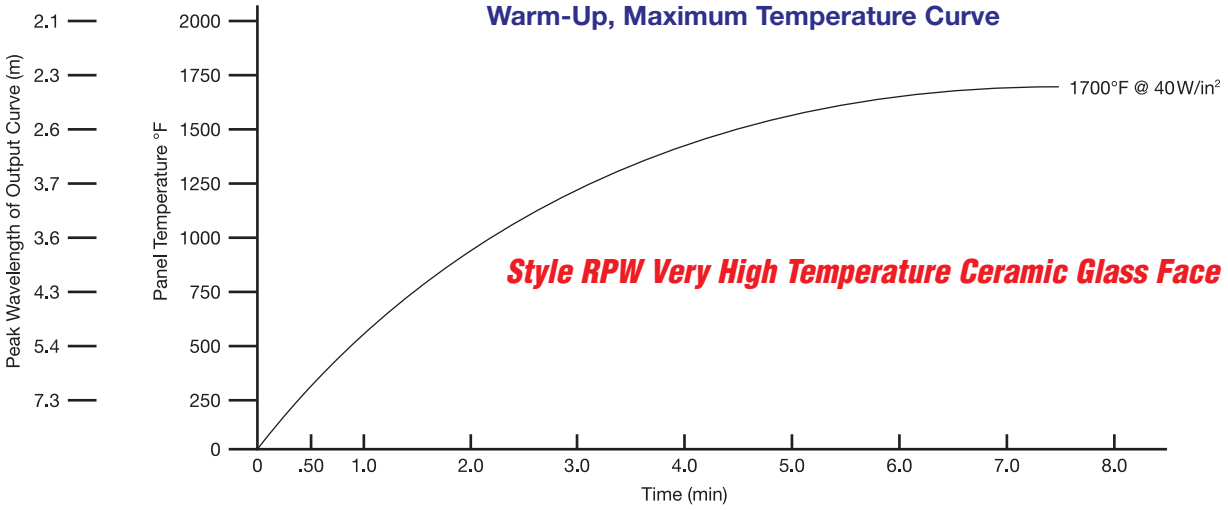
Infrared Medium Wave Panel Heater Warm-Up Curves

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.







Infrared Panel Heater Options

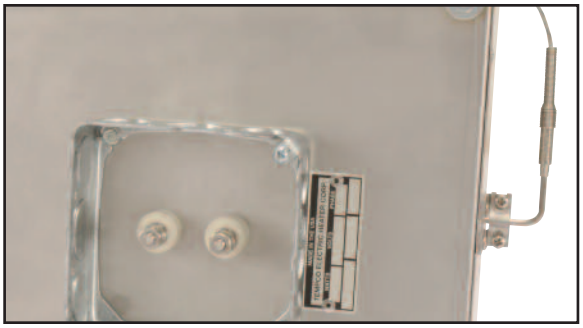
Construction Options

The standard enclosure case is aluminized steel. Aluminized steel is the optimum choice for most applications. It will reach 650°C/1200°F without discoloring or degrading.

304 Stainless Steel is available when cleanliness is of the utmost importance. (Note: 304 SS will discolor at a lower temperature than aluminized steel).

Rivets are normally used to hold the case together. In addition to the side slots, this allows for expansion/contracting of the case and minimizes potential warping. There are applications that require minimal potential particulate matter. For these applications the side slots are not put in and the metal seams can be welded closed.

Thermowell/Thermocouple Temperature Sensing Options

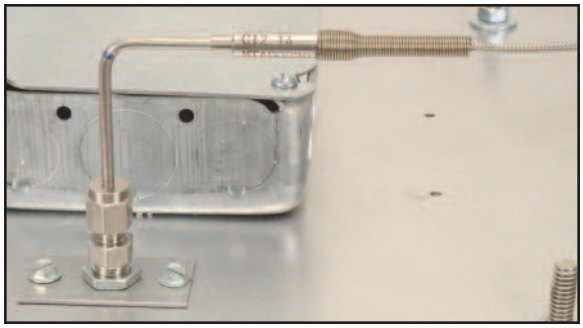


Standard Side Mount Thermowell with Clamp

The standard Side Mount Thermowell with Clamp is a 5" long, 4 mm ID quartz glass tube, installed in the short side of the panel, just behind the resistance coil. The screw pressure clamp and thermowell are designed to hold a 0.125" diameter probe.

