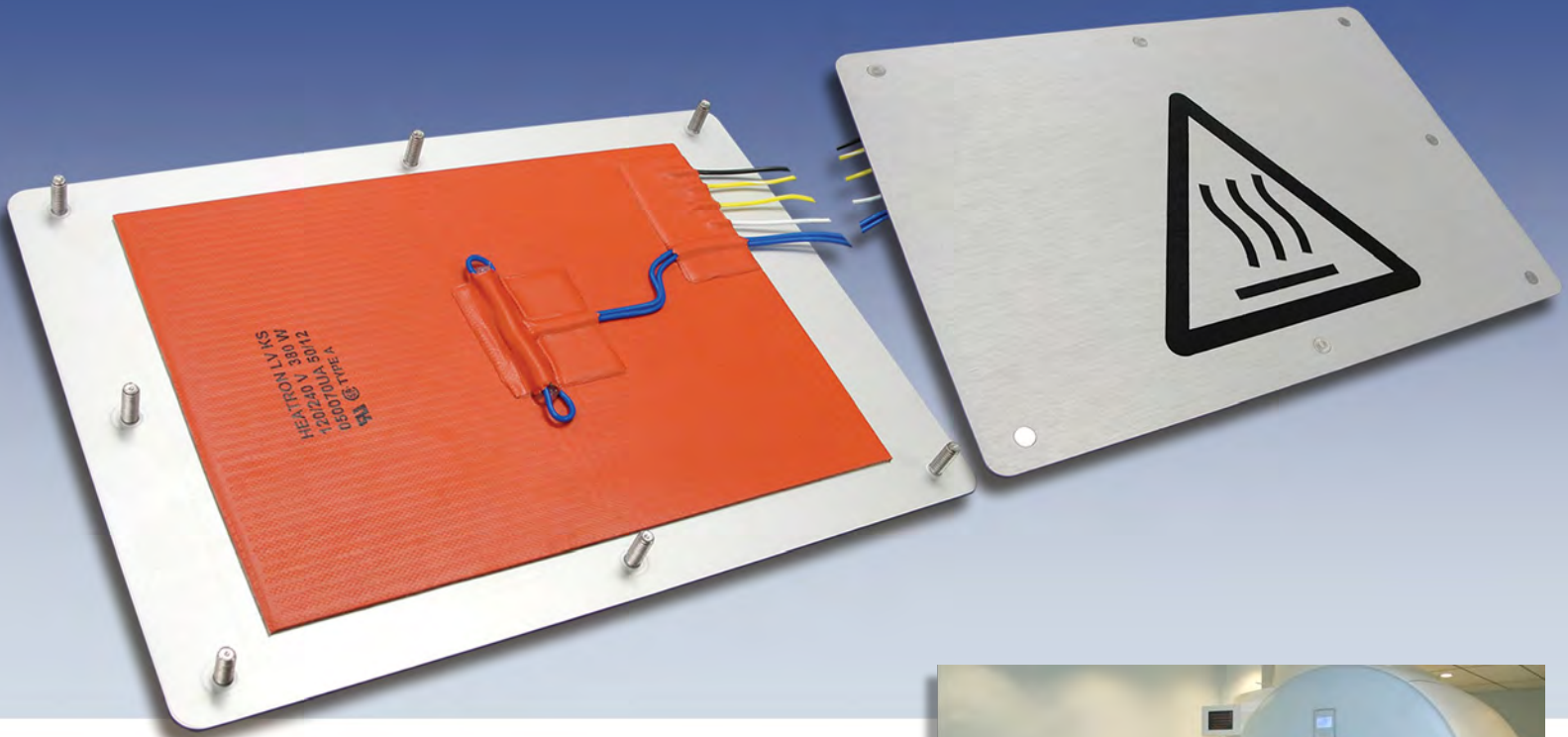




# HEATFLEX

Flexible Heating Elements  
Silicone & Kapton®

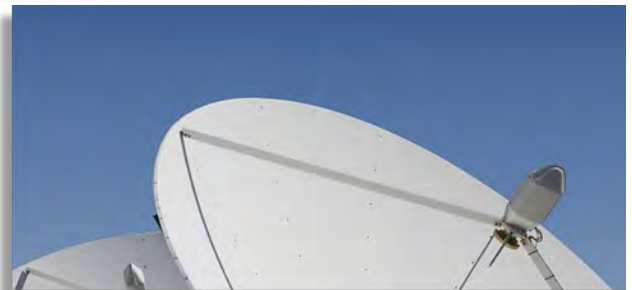


## Making the Complex Manageable

Thin, lightweight, resilient and flexible, HEATFLEX heaters provide design engineers with a variety of fabrication options. Precisely applied heat delivers excellent response time to create faster thermal output and cool-down, even in the most extreme environments. Engineered for complex forms, shapes and sizes, HEATFLEX heaters offer unparalleled custom design opportunities.

## Accelerating Your Product Vision

Higher performance products that differentiate your business, Heatron's flexible heating elements reside in some of the world's most innovative, award-winning products. Heatron designs products based on intelligent combinations of materials and complex component integration. With expertise in a multitude of key thermal technologies, our products are engineered to withstand the extraordinary demands placed on them.



*Transforming Your Vision  
into Higher Performance Solutions*

# HEATFLEX Overview

## Precision Heat.

## Maximum Reliability.

Ideal for applications where space and weight are limited, or where the heater will be exposed to harsh environments, HEATFLEX flexible heaters can be tailored to exactly fit your crucial needs.

- Excellent dielectric strength.
- Close, uniformly spaced trace width heating elements, as close as 0.007 in./0.17 mm, distributes heat evenly.
- Flexible geometry permits holes, notches and unusual 3-D shapes.
- Zone control available for consistent, uniform heat delivery, where needed.
- Flexible design allows for distributed wattages.
- Design multiple circuits within the same heater.
- Available with integrated temperature sensors, thermostats and a variety of mounting or attachment options.

*Heatron's flexible heating elements reside in some of the world's most innovative, award-winning products.*

