



**B I R K**

Engineering Thermal Solutions

Fast prototyping  
Superior quality  
Exceptional service

# Birk Manufacturing Product and Capabilities

AS9100 | ISO 9001 | ISO 13485  
ITAR, UL and CSA Certified



Medical  
Semiconductor  
Battery heaters  
Military  
Industrial

# Proven Success

For more than 30 years, Birk Manufacturing has been engineering thermal solutions. We understand that the markets we serve expect smart solutions and critical equipment components of the highest quality:

- **Medical**
- **Military**
- **Semiconductor**
- **Industrial**
- **Battery heaters**

Birk's success engineering thermal innovations begins with the knowledge that our customers' heating challenges are unique. We offer free access to Birk's application engineers, who work to individual requirements.

Using modern manufacturing equipment, we build the prototypes, test and produce the one-of-a-kind components in our Connecticut facility, all while offering some of the shortest lead times for new orders in the industry. This ensures a satisfactory experience from product conception to delivery.

Birk Manufacturing boasts some of the highest standards possible, including being ISO 9001, ISO 13485, AS 9100 and ITAR certified. In addition to these accreditations, Birk is UL & CSA certified.

# Experience, Creativity, Speed

We pride ourselves on our engineering and design experience, creative solutions and speed. And our customers reward us. They return to Birk time and time again to engineer thermal solutions for their most critical applications.

## Services:

**Application engineering** – Collaborate for free with Birk's exceptional engineering team.

**Prototype development** – The most rapid prototyping in the industry, resulting in reduced costs and speed to market.

**Modern manufacturing** – Highly trained personnel use the most current machinery to produce customized solutions.

**Customer service** – Well-trained personnel ensure customers receive the service they need, when they need it.



## Thermal Partner

Birk customers' thermal challenges require more customization and integration than ever before. Turn-key solutions are no longer seen as a something to strive for; they are now a necessity in an expanding global market. With the highest quality certifications and the integration of temperature sensors, fuses, connectors, and controllers into their already superior flexible heater lines, Birk provides customers with a thermal partnership that assists their flexible heater and sensor needs.

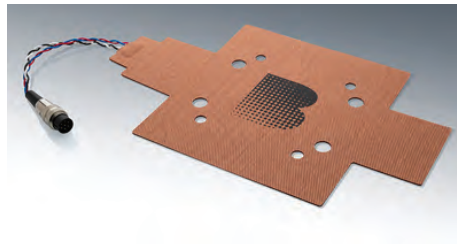
# Heater Products

## Silicone Rubber Heaters

Silicone rubber is a rugged, flexible elastomer that has excellent thermal transfer characteristics. Silicone heaters are available with either an etched-foil element or a wire-wound conductor: heaters with etched foil offer greater heat distribution, while wire-wound heaters are more economical and better suited for dynamic or curved applications. They are widely used in large industrial applications, but are seen in many other contexts as well.



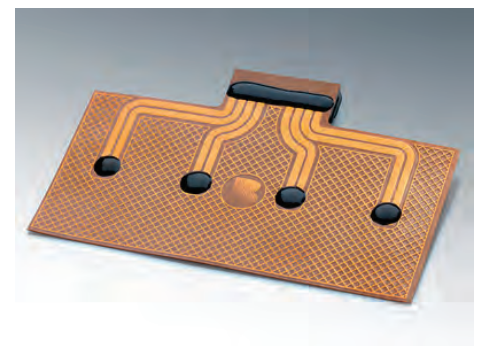
- Custom shapes up to 35"x Unlimited length
- Temperature capabilities from -40°C to 230°C
- Can have button hooks, snaps, Velcro and springs for repeat installation and removal
- UL and CSA component recognition available



## Kapton® Polyimide Heaters

Kapton® polyimide film is a thin, translucent material with superior dielectric properties. Kapton® polyimide heaters are small in profile (<.006" in some cases) and are ideal for somewhat complex geometric designs. They are widely used in many medical and defense applications, but can be adapted to any end use.

- Custom shapes up to 23"x 30" or 8"x 65"
- Temperature capabilities of FEP: -40°C to 260°C and acrylic: -40°C to 120°C
- Exceptionally small sizes and somewhat complex geometries available
- UL and CSA component recognition available





## Mica Heaters

Mica heaters are made of flexible mica sheet, and can be formed to a curved surface to accommodate many complex geometries.

Mica heaters are designed to be used in clamped applications, providing excellent heat transfer, fast warm up and quick thermal recovery times. They are suitable for applications that require higher-than-normal watt densities and fast temperature recovery. Mica flexible heaters provide maximum temperature capability.

