



## *Mica and Mineral Insulated Band Heaters*



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Mica & Mineral Insulated Band Heaters from National Plastic Heater are available in various sizes, voltages, wattage's, and constructions to suit every application. The Mica Insulated Band Heater is used for temperatures to 900°F. The Mineral Insulated Band Heaters is used for temperatures to 1400°F. The Mica and Mineral Band Heater can be internally or externally heated, full or split case for easy removal or installed and supplied with various types of leads as shown below.

***Mica & Mineral Insulated Band Heater Features:***

Sheath temperatures to 1400°F (760°C) mineral insulated

- Split case design for easy removal and installation
- Nichrome ribbon resistance wire precision wound
- Mica/mineral insulation thin construction for quick heat transfer
- Contamination resistant closed ended heater construction
- Superior heat transfer due to minimum spacing between wire and sheath
- Single set of leads possible on split case heaters

***Mica & Mineral Band Heater Specifications Design Capabilities:***

Dimensions. . . . . Minimum Inner Diameter 0.750"

Maximum Diameter Consult NPH

Maximum width 2 X diameter Consult NPH

Voltage. . . . . 12 volts to 600 Volts AC/DC 1 or 3 Phase

Watt Densities. . . . . Maximum to 100 watts/in Mineral Insulated

Maximum Current. . . . . 30 Amps Post Terminals 8.5 Amps per Pair

Options. . . . . Holes along the heater at required location

Cutouts or slots of various dimensions

Partial Coverage for sectional heating

Larger Gaps at clamping end for sensors etc.

Ground Wire or Lug for safety

2 Piece Split Case or Hinged construction

European Plug / Terminal Box

Internal Thermocouple. . . . Available J, K

Thermocouple Location. . . . Sheath

To Order a Mica & Mineral Band Heater Please Provide:

Watts, Volts, Inner Diameter, Width, Lead Length, Type of leads, Options.



## *Mica Band Heaters - Clamping Styles*

- **Independent strap**
- **Built-in barrel nut**
- **Spot welded straps**
- **Flange lock-up**
- **Wedge lock**
- **Latch and trunion**
- **Hinges**
- **Spring-loaded barrel nuts**
- **Clamping pads**

The longevity of a band heater is directly related to the heat transfer rate from the heater to the cylinder it is intended to heat. One factor affecting the quality of heat transfer is the clamping mechanism of the band heater. Mica Band Heaters come with different styles of clamping mechanisms. Each style has unique characteristics and advantages. Selection is based on the specific requirements of the application.



### *Independent strap*

These straps evenly distribute the drawing force around the band heater by clamping the heater tightly around the surface of the cylinder. This distributed force is transferred to the internal windings, improving heat transfer through effective surface contact and elimination of air gaps.



### *Built-in barrel nuts*

This clamping mechanism combines the drawing quality of an independent strap with ease of installation. The top sheet is transformed into a strap by incorporating barrel nut fasteners at both sides of the gap. Recommended when holes and cut-outs prevent the usage of an independent strap.



### *Spot-welded straps*

This construction is similar to the built-in barrel nut style. The fastener section of an independent strap is spot welded on the top sheet on both sides of the gap. This construction allows for a heated section under the fastener.



### *Flange lock-up*

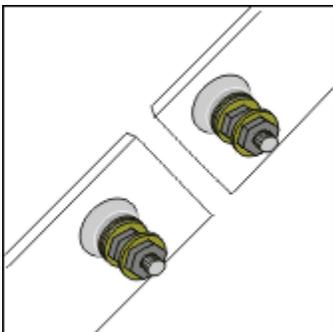
The most economical fastening style, flange lock-up is used mostly on narrow heaters.

Mica band heaters are available with various types of electrical terminations. Each termination has its own unique characteristics, advantages and limitations. When selecting a termination style, the following factors must be taken into consideration: diameter, width, voltage, amperage, operating temperature, electrical safety and cost.



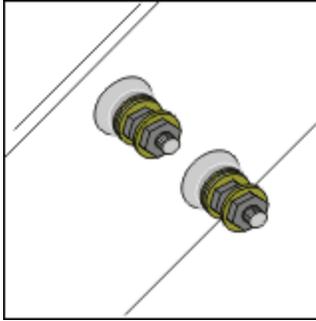
### *Screw Terminals*

Stainless steel screw terminals are the most convenient and economical means to connect a heater to an electrical power source. They are mostly recommended when high amperages (up to 30 amps) are involved. The temperature limitation is 840°F.