## Applications

### Medical & Life Sciences

Dialysis, CPAP, DNA Analysis, Blood Diagnostics, Surgical Irrigation, Blood/Fluid Warming, Instrument Warming, MRI Equipment, Temperature Therapy, Sterilization,

### Aviation & Transportation

Instrumentation, Personal Comfort Heating in Aviation, Over the Road Truck and Railcar Freeze Protection, Battery and Oil Heating, Auto and Motorcycles

### Telecommunications

Antennas, Enclosures, Microwave Repeaters, Back-Up Battery Systems

### Food Service

Warming Cabinets, Heated Display Shelves, Prep Stations, Fryer Systems, Toasting/Grilling Platters

### Security

Chemical Detection, Explosives Detection, Cameras

### Energy

Fuel Cells, Power Meters, Battery systems, Transmission Switches

### Industrial

Packaging Lines, Electronic Enclosures, Freeze Protection, Motor Heaters, Cold Storage Equipment

## Case Studies

**Project:** Sleep and Respiratory Care

**Standout:** Designed to meet exacting medical standards and patient-controlled performance standards, Heatron's heating element allows customizable humidity control for optimal patient comfort. The heater was engineered to pass extreme test conditions, as well as easy attachment to the device in the assembly process.

**Project:** Microwave Repeaters

**Standout:** Using new materials that can withstand extreme outdoor conditions, this design collaboration of an eight section heater embeds multiple wattages and voltages. Engineered insulation that protects against UV, water and fire, yet allows for easy installation in the field.

**Project:** Chemical / Explosion Detection

**Standout:** Engineered using advanced multi-layer flexible heating and precision components to ensure accurate heat using real-time analysis in critical security conditions.

**Project:** Aircraft Cabin

**Standout:** Meeting stringent quality requirements, while pushing the boundaries of heating at cruising altitudes of up to 40,000 feet, the heater is designed for an environmentally controlled system divided into several temperature zones and conditioned to the heat load of each zone.

