Dalton
Watt-Flex® Cartridge Heaters

Product Guide

Watt-Flex®

Custom Engineered Split-Sheath Cartridge Heating for Precision Tooling

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Watt-Flex® Cartridge Heaters

Engineering Excellence in Cartridge Heating

Dalton Electric is a 104 year old mechanical engineering firm that works with companies to jointly solution complex process heat systems. From enabling next-generation X-Ray development and nuclear microreactor testing to forming the everyday plastics we depend on, our heating solutions are trusted by the world's leading manufacturers where part conformity/reliability is crucial.

Watt-Flex® split-sheath cartridge heating technology delivers:

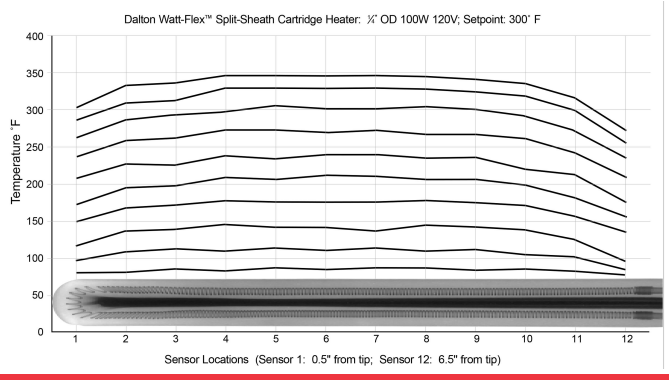
- **Faster Cycle Times**
- **Improved Finished Part Quality**
- **A Lower Total Cost of Heating**

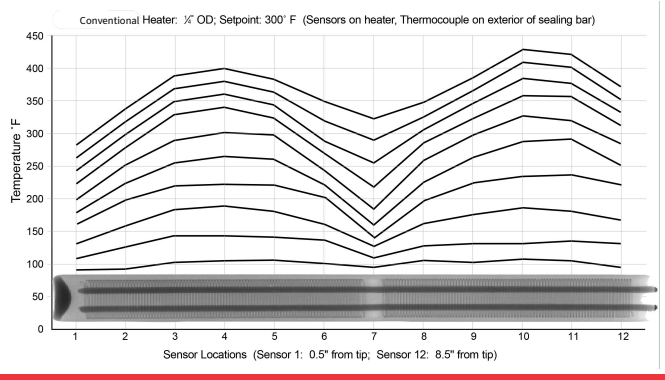
Watt-Flex® split-sheath technology is engineered for performance, built to enhance equipment output, improve product quality, and increase operational efficiency. With uniform heat distribution, extended service life, and easy removal, Watt-Flex® helps manufacturers increase throughput, improve finished part quality, yield a lower total cost of heating, and maximize return on investment, unlike conventional heaters.

At Dalton, we engineer integrated thermal solutions that help our customers push boundaries. Whether it's forming aerospace engine blades to exacting specs, accelerating production cycles in high-volume packaging, or supporting zero-defect assembly in medical and electronics manufacturing, our team works side-by-side with OEMs and end users to design heating systems that elevate process control, energy efficiency, and enhance part consistency.

Dalton has grown alongside our channel partners, expanding our capabilities, refining our processes, and staying relentlessly focused on what's next. With unwavering commitment to innovation and quality, we continue to redefine what's possible in industrial process heating.

Our customers tell us, that our Watt-Flex® split-sheath heaters are an investment in their equipment. When the heater performs, the process delivers. And when the process delivers, greater profits result.





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Watt-Flex® Cartridge Heaters

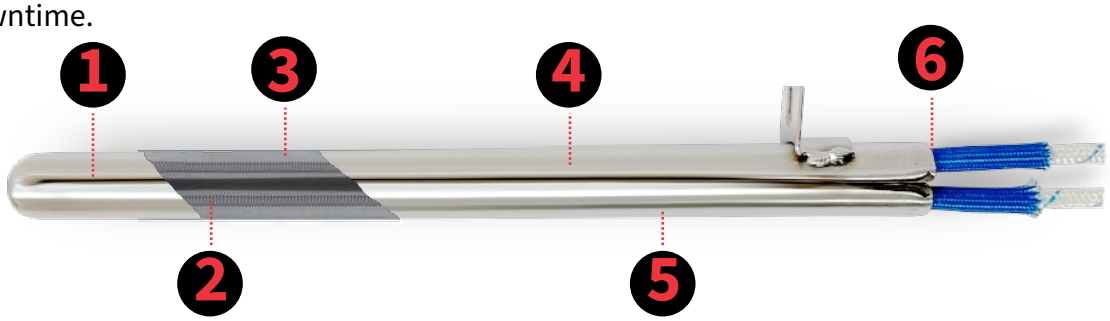
Product Overview

What is a Split-Sheath Cartridge Heater?