Replacement TC Probes (with 48" leads, SS overbraid)

Type K — Part Number MTA00839
Type J — Part Number MTA00840

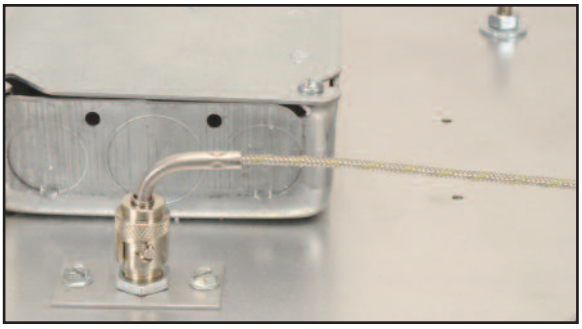


Back Mount Thermowell with Compression Fitting

The optional Back Mount Thermowell with Adjustable Compression Fitting is a short, 4 mm ID quartz glass tube, mounted perpendicular to the face with a ceramic disk at the bottom. The compression fitting and glass tube are sized for a 0.125" diameter probe.

Replacement TC Probes (with 48" leads, SS overbraid)

Type K — Part Number MTA00839
Type J — Part Number MTA00840

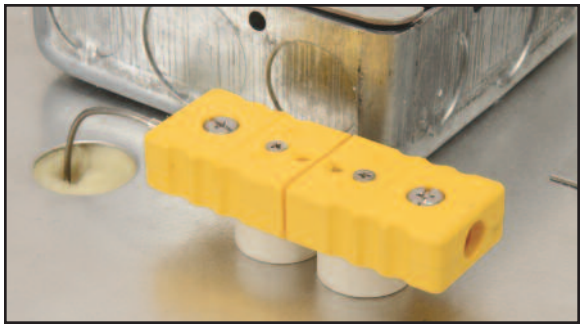


Back Mount Thermowell with Bayonet Fitting

The optional Back Mount Thermowell with Bayonet Fitting is a short, 8 mm ID quartz glass tube, mounted perpendicular to the face with a ceramic disk at the bottom. The bayonet fitting and glass tube are sized for a 0.187" diameter probe.

Replacement TC Probes (with 48" leads, SS overbraid)

Type K — Part Number TCP50270
Type J — Part Number TCP50269



Back Mount Thermowell – Parallel to Face

The optional Back Mount Thermowell (Parallel to Face) is a 5", 6 mm ID quartz glass tube with a soft 90° bend, mounted along the face, exiting in the rear. A maximum 0.063" diameter probe is required to make the bend. Screws and ceramic spacers are provided.

Replacement TC Probes (with connector set)

Type K — Part Number MTA01546
Type J — Part Number MTA01775

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

Operating life

CAUTION 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

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

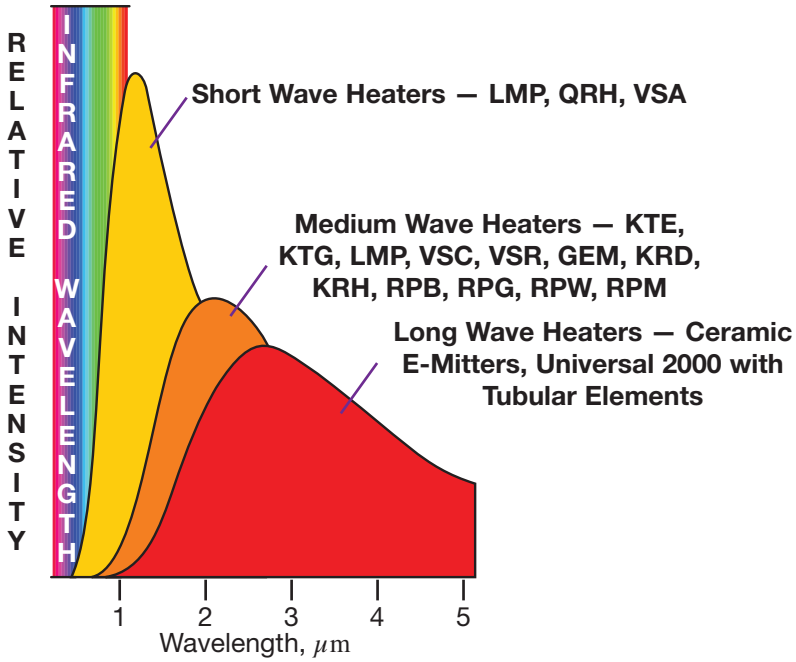
Many applications in the field are unique and present substantially different operational parameters and characteristics. This application diversity should be evaluated accordingly, and while the material presented in this section is intended to provide some background reference, it is very generalized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

