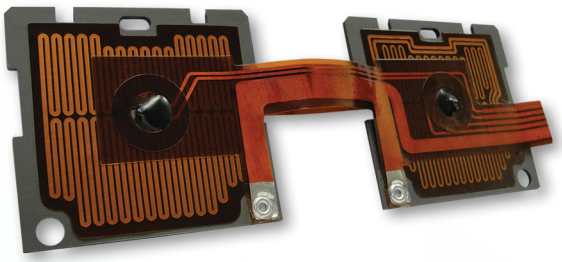
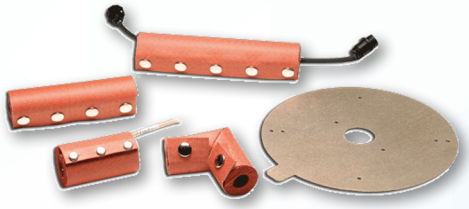
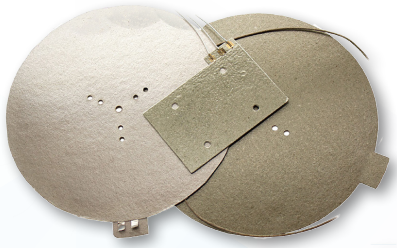
HEATRON

FLEXIBLE HEATING ELEMENTS







3000 Wilson Ave Leavenworth, KS 66048 USA
1.913.651.4420 • sales1@heatron.com • www.heatron.com

HEATFLEX

Flexible Heating Elements Silicone & Kapton®

Transforming Your Vision Into Higher Performance Solutions

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.

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 offers unparalleled custom design opportunities to meet your product demands.

	Kapton	Silicone	
Specifications		**Kapton**	**Kapton**
Max UL Component Recognition Operating Temperature*	260°C 500°F	200°C 392°F	220°C 428°F
Min Operating Temperature -60°C	-60°C -76°F	-55°C -70°F	
Max Watt Density	50 W/in^2	60 W/in^2	12 W/in^2
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^2	115 Ω/in^2	1000 Ω/in^2
	Dimensional Tolerance		
- 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.*

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

HEATFLEX OVERVIEW

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.

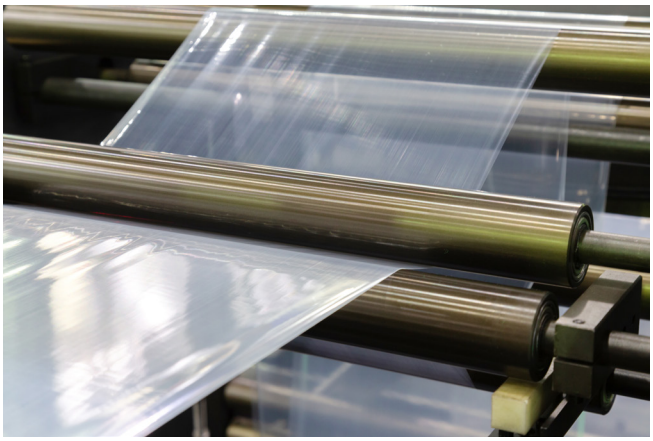
Project: Chemical / Explosion Detection

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.

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



SILICONE RUBBER HEATERS

Rugged. Reliable. Accurate.

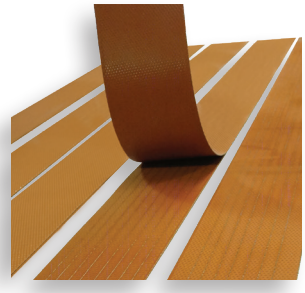
High-strength fiberglass reinforced silicone rubber gives the heater dimensional stability without sacrificing flexibility. Moisture and chemical resistant, HEATFLEX can be vulcanized to conform to the contours of diversely shaped parts, equipping our heaters with the exceptional ability to fit over 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/in2.
- 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

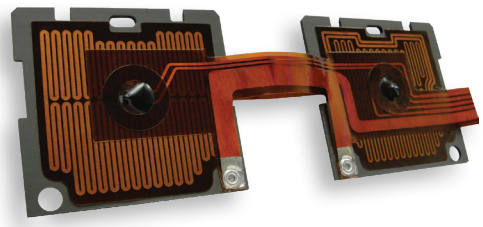
Ultra Thin. Low Mass.