- **High watt density capabilities up to 150W/in<sup>2</sup>**
- **Can be formed to curves and cylindrical shapes**
- **Rapid thermal recovery**
- **Very even heat distribution**



## General information applicable to all heaters

- Custom watt density available to create uniform temperature profiles
- Vulcanization or mechanical bonding to metal plates or machined parts to maximize heat transfer is available
- Heaters can include thermostats, temperature sensors and cutoffs, wiring harnesses and connectors
- Custom turnkey solutions available to reduce assembly time and vendor base
- RoHS compliance available for all heater types upon request

# Temperature Sensor Products

## Resistance Temperature Detectors

RTD sensors are highly accurate and fast-responding sensing elements. They utilize the direct relationship between resistance and temperature to provide repeatable and measurable results. RTDs have broad temperature ranges and are less susceptible to EMF resistance, vibration and temperature shock. They provide excellent long-term stability and are available in small dimensions.

### Operating temperature range:

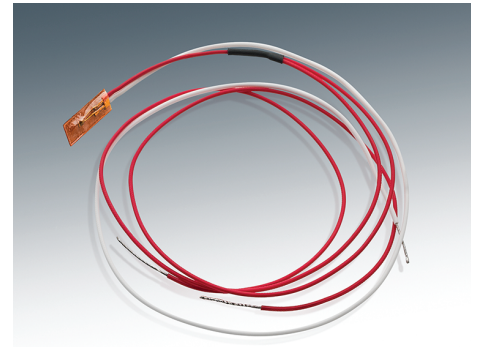
- **With platinum leads: -200°C to + 600°C**
- **With silver leads: -200°C to + 400°C**
- **Long-term stability: <0.04% at 1000h at max. temperature**
- **Characteristics curve: 3850 ppm/f**

## Thermocouple Temperature Sensors

Thermocouple sensors are temperature-sensing devices consisting of two different metal alloys that will produce a voltage directly proportional to the temperature difference between the conductors. They are self-powered sensors that do not require any external form of extraction. Thermocouple sensors are less expensive, have greater temperature ranges than a traditional RTD, provide accelerated response times and are extremely robust.

### Operating Temperature Ranges:

- **Thermocouple with Teflon insulation: (200°C)**
- **Thermocouple with fiberglass insulation: (300°C)**



## Surface Mount Sensors:

### Kapton® & Silicone Encapsulated

The RTD or thermocouple can be encapsulated with either Kapton® or silicone for superior protection of your sensor.

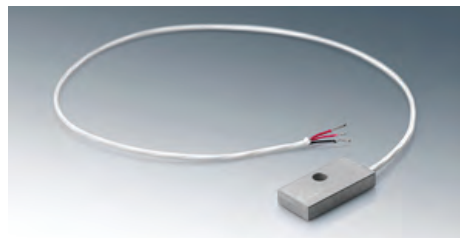
Kapton® encapsulation provides additional benefits by eliminating the fiber content found in traditional silicone. These Kapton® surface mount sensors provide water resistance and chemical protection. They are clean, durable and cost-effective. Silicone, while still cost effective, has the advantages of being waterproof and more chemical resistant than Kapton®. It is also more elastic, and provides a low-stress bond between sensor and surface.

- **Maximum temperature:**  
**260°C (Kapton®-encapsulated);**  
**200°C (silicone-encapsulated)**
- **RTD Long-term stability:**  
**<0.04% at 1000h at max.**  
**temperature**
- **RTD Characteristics curve:**  
**3850 ppm/f**
- **Backing Options: PSA, foil**  
**backing or foil backing with PSA**
- **Additional backing**  
**options available upon request**

### Bolt-On Temperature Sensors

Bolt-On temperature sensors are designed by Birk for easy installation, and are ideal for process control testing and verification of existing systems. They can be retrofitted to existing machinery, and are available with RTD or thermocouple sensors. Each sensor capability can be applied within either a brass lug or ring terminal, depending on your application needs. Standard sizes provide quick prototyping; however, customized solutions are available upon request.

- **Nickel-plated copper-ring terminals**
- **Copper/brass lugs**
- **Long-term stability: <0.04% at 1000h at max. temperature**
- Operating temperature range for both RTD and thermocouple:**
  - **with platinum leads:**  
**-200°C to + 600°C;**
  - **with silver leads:**  
**-200°C to + 400°C**



### Temperature Probes

High-temperature RTD elements or thermocouples are those that have been assembled within stainless steel casings to offer additional protection in rigorous applications and at elevated temperatures. These temperature-sensing probes are perfect for installations in channels, thermowells, organic liquids, salt solutions, acids and bases. RTD temperature probes using Teflon® lead wiring provide the ability to retrofit smaller profiles, and are extremely resistant to chemical seepage. Thermocouple temperature probes are assembled using fiberglass-lead wires to allow for higher temperature ranges and greater flexibility.