Note: 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:

$$\lambda = c \div f$$

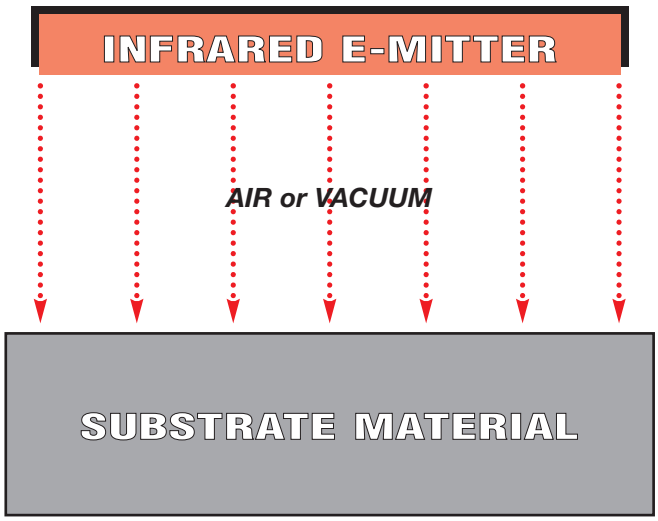
"c" is the speed of light (3×10^{-8} m/s)

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).



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 E-mitter 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.

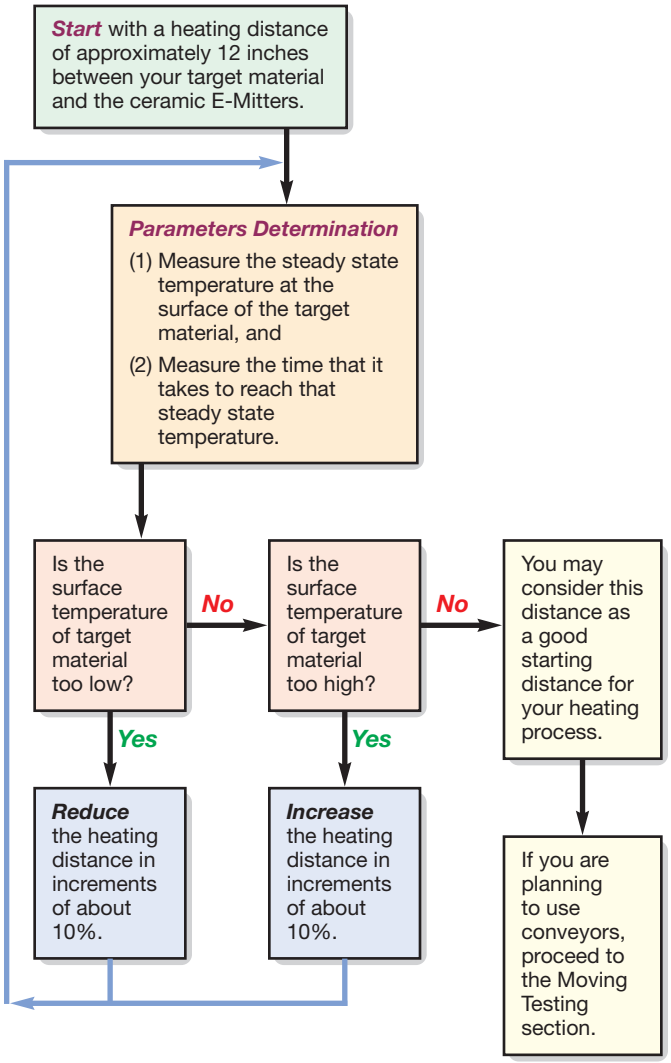
Heating Distance for Stationary and Moving Systems

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 7-98 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, 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.