Kapton and All Polyimide heaters are ideal for applications requiring low out gassing, 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 out gassing.
- 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.



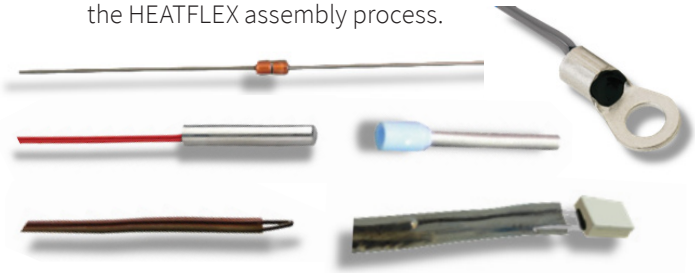
SPECIFICATIONS AND OPTIONS

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.

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 incorporatedinto 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.

Wattage

- Distributed Wattage can be used to compensate for heat loss and create uniform temperature in application. Operate more efficiently by applying heat were 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.

Connecting Leads

Typical Options Include:

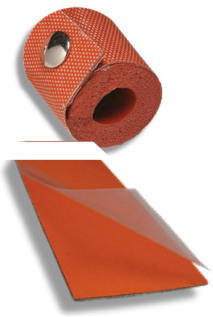
- Teflon® (TFE) insulated, 19-strand silver plated copper conductor.
- Silicone rubber insulated leads.
- HPN (lamp or zip cord).
- SJO cord.

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.

GAS LINE HEATERS

Modular, Insulated Heat Wrap Solutions

More control. Uniform heat.

Semiconductor fabrication demands precision heating of gas delivery lines, fore lines, vacuum lines and valves to prevent deposition of impurities that can ruin a wafer. Heatron's modular heaters are custom-fitted and interconnect to completely envelop gas delivery piping systems, ensuring a uniform temperature gradient and protection against particulate formation.

Snap on. Snap off.

Heatron's modular gas line heaters are customized for your system. Pipe wraps, formed valve covers, and interlocking angles interconnect with insulated leads. Each piece snaps right into place, reducing downtime for installation. Heatron's gas line products are manufactured in the USA.

Endlessly inventive
heating solutions for
high-performing applications.

SPECIFICATIONS

Performance beyond specifications listed here is possible with custom design.

UL 94 V-0 Gas Line Heaters

Specifications	Metric	English
Max. Operating Temperature (UL)	150°C	302°F
Max. Watt Density (Gas line to 3/4")	0.4 W/cm²	2.5 W/in.²
Max. Watt Density (Pump line to 2")	0.25 W/cm²	1.5 W/in.²
Max. Watt Density (Pump line to 4")	0.2 W/cm²	1.25 W/in.²
Insulation Options	Foam and Formed Silicone Rubber	
Typical Voltage	120V, 208V, 240V (AC)	
Color:	Grey	

UL 94HB Gas Line Heaters

Specifications	Metric	English
Max. Operating Temperature (UL)	200°C	392°F
Max. Watt Density (Gas line to 3/4")	0.4 W/cm²	2.5 W/in.²
Max. Watt Density (Pump line to 2")	0.25 W/cm²	1.5 W/in.²
Max. Watt Density (Pump line to 4")	0.2 W/cm²	1.25 W/in.²
Insulation Options	Foam and Formed Silicone Rubber	
Typical Voltage	120V, 208V, 240V (AC)	
Color:	Orange	

UL 94V-0 Fore Line/Exhaust Line

Specifications	Metric	English
Max. Operating Temperature (UL)	150°C	302°F
Max. Watt Density (Gas line to 3/4")	0.4 W/cm²	2.5 W/in.²
Max. Watt Density (Pump line to 2")	0.25 W/cm²	1.5 W/in.²
Max. Watt Density (Pump line to 4")	0.2 W/cm²	1.25 W/in.²
Insulation Options	Foam and Formed Silicone Rubber	
Typical Voltage	120V, 208V, 240V (AC)	
Color:	Grey	