# HEATFLEX Overview

*Heatron offers unparalleled custom design opportunities to meet your product demands.*

*For custom solutions outside the parameters listed, please contact Heatron for design assistance.*

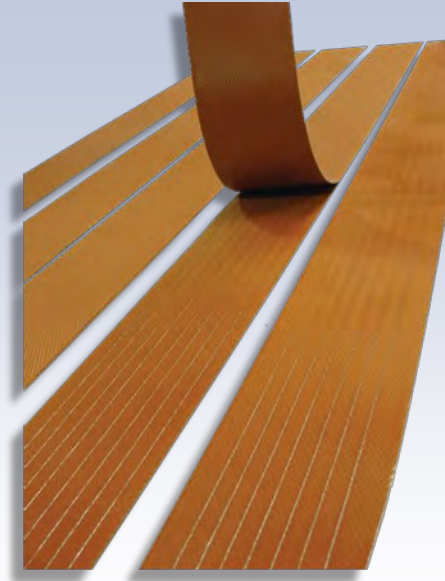
Specifications	Kapton	Silicone	
		Etched	Wire Wound
Max UL Component Recognition Operating Temperature*	260°C 500°F	200°C 392°F	220°C 428°F
Min Operating Temperature	-60°C -76°F	-55°C -70°F	
Max Watt Density	50 W/in <sup>2</sup>	60 W/in <sup>2</sup>	12 W/in <sup>2</sup>
Nominal Thickness	0.15 mm 0.006"	0.76 mm 0.030"	1.0 mm 0.040"
Dielectric Strength	3000 V/mil	400 V/mil	
Max Size	560 x 560 mm 22" x 22"	560 x 710 mm 22" x 28"	915 x 1775 mm 36" x 70"
Max Resistance Density	115 Ω/in <sup>2</sup>	115 Ω/in <sup>2</sup>	1000 Ω/in <sup>2</sup>
<b>Dimensional Tolerance</b>			
- Less than 150 mm - Less than 6"		± 0.8 mm ± 0.03"	
- 150 to 300 mm - 6" to 12"		± 1.5 mm ± 0.06"	
- Greater than 300 mm - Greater than 12"		± 3.0 mm ± 0.12"	
Resistance Tolerances		+10% -5%	
* Higher temperatures available.			



# Silicone Rubber Heaters

## Rugged. Reliable. Accurate.

High-strength fiberglass reinforced silicone rubber gives the heater dimensional stability without sacrificing flexibility. Moisture and chemical resistant, HEATFLEX can be vulcanized to conform to the contours of diversely shaped parts, equipping our heaters with the exceptional ability to fit over your custom component and follow compound curves.



## Etched Foil:

When watt density matters, Heatron's state-of-the-art flexible circuitry allows designers to distribute wattage and create complex heat distribution patterns. Etched foil offers greater heat coverage and up to twice the wattage density of wire wound.

- Etched foil provides options for variable watt density and complex heat patterns.
- Etching circuits is an efficient means for manufacturing in high quantities.
- Foil thickness ranges from .0005" to .004" depending on your required resistance.
- Different material types can be used depending on the heater resistance needed.
- Etched designs are excellent for applications requiring watt densities greater than 5 watts/in<sup>2</sup>.
- Excellent choice for heaters that require multi-zoned wattages or heaters that have many holes or cutouts.
- Offers excellent circuit repeatability.
- Elimination of edge loss due to compensation using distributed wattage.

## Wire Wound:

Built to withstand adverse conditions, robust wire wound heaters offer stronger, more flexible heaters along with fast, inexpensive prototyping. Our designers work with a variety of material combinations specifically chosen based on your resistance density and mechanical requirements.

- Large heaters in large quantities.
- Provides excellent repeatability.
- Better choice for high flex applications.
- Adapts to contoured surfaces with ease.
- Excellent for applications requiring high watt densities.
- Facilitates high resistance applications and heater sizes not lending themselves to the etching process.
- Freeze protection and condensation prevention.
- Resistant to many chemicals.

