Design and Construction

Rama®Band and Rama®Strip heaters are computer-designed and verified to Rama standards and customer specifications. Highest quality materials are used in manufacturing to assure long useful service life.

RAMA® BAND HEATERS

Mica Insulation
- Uniform thickness with excellent electrical insulation
- Mica sheets with excellent resistance to moisture

Resistance Wire
- Precision wound by solid state turn counting winder for high repeatability and accuracy
- Nickel/chromium
- Uniform heat distribution

High Emissivity Sheath
- Aluminized steel
- Temperature range to 900°F
- Rust resistant
- Approximately .130” thick

Clamping Band
- Rugged stainless steel construction
- Design holds heater tightly against cylinder wall to maximize heat transfer
- Standard gap is 1/4”

Leadwires
- UL recognized rating
- Continuous 450°C service
- Standard leadwires are 12”

RAMA®STRIP HEATERS

- Resistance ribbon/wire
- Approximately .188” thick
- Stainless steel or aluminized sheath

Standard Post Terminal

Standard Clamping Band
Guide to Design Selection

**Rama®Band**

1. Select heaters with diameters closely matching your cylinder or barrel, allow a gap between ends to prevent touching when they are clamped. Standard gap is 1/4”.
2. Calculate the surface area of your cylinder to be heated.
3. Using the curves shown, determine the recommended watt density for your operating temperatures. For heaters 2-1/2” or wider decrease watt density by 15%. Decrease watt density by 30% when using “on/off” thermostats instead of solid controllers.
4. Multiply surface area by watt density to determine required wattage for your heater.
5. Select correct combination of heaters from standard designs.

### Watt Density Formula for Band Heaters

- Watt Density for heater with leads = \( \frac{\text{Wattage}}{(\text{Heater ID} \times 3.14) - 0.75 \times \text{width}} \)
- Watt Density for heater with posts = \( \frac{\text{Wattage}}{(\text{Heater ID} \times 3.14) - 1.75 \times \text{width}} \)

![Graph showing watt density for different cylinder sizes and temperatures.](image)

**Rama®Strip**

Using the calculations in the Engineering Section, calculate the power requirements for your strip heater.

### Watt Density Formula for Strip Heaters

- Watt Density for heater with leads = \( \frac{\text{Wattage}}{\text{(Length-Cold)} \times \text{Width}} \)
- Watt Density for heater with posts = \( \frac{\text{Wattage}}{(\text{Heater length-Cold}) \times \text{Width}} \)
Clamping Rama®Band Heaters

Rama uses extra strength full band clamps, the standard, low-profile design utilizes a 22 gauge stainless steel with continuous strap and spot welded turnover. These provide full strength clamping with minimum heat distortion. In addition, Rama also provides a 90° facing clamp, which is an integral part of the heater sheath, and the pin and-screw clamp, which is spot welded to the heater sheath and does not require a clamping band. These latter two designs are available upon request. All standard designs are supplied with the standard full clamp band.

Clamping/Derating Rama®Strip Heaters

Strip heaters should be firmly clamped to the surface to be heated to prevent expansion or bowing away from the heated surface. Clamping bars 1/4” thick are recommended spaced 3” to 4” apart. When spacing heaters as close as 3/4”, or in close proximity to bright reflective surfaces, reduce wattage by 10%.

Installation and Operation

To maximize performance of the Rama®Band and Rama®Strip heater, follow these instructions:

- Do not bend 1 piece heaters
- To provide close contact with heating surface, tighten clamping bands while taping around the outside of band heaters. After heat-up, occasionally re-tighten the clamping band.
- Match the wattage of band and strip heaters as closely as possible to avoid excessive on/off cycling.
- To tighten post terminals, bottom nut should be held in place while tightening top nut (to avoid putting stress on terminal).
- Avoid spilling oils, grease, water or molten plastic on leadwires, post terminals or ends of heaters.
- Do not pull on leadwires with a force exceeding 15 lbs.
- Make sure strip heaters fit in close contact with surface to be heated, using clamping bars as required. After heat-up be sure heater has not expanded or bowed away from surface, re-tighten as required.
- Select the band heater whose diameter most closely approximates the diameter of your part.
## Configurations