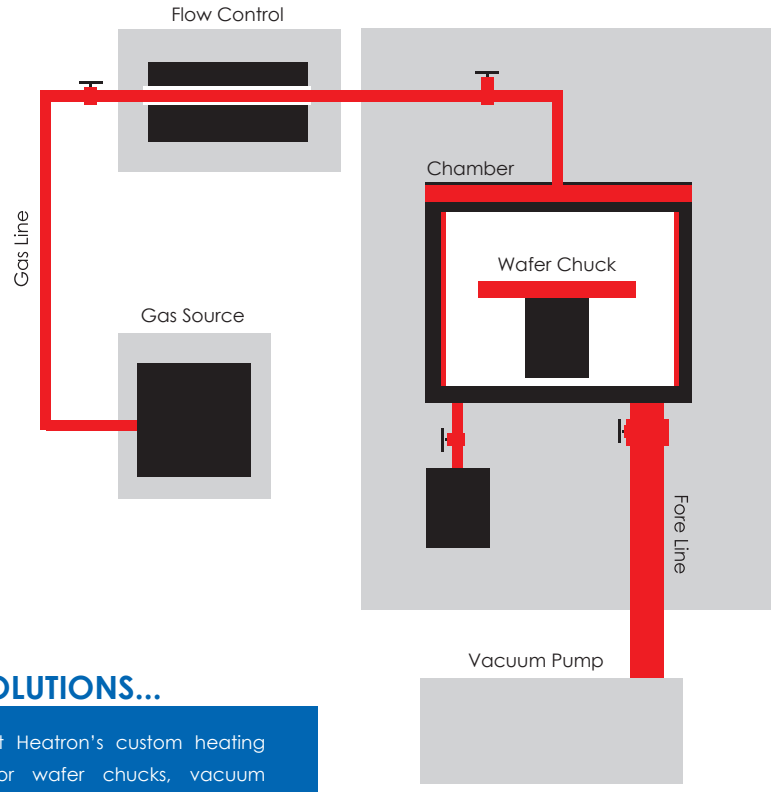
PROCESS

Complex assembly? No problem.

Heatron takes your drawings or 3D models and designs each piece of the system to fit. Angles, curves and tight spaces are no problem. Linear pipe wraps, corners, fitted valve covers and formed caps are all checked for fit and performance before entering production.

The end result is a tight fit, with fast installation and maximum coverage, ensuring a smooth temperature gradient and better particulate control, even in the most complex systems.

APPLICATIONS



LINES...

- Gas Lines
- Gas Panels
- Vacuum Lines
- Exhaust Lines
- Fore Lines
- Pump Lines
- Valves

GASES...

- Silicone Nitride
- Aluminum Etch
- Tungsten Etch
- CVD

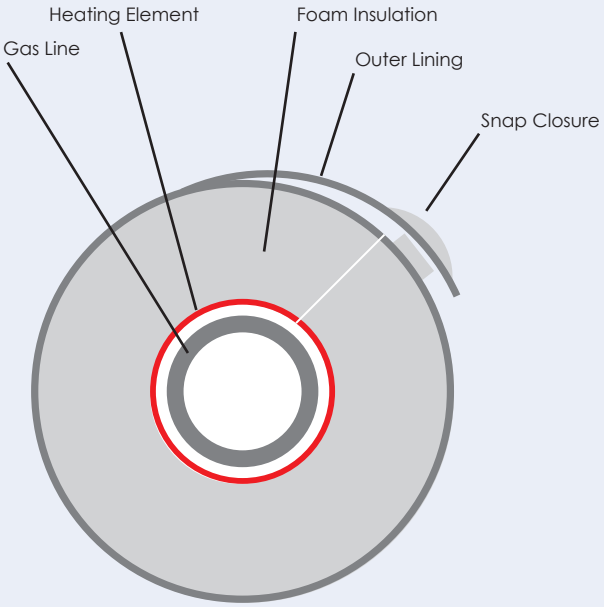
Heatron modular pipe wrap systems are primarily used in high-temperature, high-volume gas delivery, exhaust and pump systems, like those used in semiconductor fabrication.