# Kapton® and All Polyimide

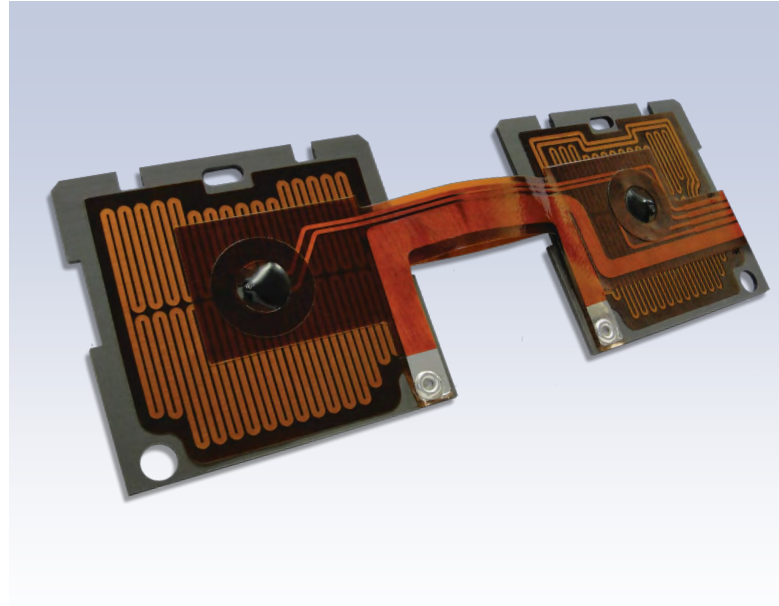
## Ultra Thin. Low Mass.

Kapton and All Polyimide heaters are ideal for applications requiring low outgassing, operating in extreme environments or where space and weight are limited. The material has high dielectric strength and excellent dimensional stability for higher watt density and temperature applications, while providing lower operating costs and increased throughput.

## Etched Foil:

Kapton and All Polyimide heaters are constructed using foil as the element and chemical etching to delineate the element pattern. Advanced circuit imaging and printing, combined with chemical etching allows designers the flexibility to distribute wattage and create multiple heat patterns within a single heater.

- Very thin heating for very small sizes.
- Superior tensile strength and tear resistance.
- Low outgassing.
- High dielectric strength.
- Flexible circuit design.
- Precise heat distribution.
- Elimination of edge loss due to compensation using distributed wattage,
- Resistant to most radiation, chemicals and solvents.
- Ideal for extreme temperature environments.
- Multiple layers possible.



*Expertise in design for performance, design for manufacturing and vast insights into the challenges you face.*

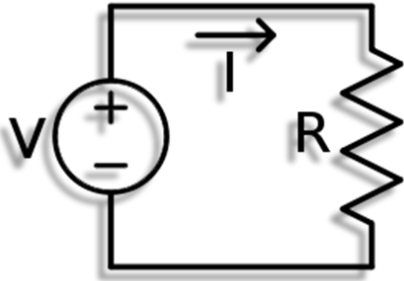
## Unparalleled Manufacturing and Assembly

- Proven FDA and Safety Agency experience.
- Quality Audited by Fortune 500 customers.
- ISO 9001:2008 Certified.
- Class 10,000 Clean Room.
- High velocity production experience.
- Incredible throughput.
- Best-in-class path planning and control.
- Exceptional circuit repeatability, even for the most demanding applications.

Heatron provides turnkey manufacturing solutions for products, subassemblies and components to lower cost of ownership and speed time to market. We continually reinvest in new technology while utilizing Lean Principals to streamline operations, eliminate variation and deliver a competitive advantage to our customers.