A split-sheath cartridge heater is designed to expand outward when energized, creating complete, uniform contact with the bore surface. Unlike conventional heaters that have insulating air gaps, the split-sheath design improves heat transfer, reduces energy loss, and reduces bore seizure.

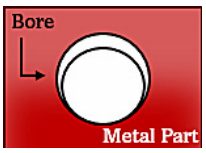
The Watt-Flex®

Dalton Electric's Watt-Flex® split-sheath cartridge heaters are engineered for precision, durability, and consistent performance in demanding thermal environments. Each heater features a continuous coil embedded in highly compacted magnesium oxide, delivering even heat distribution and long-term reliability. Watt-Flex supports enhanced part quality, reduced scrap, and increased production output. Manufacturers depending on high throughput, precision driven processes can expect higher performance and less unplanned downtime.

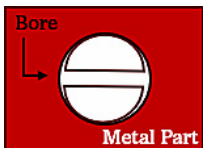


1. Split-sheath expands when energized for full bore contact and efficient heat transfer.
2. Continuous heating coil for uniform, end-to-end heat distribution.
3. Highly compacted magnesium oxide insulation increases dielectric strength and thermal conductivity.
4. Corrosion and oxidation resistant Incoloy® alloy sheath for high-temperature durability.
5. Tightly controlled sheath diameter ensures repeatable fit.
6. Cool termination lead wire exit zone protects wiring and maintains electrical integrity.

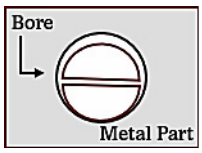
Split-Sheath Design Enables Greater Contact



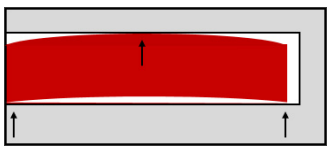
Conventional Cartridge Heater



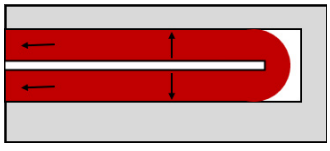
Split-Sheath Cartridge Heater Energized



Split-Sheath Cartridge Heater De-energized



Conventional Cartridge Heaters Warp



Split-Sheath Heater Halves Expand Independently

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Watt-Flex® Cartridge Heaters

Key Advantages

Accelerated Cycle Times

Conductive Heat Transfer for Fast, Efficient Heat-Up

Watt-Flex® split-sheath cartridge heaters make direct contact with the bore wall, eliminating insulating air gaps that slow heat transfer. This direct contact enables conductive heat transfer producing faster ramp-up to set point temperatures, reducing dwell times and improving thermal responsiveness. This heater's continuous coil design ensures even heating along the entire length, allowing thermal processes to run at optimal speeds without sacrificing accuracy or control. **Faster heat recovery accelerates cycle time, increasing parts-per-hour output.**

Consistent Part Quality

Uniform Temperature Distribution for Process Stability

Watt-Flex® split-sheath cartridge heaters are engineered to deliver axially symmetric heat output, ensuring even temperature distribution across the entire heating zone. This thermal uniformity minimizes hot and cold spots in tooling, reducing dimensional variability and improving process repeatability. In precision applications, such as sealing, molding, or forming, this level of thermal control directly translates to higher-quality parts with fewer defects. **Improved temperature stability leads to better part consistency, tighter tolerances, and greater yield across production runs.**

Lower Scrap Rates

Thermal Precision that Reduces Waste

Uneven heating and delayed response times from conventional cartridge heaters often lead to incomplete seals, improper curing, and scrap. Watt-Flex® improves thermal consistency and accelerates thermal transmission, which reduces variability in heat-sensitive processes. With fewer defects due to temperature drift or localized overheating, operations experience a measurable reduction in material waste and rework. **Watt-Flex® minimizes scrap by eliminating inconsistencies that impact product integrity.**

Increased Uptime & Predictable Maintenance

Engineered for Reliability and Long-Term Performance

The expanding and contracting nature of the split-sheath minimizes the risk of seizing in the bore, even after extended high-temperature operation. This eliminates bore seizure and the need for drilling out seized heaters and allows for easy removal. Combined with a robust internal coil and highly compacted magnesium oxide insulation, Watt-Flex® heaters offer significantly longer operational life and support proactive maintenance planning. **Watt-Flex® reduces unplanned downtime and enables predictable, low-effort changeouts, keeping production lines running longer with fewer interruptions.**