# Key Industries

## Medical

Birk supplies many types of heaters to leaders in the medical device industry. These heating systems are used in a variety of applications, from reagent testing systems to surgical tool assembly. Heaters are optimized for each application, whether it be mechanical adhesion to a surgical tool or a design to fit a small surface area with intimate contact around multiple openings. Heaters can also be designed to fit Teflon® tubing or machined parts. Birk's in-house testing team will verify compliance with medical standard ISO 13485.

### Key applications:

- **Blood analyzers**
- **Hemostasis management**
- **Small heater assemblies**
- **Surgical tool assembly**



## Defense

Birk supplies heaters to the military and defense industries in order to keep display, memory and processing field components within operating temperature specifications when ambient temperatures are below those specifications. Wiring harnesses can be used to support single or multiple heater systems, and sensors are designed to meet customers' end needs. Most defense applications require Birk's unique and advanced design capabilities. Birk is registered with ITAR and complies with its regulations.

### Key applications:

- **Ruggedized laptops and memory storage**
- **Acquisition systems**
- **Heated air handlers**
- **Vehicle and vessel lighting**
- **Battery heaters**





## Semiconductor

Birk supplies heaters to leading manufacturers in the semiconductor industry, primarily for burn-in testing of integrated circuits and for maintaining process heat at tightly defined thresholds in the manufacture of wafers. Many thermal systems employ multi-layer circuits to maximize the heating area for the heater circuit and offer rapid heat-up and close control through the use of sensors. Heaters can be mechanically bonded to the required heat sinks using proprietary process.

### Key applications:

- **Burn-in testing**
- **Valve ambient-temperature control systems**
- **Wafer handling**
- **Heated chucks**
- **Heated hoses for processing**

## Security

Birk manufactures assemblies for the security industry, to be used in various applications, from bomb detection to lens heating for camera systems mounted outdoors. For most of these applications we integrate a thermal system into an assembly or sub-assembly. Heaters can be vulcanized or laminated to machined parts, and can include sensors, switches or cutoffs. All turnkey assemblies are tested and ready to be installed upon receipt.

### Key applications:

- **Bomb detection**
- **Camera heaters**
- **Outdoor enclosure heaters**

## Industrial

Birk supplies heaters to leading manufacturers to be used in many different types of industrial applications. Heaters can be used as stand-alone pieces or vulcanized to backer plates to create permanent bonds. They can be designed to be self-regulating or integrated to a control system. Many of these systems are used in harsh, heavy-use environments to keep operating parts within temperature specifications. Our advanced designs offer the ability to produce varying watt densities to allow for even heat distribution while accommodating for heat loss.

### Key applications:

- **Battery heaters**
- **Threshold heaters for the rail industry**
- **HVAC**
- **Food processing and vending**
- **Outdoor enclosure heaters**

# Thermal Systems for the **Medical Industry**

Birk heaters are designed to:

**Replicate body (or higher) temperature for body fluid testing**

**Merge heat and sensors into surgical tools**

**Fit small surface areas with heat contact**

**Provide very even heat distribution**

## Innovating to Support **Medical Industry** Leaders

Birk supplies many types of heaters to leaders in the medical device industry. These heating systems are designed to keep materials under test within precise temperature ranges to help ensure system accuracy. Birk heaters are typically made of Kapton® polyimide film, and are optimized for each application. We provide complete assemblies, using a process that is managed entirely in-house, in order to give our customers enhanced plug-in capability. We provide mechanical attachment to machined parts, and offer the option of gold/nickel plating, which increases resistance to corrosion or oxidation. In-house testing is available to verify compliance with medical industry standards. Some proven applications include:



### — **Blood analyzers**

Birk makes custom polyimide film heaters for reagent testing. We build heaters to fit Teflon tubing and machined parts, and provide both standard and custom thin-film sensors to fit the parameters of the user's control system.

### — **Hemostasis management**

Birk develops innovative polyimide film heaters to fit small surfaces areas with close heat contact around multiple openings. Sensors are customized for our customers' end needs.

### — **Small Heater Assemblies**

Birk has heater design capability to less than 0.040" diameter and sensor capability down to 44g wire. Heaters can be housed in polyimide film tubing and are made of polyimide film or silicone. Low out-gassing heaters of up to 60 inches in length are also available.

### — **Surgical tool assembly**

We have designed unique heaters with flex heater/flex circuit integration, which provide power and signals to the same connection. They are manufactured to provide mechanical adhesion to in-house surgical tools.

# Thermal Systems for the Defense Industry

Birk heaters are designed to provide:

**Heat at operating temperatures as low as -40°C**

**Very low out-gassing**

**Very even heat distribution**

**Integrated sensors and flex circuits**

## Innovating to Support Defense Industry Leaders

Birk supplies heaters to the military and defense industry leaders. These heating systems keep components within operating temperature specifications when ambient temperatures are below those. Birk heaters are typically made of Kapton® polyimide film and optimized for each application using proprietary design and fabrication methods.