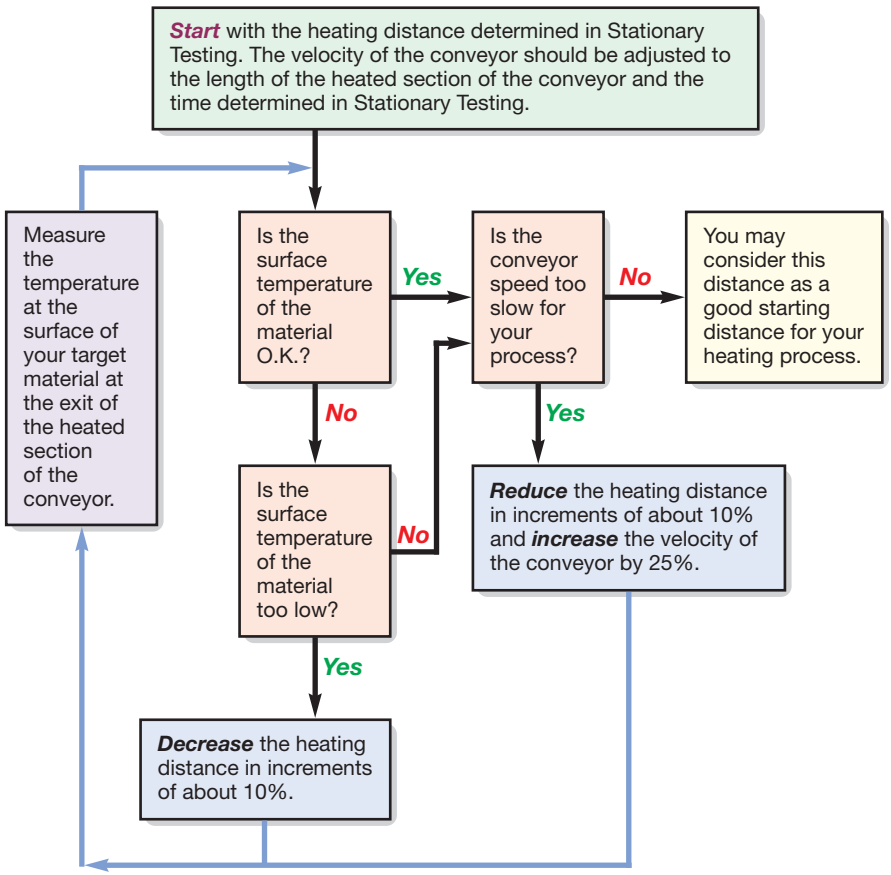
As for ***curing and cooking***, because of the many different applications encountered within various industries, no specific rules can be offered in this general guideline. Testing of the application is recommended to determine the process requirements. Contact Tempco's sales engineers if assistance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

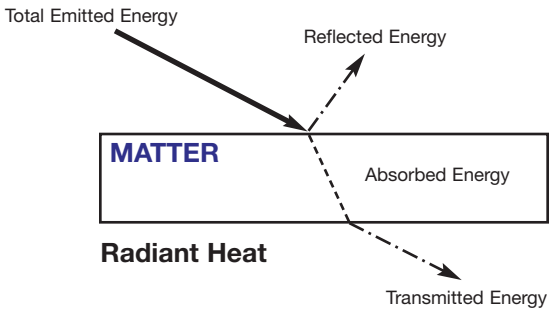
Multilayer materials present some difficulties when they are to be heated with infrared heaters. The top layer dries faster than the lower layers, causing different rates of shrinkage throughout the material. Infrared heat energy is transmitted with the speed of light from the surface of an emitter source (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.

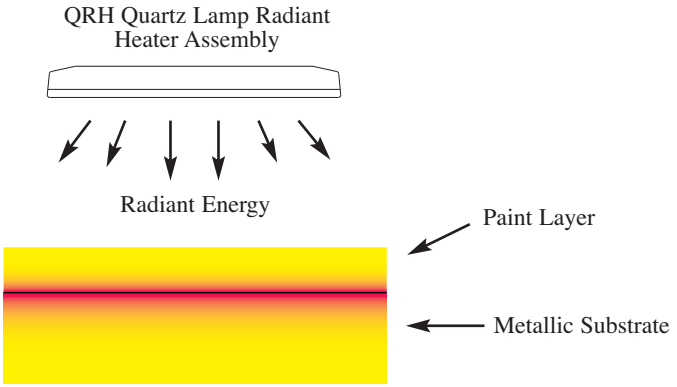
Higher heating rates can be achieved in moving systems that result in higher production output. This higher output can be easily accomplished without complications on properly designed, installed and maintained infrared heating systems.

Material Thickness

The thickness of any given material is very important for most infrared heating applications. This is because many materials 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. 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, heating from the inside out. Blistering is avoided or reduced to a minimum by employing this technique.

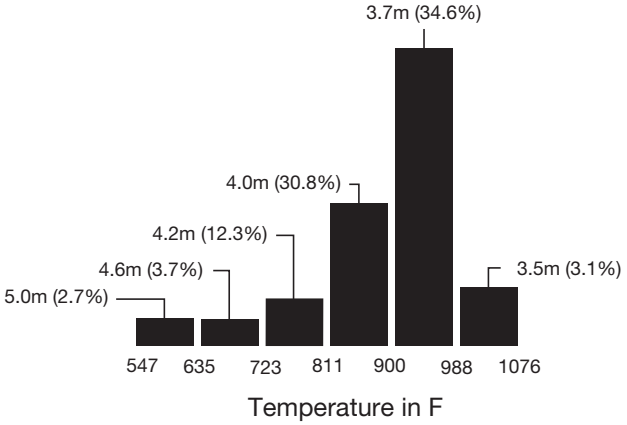




Ceramic Infrared E-Mitter Technical Data

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.