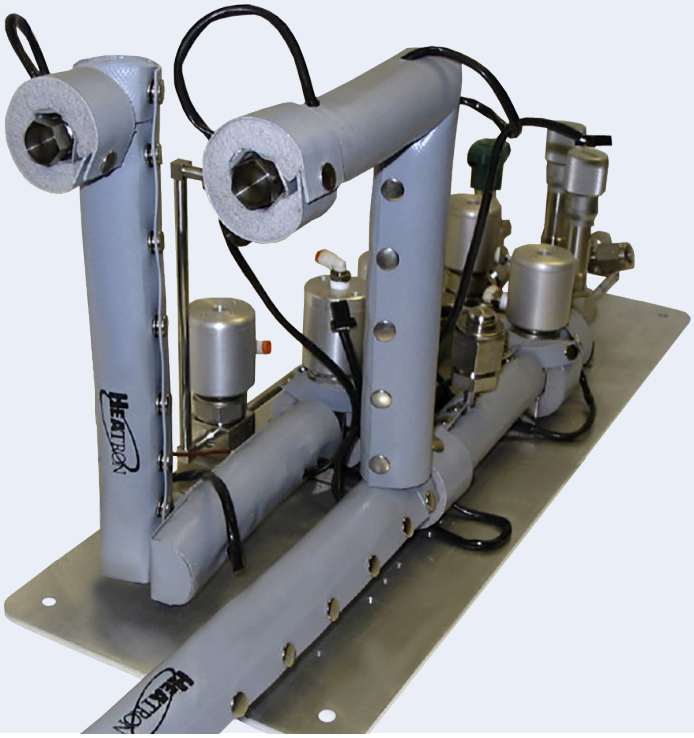
The snap-to-fit design is easier to apply and remove than heated tape, and creates a tighter fit than Velcro®, making it the best option for high-maintenance systems where temperature fluctuation can drive up costs.

GAS LINE HEATERS ARE COMPLIANT WITH SEMI S2-93 SAFETY REQUIREMENTS.

MORE SOLUTIONS...

Ask about Heatron's custom heating options for wafer chucks, vacuum chambers, and more specialty heaters for the semiconductor industry.





ABOUT HEATRON

KAPTON/POLYIMIDE ETCH

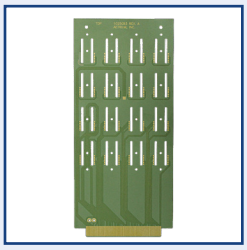
Super-thin and precisely etched foil heaters with low outgassing for a wide range of applications.

SILICONE RUBBER

High strength fiberglass reinforcement with wire-wound or etched heating elements provide even heat.

ETCHED MICA

Rigid etched mica heaters offer high temperature, large physical dimensions and high watt density.



THICK FILM

Printed circuits on metal or ceramic provide unsurpassed control, high heat resistance and integrated controls.

Special applications for...

Heatron is a trusted manufacturing partner for a broad range of industries. We understand the exacting demands you face and what it takes to meet them.

- 3D Printing
- Aviation/Defense
- Commercial Equipment
- Food Service
- Industrial Equipment
- Laboratory Equipment
- Medical Devices
- Oil and Gas
- Packaging
- Plastics Processing
- Process Industries
- Security
- Semiconductor
- Telecommunications

More options for higher performance solutions.

Heatron is a global leader in design, engineering and manufacturing of heating solutions. Heatron's experienced engineers and designers offer complete solutions, from initial concept and design to complex integration and manufacturing. Heatron speeds time to market by bridging the gap between concept and commercialization.

Our expertise in design, manufacturing and market standards provides our customers with the documentation and knowledge of agency approvals that is essential in today's tightly regulated environment.

HEATRON

3000 Wilson Avenue
Leavenworth, KS 66048-4637 USA
P: 1.913.651.4420 • F: 1.913.651.5352
www.heatron.com • sales@heatron.com

ISO 9001 • Registered by Underwriters Laboratories, Inc.
FDA Registration: 3001297547
A member of the NIBE Element group.

Contact a Representative:

CONSTANT FLOW FLEXIBLE HEATED HOSE

DESIGN GUIDE

The Heatflex ***CONSTANT FLOW*** flexible heated hose technology provides a temperature regulated flexible conduit for delivery of a media with high viscosity or material that is a solid at ambient temperature.

- *CONSTANT FLOW* has a Teflon® liner which allows for higher operating temperatures and will prevent contamination of the product flowing through it.
- The heated liner and outer insulation jacket delivers quick heat up and a stable product temperature at high flow rates.