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Watt-Flex® Cartridge Heaters

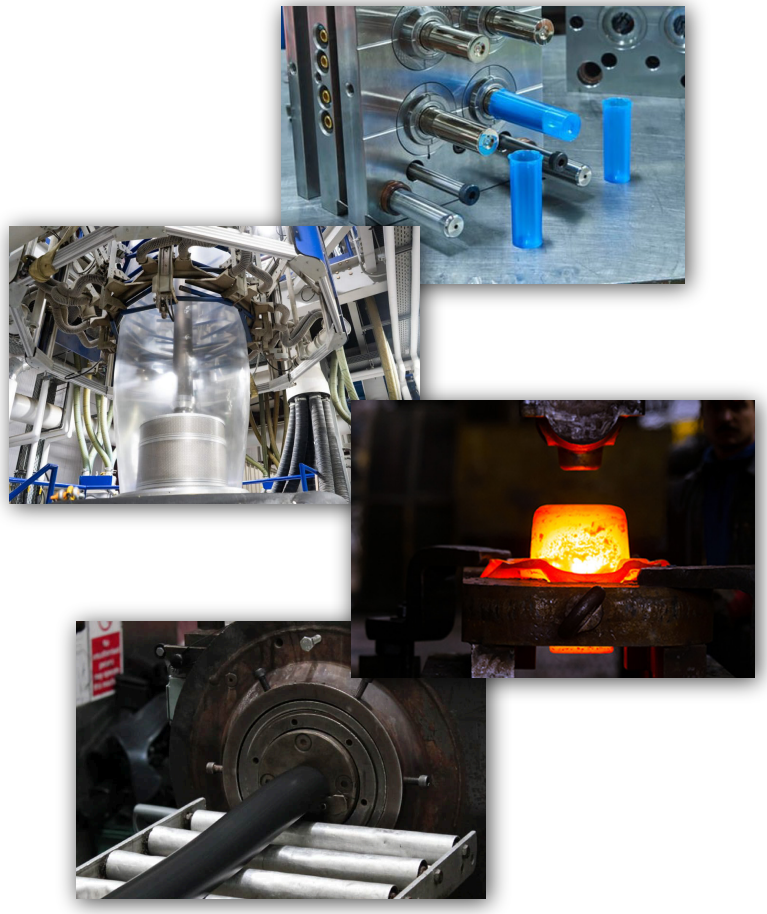
Engineered for Critical Thermal Processes

Industries We Serve

- Aerospace & Defense
- Automotive
- Energy (Alternative)
- Foundry
- Medical
- Packaging
- Petrochemical
- Electronics
- Food & Beverage
- Pharmaceutical

Applications We Support

- Die Casting
- Injection Molding
- Over Molding
- Blow Molding
- Thermoplastic Molding
- Resin Transfer Molding
- High Temperature Forming
- Superplastic Forming
- Thermoset
- Plastic Thermoforming
- Plastic Blow Film
- Plastic Welding
- Bag Sealing
- Extrusion
- Aluminum Extrusion
- Forging
- Molten Metal
- Heated Press
- Liquid Silicone Rubber
- Gas Chromatography



Typical Applications

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Performance Insight

Precision Heating Solution Transforms Poultry Packaging Performance

Challenge

A leading sustainable packaging manufacturer set out to disrupt the poultry market with a vacuum-sealed tray that was recyclable, high-performance, and shelf-life extending. To succeed, they needed a sealing solution that could keep pace with high-speed production without sacrificing quality.

Solution

Dalton Electric partnered closely with the customer's engineering team to develop a purpose-built heating system that delivered precise, scalable performance. The team:

- **Engineered** a split-sheath cartridge heater designed for evolving tray shapes and tooling
- **Delivered** uniform, controlled heat to eliminate weak seals and waste
- **Enabled** faster heat-up and recovery to support high-speed production
- **Prevented** unplanned downtime through durable split-sheath construction

Results At A Glance

- **Doubled product shelf life**, unlocking new possibilities for freshness and distribution
- **Achieved flawless seal integrity**, even at maximum production speeds
- **Eliminated unplanned downtime**, ensuring nonstop performance and peace of mind on the plant floor

Aerospace Heating Solution Lifts Composite Throughput to New Heights

Challenge

An advanced composites manufacturer supplying next-gen aerospace turbines faced increasing pressure to improve engine efficiency while achieving a 15% fuel savings in flight. The company sought to develop a lightweight composite bypass blade, which would outperform traditional alternatives. This production process required highly consistent and reliable heat delivery to ensure the precision molding of these complex components.