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 = $(4.0 + 3.4) \div 2 = 3.7\mu m$

Using Wien's law, we have:

$3.7\mu m = 5215.6 \div (°F + 460)$ or $°F = (5215.6 \div 3.7) - 460 = 949.6°F$

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 with 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

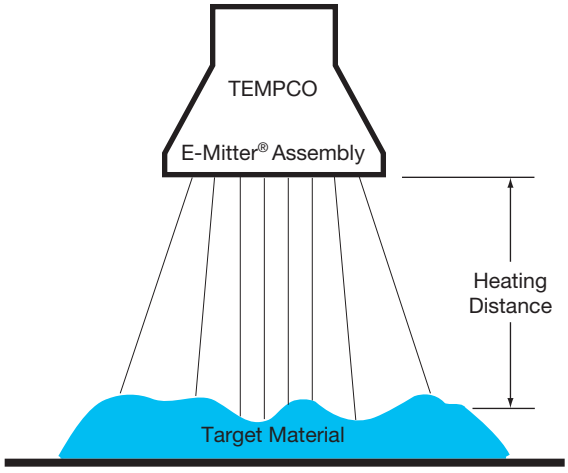
Moving heating systems generally achieve higher output per hour than is possible with static systems. The radiant heater's setpoint temperature is set higher in conveyor systems than static systems due to the limited time the product is under the heaters. Tests should be carried out to determine the 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)

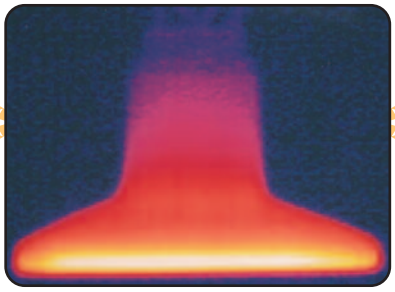
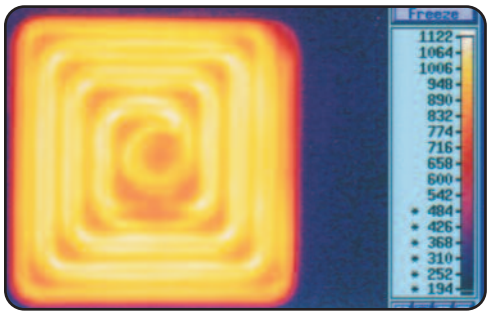


Image of Part Number CRD00002

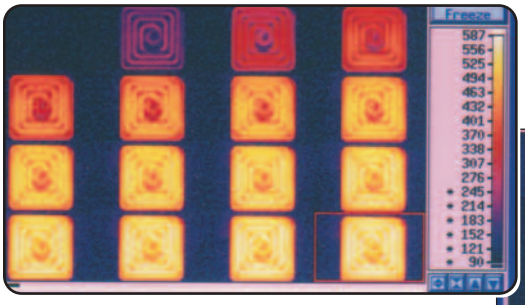
Side View The lighter color (yellow) represents the hottest area(s), while the black (background) represents the ambient temperature. The air gap and the ceramic fiber insulation produce a dramatic temperature gradient between the heating elements (yellow region), and the supporting clamps (purple region).

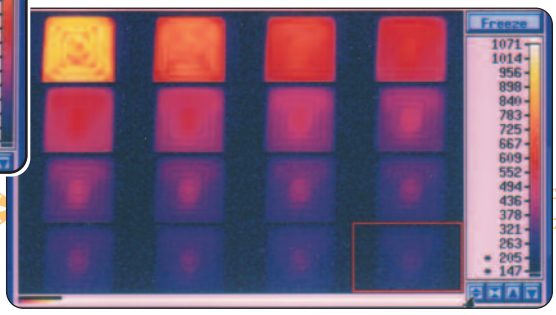


Bottom View The temperature distribution in this face is particularly homogeneous, assuring a uniform radiant heat to a given application. The convective heat losses are more noticeable at the edges of the heater. Except in vacuum conditions, convective losses must always be considered in a heating application.

Infrared Images

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





Note: The temperature scale (°F) corresponding to each color is on the right side of the images.