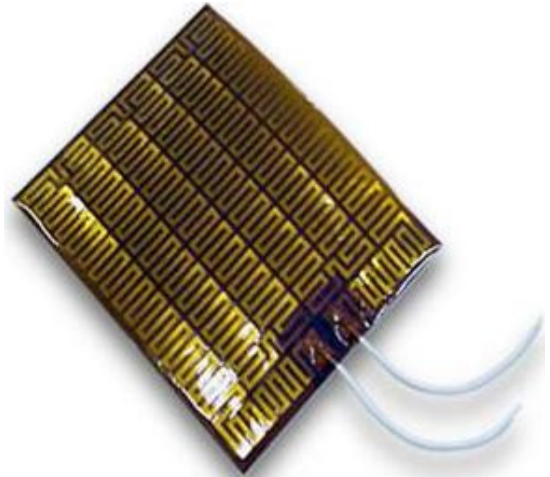


## Flexible Heaters

Flexible heaters have the unique ability to satisfy almost any application (literally, try us) while maintaining good mechanical, electrical and chemical properties in temperatures as high as 500°F and as low as -319°F. Flexible heaters provide uniformed heat to many odd-shaped objects by conforming to the surface on which they are mounted. Although thin and flexible, their rugged construction and moisture and chemical resistance make them the perfect heater for many hard-to-heat areas.



### Put Heat Right Where You Want it!

Complex shapes, odd configurations and 3-D units are easily heated with flexible heaters. Most applications can have the heater engineered so that it wraps around every surface of the object without compromising any design. You can think of flexible heaters like a second skin around the object being heated.

### Typical Applications:

- Storage Tanks
- Process Vats and Dip Tanks
- Low Temperature Ovens
- Water and Feed Troughs
- Heat Tracing Systems
- Conveyors
- Humidity Control Systems
- Freezer/Refrigerator Defrost
- Heated Tabletops
- Fluid Line Freeze Protection
- Foodservice Equipment
- Medical and Laboratory Devices
- Ceiling/Wall Radiant Heating
- Satellite and Communications
- Epoxy Curing Equipment
- Alternative to direct immersion

### Endless Possibilities

Flexible heaters have standard sizing and can also be custom made. Stock heaters include pail, drum, tote, and gas cylinder heaters as well as heat tapes. Some hard-to-heat applications, however, require custom heaters with flexibility, resistance to wear, reliability and cost effectiveness. With no order minimums and the ability to choose material, size, voltage, wattage, cutouts, attachment options, and built-in controlling options, flexible heaters are so personalized that virtually any application could be satisfied.

# Material Choices

## Silicone Rubber

The excellent dielectric properties of silicone rubber combined with the strength of fiberglass twine make silicone rubber heaters versatile and durable solutions for many applications.

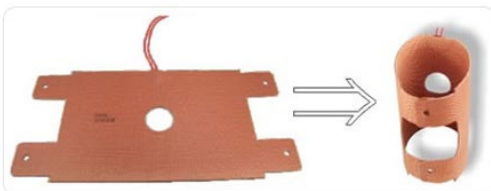
Wire wound elements are wound on permanent tooling to provide repeatability and pattern and have operating temperatures to 392°F.

Etched silicone has superior heat transfer, exceptionally uniform heat output, fast heat up cycle, longer life, complex circuit reproduction, and can operate to 500°F.

Hazardous-area silicone heaters are available with temperatures to 400°F.

### Resistant to

- Vibration
- Separation/ Stretching
- Outdoor Exposure
- Most Chemicals
- Deterioration by Moisture
- Ripping/ Tearing
- Thermal/Mechanical shock
- Edge Loss (*etched only*)



## Polyimide (Kapton®)

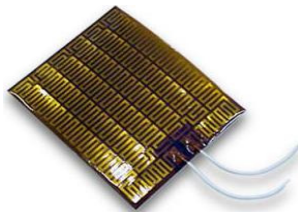
Fast warm-ups and quick responses as well as lightweight flexibility and outstanding mechanical, chemical, and electrical properties are some benefits.

Their thin, lightweight design (0.005" thick) allows close thermal contact for maximum efficiency, and their distributed wattage design eliminates edge loss compensation.

Kapton has double the tensile strength as fiberglass reinforced silicone, is almost 50% lighter, and meets precise heating requirements in applications with temperatures as high as 392°F and as low as -319°F. It is also not effected by common solvents/ fluids.

### Distinct Advantages

- Dimensional stability
- Tear/ Cut Resistance
- High Dielectric Strength
- Minimal out-gassing in high vacuum environments
- Resistance to radiation, fungus, oil and chemicals
- Thinnest, Most Rugged Flexible Heater



## Foil Laminated

Foil heaters are economical, long-lasting solutions for low-moisture applications. They can conform to most cylindrical or flat surfaces with great surface contact, providing very efficient heat transfer. Unique patterns can be easily configured since every foil heater is custom per application.

A foil heater allows the rope heater to be laid into a specific pattern then it is encapsulated by two layers of foil. Silicone rope, PVC rope, or fiberglass rope can be used.

Adhesive can mount the heater to the surface.

Acrylic adhesive allows temperatures to 302°F, and silicone adhesive allows temperatures to 600°F.

### Characteristics

- Economical
- Low Cost Solution
- Great Surface Area
- Great Heat Transfer
- Heat Large Surface Areas (48" x 96")
- Long Field Life
- Low Development Cost
- No Special Tooling



# Attachment Options

## RTV Adhesives

Strong bonding to surfaces in the field can be achieved by using adhesive pastes. RTV paste is best used at room temperature and is adequate for temperatures to 500°F.