The heated liner can be of various diameters and lengths. Wattage and watt density are adjustable to suit the customer's application.

Technical Specifications

- *CONSTANT FLOW* heated hose
- Tube Size: 0.032" to 1.00"
- Tube Material: Teflon® or customer specified
- Temperature Sensors: RTD, Thermistor, T/C, thermostat
- Insulation: Various options are available if required

Applications

Printing

3-D Printers, Laser Printers, Card Printers, Thermal Printers, Commercial and Industrial Printers

Medical and Life Science

Fluid warming

Adhesives

Adhesive dispensing

CONSTANT FLOW heated hose is the cost effective solution to maintain media flow and process control. Performance optimization is designed into each specific customer application. Applications include conditions that require the heated hose to be flexed during installation and perhaps routed through a maze of obstructions, but then may rest motionless during operation of the equipment.

CONSTANT FLOW heated hose is also designed to allow continuous flexing once attached with fittings into the customer's equipment. The product is light weight, easy to install and service, and is designed to survive challenges of durability.

POLYESTER ETCH FOIL HEATERS

Lower cost. Superior heat transfer

An economical etch heater for lower temperature, complex design applications.

HEATFLEX polyester heaters are constructed using an etched foil heating element. Advanced circuit imaging combined with chemical etching allows designers the flexibility to distribute wattage while creating multiple heat patterns in a single heater.

- Precise heat distribution
- Superior tensile strength and tear resistance
- Low out gassing
- Flexible circuit design
- Elimination of edge loss due to compensation
- using distributed wattage
- Water resistant
- Multiple layers possible

Agency Approval:

UL E91597 (UL 499)
Heatron offers an extensive UL option list and builds to UL 60601/IEC-60601.

DESIGN GUIDE

Construction Options:

See Design Guide on next page for common options.

Performance Options:

Dual voltage
Ground circuits or wires
Three phase power
Distributed wattage
Dual wattage
Onboard sensors, thermostats and thermal fuses
Over temperature control
Special marks, labels and serialization

Applications:

Medical and Life Sciences
Medical decives, Laboratory equipment, Vetinary tables

Industrial
Battery heaters, Enclosures

Food Service
Food service equipment, Warming trays

Transportation
Rear view mirror, Hand grip heater

Specifications	
Max UL Component Recognition Operating Temperature*	105 °C 221 °F
Min Operating Temperature	-40 °C -40 °F
Max Watt Density	7.8 W/cm^2 50 W/in^2
Nominal Thickness	0.15 mm 0.006"
Dielectric Strength	300 V/mil
Max Size	560 x 560 mm 22" x 22"
Max Resistance Density	115 Ω/in^2
Dimensional Tolerance	
- 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 and tighter tolerances available.*	

Wattage and Voltage

Custom watt density and multi-zone controls are available for added efficiency. Distributed wattage can compensate for heat loss and create uniform temperature profiles. Polyester etch circuits typically operate from 2 to 240 volts, including dual voltage, and function with AC and DC voltage sources.

Surface Mount Sensors and Thermostats

Heatron offers a selection of sensors, thermostats and thermal fuses that maximize efficiency for your application, and can be incorporated in the assembly process. Sensors can be mounted over heated and non-heated sections. RTDs or thermistors provide direct, onboard temperature feedback and control for more complex heater system assembly.

Connecting Leads

A wide range of connections are available. Typical options include PVC insulated, Teflon® (TFE) insulated, 19-strand silver plated copper conductor, flexible circuits and silicon rubber.

Attachment Methods

Pressure Sensitive Adhesive can be bonded to customer's part at Heatron's facility or applied for attachment at customer location.

CLEARVIEW TRANSPARENT FLEXIBLE HEATERS

Cearview keeps vital equipment clear and operational in extreame conditions.

Clearview is a flexible transparent heater designed for high-use and high-exposure industrial and comercial applications. Heatron's Clearview optically clear technology delivers a precisely controlled heat source that keeps screens, lenses and display panels ice and moisture free.