### Standard Designs

<table>
<thead>
<tr>
<th>TYPE</th>
<th>COVERING</th>
<th>Rama®Band</th>
<th>Rama®Strip</th>
<th>MOD</th>
<th>LEADWIRES OR POST TERMINALS</th>
<th>RAMA®BAND</th>
<th>RAMA®STRIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Metal Braid</td>
<td>Same side, each end 3/4” min width</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>3” Fiberglass Sleeving</td>
<td>Single point of exit perpendicular to heater surface 1” min width</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Metal Braid</td>
<td>1” min width</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>3” Fiberglass Sleeving</td>
<td>Each end of heater on opposite sides 3/4” min width</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Flexible Metal Conduit</td>
<td>Leadwires exit each end of heater, perpendicular to heater surface 1-1/2” min width and 1-1/2” min dia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>3” Fiberglass Sleeving</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Metal Braid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>3” Fiberglass Sleeving</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>Metal Braid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>Each end 1” min width and 1-1/2” min diameter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>Same end, adjacent; 2” min width</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>Same end, tandem, 1” min width and 2” min diameter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Design Specifications

- Standard leadwire length for all band and strip heaters is 12”
- Max ID for 1-piece Rama®Band is normally 14-1/2”; anything over 14-1/2” would be a 2-piece design. Consult factory for longer ID requirements.
- Min ID for 2-piece Rama®Band construction is 3”.
- Standard terminal box dimensions: 1-1/2” wide, 1-1/2” depth at centerline, length may vary based on configuration. Dimensions for heaters with terminal box: Min heater Dia is 3”, min width is 1-1/2” Min Dia for 2-piece construction is 6”.
- **Note:** The Min Dia may be grater depending on type of terminal used on heater.
- For welded barrel nut clamps the top metal outer sheath must be stainless steel.
- Select heaters with diameters closely matching your cylinder or barrel; allow a .25” gap between ends to prevent touching when they are clamped.
- Strip heaters under 2” wide have a full fold over.

### Ordering Information

**Rama®Band**
- Inside diameter and width
- Wattage, voltage, and phase
- Operating temperature of cylinder or extrusion barrel
- Leadwire or post terminal design
- Leadwire length
- Type of clamping band

**Rama®Strip**
- Length and width
- Wattage, voltage and phase
- Operating temperature of plate, plaster or die block
- Leadwire or post terminal design
- Leadwire length
- Specify with or without mounting holes. Standard slots: 3/16” x 3/8”

If you require special holes, cutouts, etc. for thermostats, thermocouples or unusual shapes, please submit drawings for design configuration. Consult factory for strip heaters over 45” long or 12” wide.
RAMA®BAND HEATER DESIGNS

TYPE A: 3” nominal metal braid sleeved leadwires, exit same side of each end of heater.

TYPE B: 3” nominal fiberglass sleeved leadwires exit same side of heater.

TYPE C: Metal braid covered leadwire exit from one point on sheath surface.

TYPE D: 3” nominal fiberglass sleeved leadwires exit from one point on sheath surface.

TYPE E: Flexible metal conduit covers leadwires, exit from one point on sheath surface.

TYPE F: 3” nominal fiberglass sleeved leadwires exit from opposite sides each end of heater.

TYPE G: Metal braid leadwires exit from opposite sides at each end of heater.

TYPE H: 3” nominal fiberglass sleeved leadwires exit from sheath surface at each end of heater.
**TYPE J**

Metal braid covered leadwires exit from sheath surface at each end of heater.

**TYPE K**

Post terminals at each end of heater.

**TYPE L**

Post terminal located adjacent at one end of heater.

**TYPE M**

Post terminals located tandem at one end of heater.

**MOD N**

Two piece heater with post terminals or leadwires at each end of heater half. Each type N band will be rated at 1/2 total wattage. When wired in series, each half will be rated 1/2 total voltage. When wired in parallel, each half will be rated at total voltage.

**MOD Q**

One piece bendable heater with post terminals or leadwires at open end of heater.

**MOD T**

90° Facing Clamp.
TYPE A
Metal braid covers leadwires exit same end of heater

TYPE B
3” nominal standard silicone rubber fiberglass sleeved leadwires exit same end of heater

TYPE C
Metal braid covered leadwires exit from one point on sheath surface

TYPE D
3” nominal standard silicone rubber fiberglass sleeved leadwires

TYPE E
Flexible metal conduit covered leadwires exit from one point on sheath

TYPE F
3” nominal standard silicone rubber fiberglass sleeved leadwires exit from opposite sides of each end of heater

TYPE G
Metal braid covered leadwires exit from opposite sides of each end of heater

TYPE H
3” nominal standard silicone rubber fiberglass sleeved leadwires exit from sheath surface at each end of heater

TYPE J
Utilizes metal braid covered leadwires

TYPE K
Post terminals at each end of heater

TYPE L
Post terminals located adjacent at one end of heater

TYPE M
Tandem post terminals located at one end of heater