We provide complete assemblies, using a process that is completely managed in-house, in order to give our customers plug-in capability. Wiring harnesses are also available to support single or multiple heater systems. We provide mechanical attachment to machined parts, and offer the option of gold/nickel plating to increase resistance to corrosion or oxidation. Some proven applications include:

### — Ruggedized laptops & memory storage

Birk makes custom polyimide-film heaters to fit display, memory and processing components. We use standard sensors and custom thin-film sensors to fit the parameters of control systems.

### — Acquisition Systems

Birk develops innovative polyimide-film heaters to fit small surface areas with close heater contact around multiple openings. Sensors are customized to fit customers' end needs.

### — Heated air handlers

Birk creates innovative designs to fit filters and air handlers. Polyimide film and silicone heaters are both available for these designs. Low out-gassing heaters of up to 60 inches in length are also available.

### — Vehicle and vessel lighting

We develop heaters to fit the requirements of military vehicle lighting systems.

**Custom Designs. Prototypes. Fast.**



# Thermal Systems for the Semiconductor Industry

Birk heaters are designed to provide:

**Very low out-gassing**

**Excellent heat transfer to the heat sink**

**Very even heat distribution**

**Integrated sensors and flex circuits**

## Innovating to Support Industry Leaders

Birk supplies heaters to leading manufacturers in the semiconductor industry. These heaters can be made of silicone rubber, Kapton® polyimide film or mica sheet, and are usually bonded to the required heat sinks with acrylic or a high-performance fluoro-carbon film (FEP), using a proprietary process.

### **Primary uses: burn-in, wafer fabrication**

Birk heaters are used in the semiconductor industry for burn-in testing of integrated circuits and for maintaining process heat at precisely defined thresholds during the manufacture of wafers.

### **Advanced Designs**

Birk develops innovative and proprietary thermal systems with heaters bonded to heat sinks, and with sensors built into the heat sinks with flex circuits, in order to carry signals to connectors. Many of these thermal systems employ multi-layer circuits to

maximize heating area for the heater circuit.

### **High Watt Density**

Birk successfully designs circuits with up to 135 watt per square inch. These circuits offer rapid heat-up and close control, with sensors placed close to the work surface. Back-up sensors are also available in case the primary sensor fails.

### **Custom Designs. Prototypes. Fast.**

Birk specializes in "engineered solutions," not ordinary products you can get elsewhere. Our design team thrives on developing innovative approaches to complex problems. Our continuing implementation of lean processes allows us to deliver prototypes in days or weeks, where others take months. Each thermal system is custom-designed to meet the specific requirements of each integrated circuit under test.

# Value Added

## Value Added

Value-Added Assemblies and Sub-Assemblies

**Birk provides value-added assemblies with:**

- **Vulcanization or lamination to machined parts**
- **Integrated sensors, switches and cut-offs**
- **Wiring harnesses**
- **Electrical and thermal testing**
- **Flex circuit/heater integration**
- **Customer-specified connectors or components**
- **Vendor management**

### Innovating to Support Many Industries

Birk has supplied assemblies to leading manufacturers in the various industries for many years.

Let Birk integrate your thermal solution into your assembly or sub-assembly to reduce vendor lead time and shorten your vendor list.

### Providing Plug-And-Play Assemblies

Birk can reduce customers' production times and costs by supplying assemblies that are complete and tested.

Custom Designs. Prototypes. Fast. Birk specializes in "engineered solutions" (not ordinary products you can get elsewhere). Our design team thrives on developing novel approaches to complex problems, and our continuing implementation of lean processes allows us to deliver prototypes in days or weeks, where others take months.

## Birk Certifications

### ISO 9001 Ensures consistency and accuracy.

Birk is dedicated to continuous improvement and lean processing for quality and service. We ensure our heaters and thermal systems consistently meet the requirements, expectations and industrial standards of our customers.

### ISO 13485 Medical certification is a continual achievement.

Birk's continual achievement of ISO 13485 medical certification demonstrates our commitment to using standardized practices throughout all stages of a product's lifecycle, from prototype through manufacture. ISO 13485 certification translates into real savings for Birk's customers, in terms of both cost and time to market. All of the pre-qualification has already been done by ISO in Birk's facility. This gives Birk the ability to hit the ground running and deliver prototypes and products quickly while adhering to FDA regulations.

### AS 9100 renewal reflects Product and Brand Integrity

Birk's quality management system demonstrates the company's ability to continually meet the AS 9100 International Standard. Consistent quality production and lean processes are encoded in Birk's DNA; they ensure we always meet the statutory and regulatory requirements applicable to our customers. These processes are what provide the assurance of conformity for all national and international customers, and ensure their satisfaction.