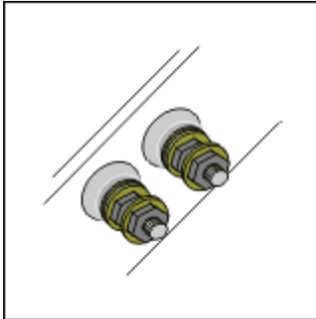


### *Styles*

*A Style* - Separate on opposite sides of the gap



***B1 Style*** - Along the width side by side



***B2 Style*** - Along the length side by side

## ***Mica Band Heaters - Lead Wire Terminals***



### ***Lead Wire Terminals***

High temperature wire is internally connect to the heater. This provides a safer electrical connection. However, it is physically impossible to conceal heavy gauge wire under the top metallic sheet. This limits the maximum amperage applicable to 20 Amps.

### ***Styles***

Within each style, there are different models of lead wire exits

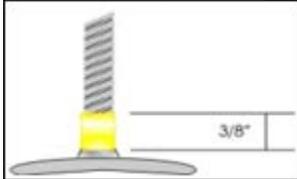
- [Armor Cable](#)
- [Stainless Steel Braid](#)
- [Plain Lead Wire](#)

### ***Armor Cable***

Armor cable provides the best protection against abrasion where a great deal of flexibility is not required. Straight lead exit or 90 degree bend are the available options for this lead type. Brass fittings are used to secure the termination.



*H Style - Straight Lead Exit*



*GM Style - 90 degree bend, armor cable*

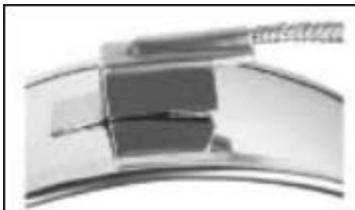


**Stainless Steel Braid**

In applications where there is frequent movement or risk of abrasion, stainless steel braided leads are recommended. Heat shrink sleeving at the end of the leads prevents the braid from fraying.



*E Style - Straight lead exit*



*LP Style - Low profile terminal cover*



*C Style - Used mostly with nozzle heaters*



*I Style - 180° from gap*

**Plain Lead Style**

Plain leads are used where there is no risk of abrasion or contamination. High temperature wire with fibreglass insulation (840°F) is standard. Teflon insulated wire is also available.



*EF Style - Straight lead exist*



*F Style - Exiting on both sides of the gap*



*CF Style - Used mostly with nozzle heaters*



*IF Style - 180° from gap*

## ***Mica Band Heaters - European Plugs***

European plugs are safe and simple to use. They provide a quick solution in applications where the electrical termination has to be disconnected frequently. They can be used on all our construction and clamping styles. EP terminals provide practical electrical connections when a failed heater has to be replaced. European plugs are available either with the tow round prongs (6 mm) or three flat prongs (one of which is ground).



*K90 Style - tangential with box*



*K00 Style - Vertical with box*



*K45 Style - At 45 degrees*



*K3P Style - 3 Prong with ground*

Female receptacles  
& male plugs

			
16A 250V	25A 380V	10A 250V	10A 250V

## *Mica Band Heaters - Construction Styles*

Maximum performance and ease of installation are two major considerations when selecting the construction style of a MEGABAND. The following are the most common construction styles.

- One piece
- Two piece or more
- Partial
- One piece flexible
- Conical
- Square/Rectangular
- Reverse



One piece:

One-piece construction is used when a heater can be installed on a barrel without extensively expanding it.

Dia ½" min 36" max

Width ½" min 15" max



Two piece or more:

Two or more pieces are for ease of installation. A practical choice when the barrel diameter is large.

Dia ½" min 36" max

Width ½" min 15" max



Partial:

Partial heaters are recommended where obstructions or complicated holes prevent having complete coverage on the surface of the barrel



#### One Piece Flexible:

One-piece flexible heaters are used in applications where two-piece construction is not practical, and expanding the heater is necessary during installation. These heaters should not be opened more than twice.

## *Mica Heater Installation Instructions*

### *Mica Bands*

Mica band heaters are designed with nickel-chrome resistance wire precisely wound around a mica sheet, which is then placed between two additional mica sheets. Mica is used because it provides good thermal conductivity and dielectric strength. The nickel-chrome resistance wire and mica sheets then are surrounded by a corrosion-resistant outer steel sheath.

Because mica bands are conductive heaters, intimate contact with the surface to be heated is important to ensure long life. Operating sheath temperatures should not exceed 850°F (454°C). (Note that this rating is for the heater's sheath--not the process.) Maximum watt density varies by manufacturer, but the average is 35W/in. On smaller mica bands, the watt density usually can go slightly higher. If the application requires higher temperatures or watt densities, another style band should be selected.