Solution

Dalton Electric collaborated with engineers of the press OEM to design a custom heating system built for aerospace-level reliability and performance. The team:

- **Engineered** a split-sheath cartridge heater for the complex geometry mold
- **Delivered** a consistent thermal profile to reduce cure variability and defects
- **Accelerated** ramp-up and cycle times to meet throughput demands
- **Ensured** durability of the heater under stress, cycle after cycle
- **Reduced** tooling stress by providing even, stable heating

Results At A Glance

- **Improved part consistency and structural integrity**, elevating product quality
- **Reduced scrap and rework**, maximizing material yield
- **Kept production on schedule**, with consistent on-time delivery across the supply chain
- **Extended mold life**, minimizing tooling costs and downtime

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Performance Insight

Precision Heating Solution Supports Innovative Grid Scale Energy Storage

Challenge

A global equipment manufacturer serving the energy storage industry needed a heating solution for their first of its kind energy storage battery technology. The customer demanded high temperature, consistent cycle times and throughput, reliable thermal control for critical applications, and seamless integration with evolving tooling designs. The solution had to support long-term uptime, reduce scrap, and maintain process reliability across global installations.

Solution

Dalton Electric provided a Watt-Flex® split-sheath cartridge heating solution engineered to meet the demands of high-output battery manufacturing. The system:

- **Delivered** a high temperature durable heating element
- **Enabled** faster thermal response to match aggressive cycle times
- **Delivered** uniform heat across tooling to ensure part consistency

Results At A Glance

- **Repeatable cycles** to support higher output and quality
- **Reduced downtime** and field service across global installations
- **Lower scrap rates** through improved thermal control

Custom Heating Solution Delivered in 10 Days for Rolling Press

Challenge

A press manufacturer was launching a new continuous press system with a uniquely complex heat profile. The application required high wattage at both ends, lower wattage in the center, even, stable heat across a constantly moving surface, fast turnaround and zero tolerance for error. The dynamic thermal loads made conventional heating systems difficult to model and risky to implement. Any delay could jeopardize launch timelines and production quality.

Solution

The Dalton Electric accelerated the entire process, from engineering to production, to deliver a complete, ready-to-install heating system in just 10 days. The team:

- **Designed** a custom Watt-Flex® heater with precision-tuned power distribution
- **Enabled** conductive, uniform heat with continuous coil expansion across variable loads
- **Aligned** the heater design with a press geometry in real time by collaborating with a mold partner
- **Delivered** a field-ready solution with no adjustments required at installation

Results At A Glance

- **10-day turnaround** from concept to on-site delivery
- **Met all thermal parameters** for continuous, high-speed operation
- **Zero on-site adjustments required**, minimizing installation time and risk
- **Built customer trust**, reinforcing Dalton as a fast, reliable manufacturer

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Watt-Flex® Cartridge Heaters

Product FAQ

Q: What are the differences between a Watt-Flex® split-sheath cartridge heater design and conventional cartridge heater designs?

A:

- Split-sheath expansion: Both legs of the heater expand when energized, ensuring full sheath-to-bore contact for fast, efficient, conductive heat transfer.
- Contraction during cool-down: Both legs of the heater contract when de-energized, reducing the likelihood of bore seizure and allowing for easier removal.
- Continuous coil design: Provides even heating from the tip to terminal, eliminating cold spots common in conventional ceramic-core designs.
- Extended service life: Typically lasts twice as long as conventional cartridge heaters in similar applications.

Q: What is the typical watt density range for Watt-Flex® split-sheath cartridge heaters?

A: Watt-Flex® split-sheath cartridge heaters are engineered to operate across a wide watt density range to meet diverse application needs. Please refer to the specifications on page 10 for detailed watt density values.

Q: We currently use standard cartridge heaters, why should we consider switching to Watt-Flex® split-sheath cartridge heaters?

A: Watt-Flex® heaters incorporate two design features that enhance part consistency. The continuous coil produces even heat along the entire length of the heater, eliminating cold or hot spots. The split-sheath enables the heater legs expansion to make direct bore contact, producing efficient conductive heat transfer and more consistent tool or platen temperatures.

Q: How can I justify the higher cost of Watt-Flex® split-sheath cartridge heaters to my customers or procurement team?

A: Watt-Flex® heaters are a strategic investment in operational performance. They accelerate equipment cycle time and increase throughput, reduce scrap, minimize downtime, and deliver a higher return on investment. In contrast, conventional cartridge heaters by design generate uneven heat, have shorter lifespans, and are prone to seizing in the bore.

Q: What are your typical lead times for Watt-Flex® split-sheath cartridge heaters?

A: Standard lead time is 2 to 3 weeks. Expedited delivery options are available upon request.