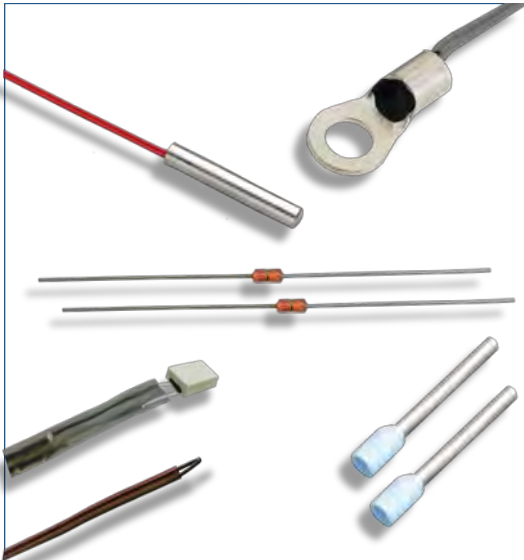
# HEATFLEX Specifications and Options



## Voltage

- Custom designed to operate up to 600 volts.
- Resistive element and functions with AC and DC voltage sources.
- With dual voltage, you get the same heater for 110 and 220 volt equipment.

*Heatron has proven experience with FDA and other regulatory agency requirements.*



## Sensors

- HEATFLEX can be supplied with a variety of sensors, thermocouples, thermistors and RTDs.
- Our design team can assist you with custom mounting options to achieve optimal results.
- Sensors can be mounted over heated and non-heated sections. Most thermocouples, thermistor or RTD sensors can be incorporated into the HEATFLEX assembly process.



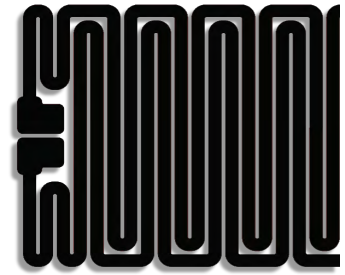
## Thermostats & Thermal Fuses

- Designed to provide maximum efficiency for your application.
- Large selection of bimetallic thermostats to perform control and safety functions. Our thermostats are limited to 240 volts and 15 amps.
- HEATFLEX heaters provide sensory control, including partial temperature capacity. This serves to limit the temperature of the heating element itself, is a great back-up temperature controller, and it is ideal for freeze prevention and condensation build-up in outdoor electronic enclosures.
- Thermostats can be mounted with the sensory side exposed to the ambient air inside the enclosure.
- Thermostats can be mounted over a heated or non-heated section. By placing the thermostat over a heated section, the thermostat will limit the temperature of the heating element itself.

# HEATFLEX Specifications and Options

## Wattage

- Distributed Wattage can be used to compensate for heat loss and create uniform temperature in application. Operate more efficiently by applying heat where it is needed.
- HEATFLEX heaters can be designed with multiple zones, controlled and operated independently. This approach saves time and minimizes design iterations in product development.



*Heatron accelerates the launch of new products that become recognized leaders in a global marketplace.*

## Connecting Leads

Typical Options Include:

- Teflon® (TFE) insulated, 19-strand silver plated copper conductor.
- Silicone rubber insulated leads.
- HPN (lamp or zip cord).
- SJO cord.

Leads can be sleeved the leads in Silicone coated fiberglass, heat shrink or stainless steel overbraid.



## Attachment Methods:

- Pressure Sensitive Adhesive for attachment at customer location.
- Heaters can be vulcanized to conform to the contours of a variety of shapes and sizes of metals and plastics. This method provides intimate contact and superior heat transfer to the part being heated.
- Attach and detach materials – over and over again. Snaps, Spring Clasps, Hooks, Velcro® – just about any fastener can be incorporated into the design for easy attachment to almost any part configuration.

## Thermal Insulation

HEATFLEX heaters can be supplied with a variety of insulation types, normally 1/8" to 1/2" medium density Silicone rubber sponge. Heatron has devised sponges that resist compression for applications where the combined heater and sponge will be under pressure.





### About Heatron

Heatron is a global leader in design, engineering and manufacturing for Heating solutions. Heatron's experienced engineers and designers offer complete solutions, from initial concept and design to complex integration and manufacturing. By bridging the gap between original concepts and commercialization, we accelerate the launch of new products that become recognized leaders in a global marketplace.

Our firm commitment to product and technical innovation, flexible design capabilities, and advanced patented technologies allow Heatron to provide a wide range of customers with next generation heating products. By working closely with our customers, we have a comprehensive understanding of design for performance, design for manufacturing and vast insights into the challenges you face.