### *Loss Prevention for Band Heaters*

Most band heaters do not actually "burn out". Instead, it is often environmental factors that create a short, cause hot spots to develop, or simply push the heater beyond its normal operating temperature. All of these factors cause a heater to fail prematurely and require replacement. Obviously, minimizing these environmental factors can reduce the frequency of replacing band heaters in your operation.

### *Contamination*

By far, the most frequent culprit of band heater failure is contamination. Liquid plastic, hydraulic oil and moisture (often from high ambient humidity) are three main causes of premature failure from contamination. Obviously, keeping the heaters free of contaminants will reduce the failure and replacement rates. In applications where liquid plastic and oil exposure is frequent and difficult to manage, the best solution may be to select low cost band-the heater will be replaced often, but the financial loss will be minimized. Alternatively, a band heater designed to resist contamination can be used. Keep in mind, though, that most heaters fail from the severe lead wire damage caused by contamination-not from contaminants finding their way inside the band - and contaminant-resistant heaters will not prevent lead wire damage.

### *Poor Contact Between Heater and Barrel*

The second most common cause of premature failure is poor contact between the machine barrel and a low cost band. Because mica, high watt density and extruded aluminum bands are heaters, a tight fit is critical. Without a tight fit, localized hot spots can be minimized on the band and cause the nickel-chrome resistance wire to fail. As inside the higher the work temperatures, the more critical a tight fit becomes.

There are two strips you can take to ensure good contact with the machine barrel. First, make sure the machine barrel outer diameter (OD) measurement is accurate; then, order band heaters with that same measurement. The heater manufacturer will factor in a 0.25" gap, so there is no need to undersize the band's dimensions.

Second, follow a strict installation and tightening procedure for mica, high watt density or extruded aluminum band heaters. Before installation, clean and smooth the machine barrel surface, removing any plastic residue. To install, tighten the heater snugly to the barrel using a clamping bolt torque of 10 ft/lb. Next, apply power to the heaters and allow them to reach halfway to set point. temperature (or approximately 300°F [149°C]). Once at this temperature, cut the power and retighten the bands at 10 ft/lb torque. Retightening the band at an elevated temperature will account for the heater's thermal expansion. (Remember, ceramic bands are radiant heaters and should not be tighten in this manner.)

### *Handling Procedures*

Often, failing to understand a heater's internal design leads to heater losses. For instance, stretching a one-piece mica band over a barrel during installation can damage the internal mica, resulting in a short circuit. Some manufacturers offer band heaters similar to mica bands that can be stretched for installation, but using installation techniques inappropriate for a specific heater type will cause problems. So, in cases where one heater design will not work-for example, if a

band cannot be installed over the end of a machine barrel without stretching the heater-use a heater that is better suited to application such as a two-piece mica or a one-piece expandable band. A two-piece design also is a good choice when a large diameter band is required-the two-piece design minimizes the chance that air gaps will develop. Two-piece ceramic bands also can be used on large diameter barrels.

Another simple handling tip is to use two wrenches to install the wiring onto the band's post terminations. This practice can eliminate failures because the wrench on the post's lower nut acts as a strain relief. If this procedure is not followed, the post's internal connection to the nickel-chrome resistance wire can be damaged and become a weak link within the heater.

### *Runaway Temperatures*

Heaters are extremely obedient entities. If a controller tells them to produce temperatures beyond their limitations, they will do so-until their demise. Runaway temperature commands often occur when the thermocouple or RTD does not make solid contact with the surface measured. If the sensor becomes loose or disconnected from the surface, its readings may be hundreds of degrees lower than the process or barrel's actual temperature. This faulty input then is received by the control device, which calls for full output from the heaters when in fact the process is already up to appropriate temperature.

### *Design Considerations*

When designing a system, it is a good idea to match the total wattage applied to the actual wattage required. This practice decreases cycling frequency and temperature overshoots while increasing the heater's life span. When possible, it also is good practice to specify strap-style clamping devices to hold the heater in place. These devices have a lower thermal expansion rate than the heater, so they can help hold the heater tightly against the barrel during operation.

Given the range of products plant maintenance or engineering personnel encounter, is not realistic for them to become experts on every piece of equipment used. This article only touches the surface of band heater design, options, performance expectations and loss prevention. Users should link up with a qualified supplier who can help design a new system or perform a design analysis on an existing system, then make recommendations to ensure the best performance for the given application. Systems arising from a good supplier/user partnership will extend equipment life and allow critical production schedules to be reached.





**National Plastic Heater,  
Sensor and Control Inc.**

**1-877-674-9744**

**[www.np heaters.com](http://www.np heaters.com)**