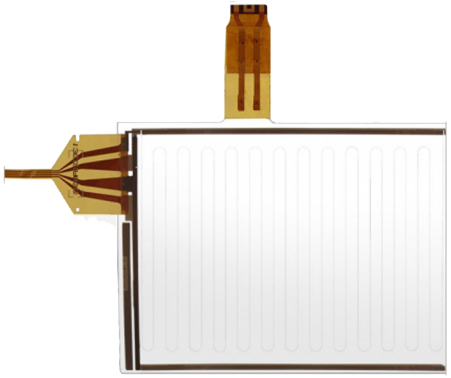
Wire-wound construction gives Clearview the durability and control needed for high-altitude applications.

More durable and faster heating than ITO options, wire-wound technology gives you precision heating tolerances and superior performance where control and reliability matter.

Design options can include flexible polyimide or fixed glass substrates, dimensions from ½" to 24" and beyond, and round, square or complex shapes. Wattage tolerances, voltage and other specifications can be customized as needed.

Clearview's ultra-fine wire construction delivers up to 90% optical clarity.

Clearview heaters keep outdoor lenses, displays, and touchscreens clear and operational to -60°C.



DESIGN SPECIFICATIONS*

Substrate:
Polyimide, polyester, glass, polished glass, float glass.

Diagonal Size Ranges:
Maximum 24" Minimum ½"

Substrate Thickness:
Typically 0.010"

Wire Dimension:
Typically 0.0009"

Shapes:
Round, rectangular, specialty

Voltage:
2-220 Volts AC/DC

Wattage Tolerances:
Typically ±10%

Visual Light Transmission
Up to 90%

Ambient Temperature Minimum:
-60°C

Operating Temperature:
Up to 95°C

*Contact Heatron Design Assistance for solutions outside the ranges specified above.

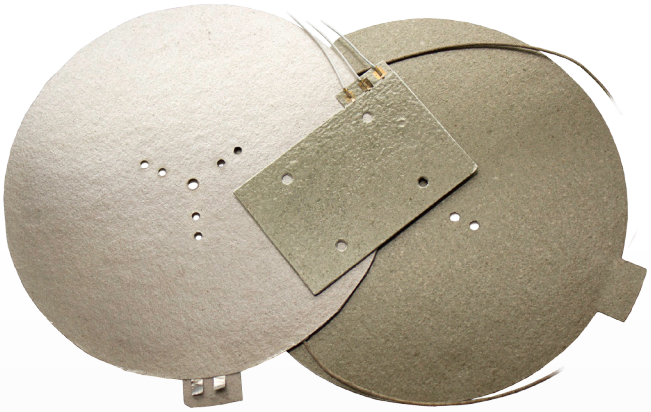
Etched Mica Heaters

Heatron is excited to announce this new, cost-effective solution for high temperature (up to 500°C) heating elements. A precisely-etched foil circuit is sandwiched between two sheets of mica, creating a durable heater with blazing fast ramp-up time and high watt density.

Mounting holes can be designed into the heater to ensure secure mounting for even heating and optimal performance when attached to metal plates and heat sinks. Ceramic paper insulation and backing plates can be provided.

Etched mica offers high watt density the highest operating temperatures in the flex heater group. Distributed wattage gives you unmatched control, reducing edge loss and allowing for zoned wattage, dual voltage options and integrated sensors.

Contact your local Heatron Sales Representative to request a consultation, or call +1 (913) 651-4420 today.



SPECIFICATIONS	
MAX DIMENSIONS	22”x 22”
MAX OPERATING TEMPERATURE	500°C
MIN OPERATING TEMPERATURE	-150°C
MAX VOLTAGE	500V
RESISTANCE TOLERANCE	±10%
NOMINAL THICKNESS	0.030” - 0.040”

Specifications beyond these parameters are available with custom design. Lead, sensor, attachment and assembly options available.

NOW AVAILABLE

Contact Heatron: (913) 651-4420 | heatron.com

HTN-HFX-PC-0716-RevA

HEATRON TRANSFORMS YOUR VISION INTO HIGHER PERFORMANCE SOLUTIONS

Contact a Heatron Specialist to request a consulation today

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.

3000 WILSON AVENUE
LEAVENWORTH, KS 66048-4637
P: 1.913.651.4420 • F: 1.913.651.5352
SALES1@HEATRON.COM
WWW.HEATRON.COM
ISO 9001 • ISO 14001