## Pressure Sensitive Adhesive (PSA)

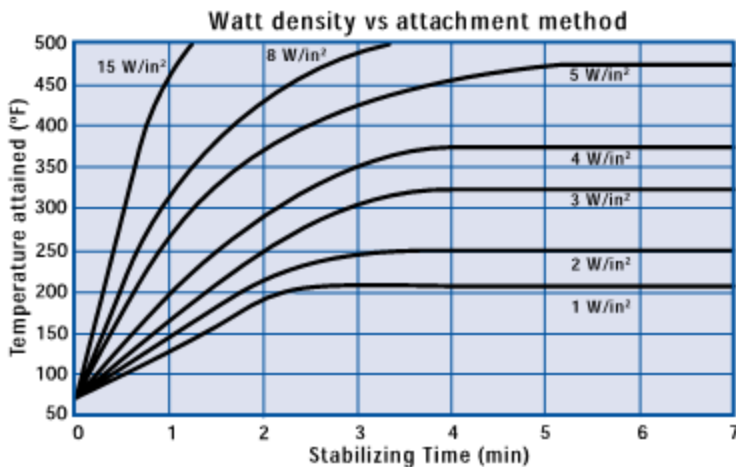
A thin layer of high temperature (300°F) adhesive backing is applied to the heater. It can adhere to nearly any surface and is supplied with a protective cover, which is easily removed before application. Watt density of the heater should not pass 5w/in<sup>2</sup> when PSA is used.

## Factory Vulcanization

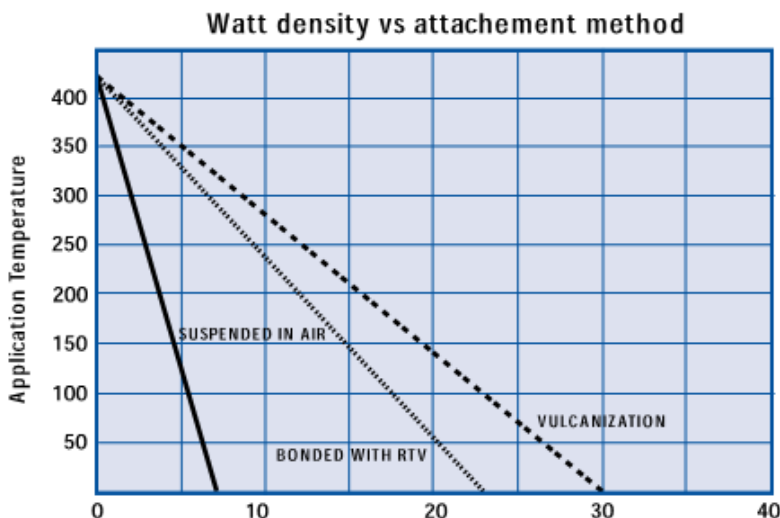
This is the most efficient method to bond a heater to any surface. Excellent heat transfer and bonding is achieved using high temperature and pressure. This process can only be carried out in the factory.

## Mechanical Fasteners


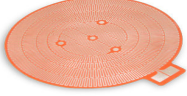
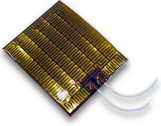


When the heater is wrapped around an application, the ends of the heater can be fastened by attachments used on fabrics. Eyelets with lacing cords, hook and loop, metallic fasteners with springs, and independent straps are the most commonly used fasteners.



The graph to the left shows the surface temp that a silicone rubber heater will attain when suspended in 70°F still air. It is recommended to bond the heater to the surface when the application requires watt densities of 5w/in<sup>2</sup> or above, or they will not reach the critical 500°F.



This graph shows the watt densities associated with the attachment methods available with silicone rubber heaters. Watt density of the heater should not exceed 5 w/in<sup>2</sup> when PSA is used.

Product/ Material	Max. Operating Temps		Distinct Advantages
	°F	°C	
 Wire Wound Silicone	500	260	<ul style="list-style-type: none"> <li>Resists rips, tears, chemicals, moisture, outdoor exposure</li> <li>Excellent dielectric properties</li> <li>Uses only limited by imagination</li> </ul>
 Etched Silicone	500	260	<ul style="list-style-type: none"> <li>Higher watt densities</li> <li>Eliminates edge loss compensation</li> <li>Higher production quantities</li> </ul>
 Kapton	392	200	<ul style="list-style-type: none"> <li>Tensile Strength, cut-through and tear resistance</li> <li>Thinnest, most rugged flexible heater</li> <li>Resists radiation, oil, most chemicals</li> </ul>
 Hazardous Area	292	145	<ul style="list-style-type: none"> <li>Exclusive hazardous-area FM approval</li> <li>Exceptional durability and flexibility</li> <li>Moisture and Chemical Resistant</li> </ul>
 Foil	650	343	<ul style="list-style-type: none"> <li>Economical for low moisture areas</li> <li>Great Surface contact/heat transfer</li> <li>Heat large areas, long field life</li> </ul>

## Design Variations

### Holes, Cutouts, and Notches

Your heater can be designed and fabricated in many types of configurations to fit the size and shape of your application. The holes, cutouts and notches are located per your specifications. Efficient heating element is placed within the predetermined perimeter.



### 3- Dimensional Heaters

Can be designed and built to fit perfectly around the complex contours of your part. This results in efficient heating and lower heating costs because there are no areas of loss. Our designers are happy work with you to satisfy these complex design challenges.



### Marking and Private Labeling

Our equipment allows us to permanently and cost-effectively mark each heater. Standard markings include OEM Heaters' name, part number, date code, voltage and watts. We offer private labeling for our customers which can include logos or other information.

## Options

- Temperature Controllers
- SJO Power Cords
- Thermostats/ Thermo-cutoffs
- RTD/Thermister
- External Lead Terminations
- Thermal Fuses

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