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Watt-Flex® Cartridge Heaters

Process FAQ

Q: Why is heating performance critical in industrial precision applications?

A: Consistent, high-performance heating shortens cycle times, which reduces production costs and increases throughput. At the same time, it enhances part quality, fit, and finish, critical to precision manufacturing.

Q: What are the consequences of inconsistent heat in manufacturing processes?

A: Inconsistent or uneven heat can slow production, reduce part quality, and increase scrap rates. These issues are common with conventional heater designs that cannot maintain uniform thermal distribution.

Q: How can a Watt-Flex® split-sheath cartridge heaters improve the performance of my processing equipment?

A: By maintaining full contact with the bore, Watt-Flex® heaters maximize conductive heat transfer, leading to faster startup times, reduced cycle times, and higher throughput. This performance boost allows processing equipment to operate more efficiently and meet higher production demands.

Q: How can a Watt-Flex® split-sheath cartridge heating improve the quality of my end product?

A: The continuous coil and split-sheath in the Watt-Flex® design ensures even heat profiles and uniform heat transfer across the entire platen or tool. The resulting thermal consistency improves dimensional accuracy by minimizing shrinkage, warpage, and cure distortion.

Q: What are the best suited environments for Watt-Flex® split-sheath cartridge heaters?

A: The environments best suited for Watt-Flex® split-sheath heaters are:

- Temperatures above 400F (204C), up to 1,652F (900C)
- Lengths above 6" (152mm)
- OD 3/8 (10mm) and above
- High watt density range

Not recommended for:

- Immersion applications
- Open air (radiant) heating applications

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Technical Specifications

Primary Specifications

Temperature Rating: 1652°F (900°C)

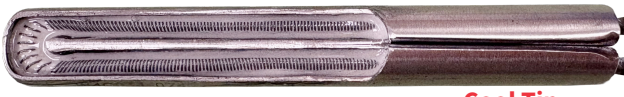
Diameter	Nominal Diameters (1)	Rec. Bore Size	Min. Length (2)	Max. Length (2)	Standard Cold Section Length at Terminal	Max. Voltage	Max. Watt Density (W/in^2)
1/4"	0.245"	0.257"	1"	20"	5/16"	240	225
3/8"	0.370"	0.382"	1 1/2"	36"	3/8"	240	200
1/2"	0.495"	0.507"	2"	50"	5/8"	480	175
5/8"	0.620"	0.632"	2 1/2"	72"	5/8"	600	150
3/4"	0.745"	0.757"	3 1/2"	90"	5/8"	600	100
1"	0.993"	1.007"	8"	60"	1"	600	75
8mm	7.875mm	8.177mm	1 1/2"	16 1/2"	5/16"	240	200
10mm	9.875mm	10.177mm	1 1/2"	27 1/2"	3/8"	240	200
12mm	11.875mm	12.177mm	2"	26 3/4"	5/8"	480	175
12.5mm	12.375mm	12.677mm	2"	38 5/8"	5/8"	480	175
16mm	15.875mm	16.177mm	2 1/2"	90"	5/8"	600	150
20mm	19.875mm	20.177mm	4"	39 3/8"	5/8"	600	100
25mm	24.875mm	25.177mm	8"	16 5/8"	1"	600	75

(1) Tolerances: +/- 0.002" (1/4" to 3/4"); +/- 0.0025" (1"); +/_ 0.05mm (8mm -20mm); +/- 0.06mm (25mm)

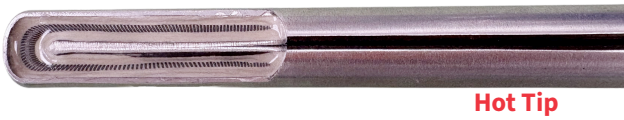
(2) Tolerances: +/- 3% with 3/32" minimum; +/- 2% above 20" (500mm)

Heater Options

- Hot or Cool Tip
- Ceramic or RTV Potting for Contaminant Protection
- Distributed Wattage



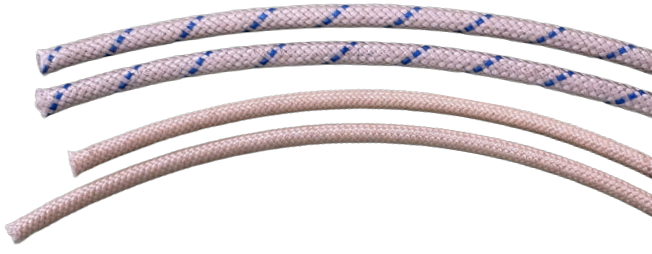
Cool Tip



Hot Tip

Lead Wire Options

- Standard Leads (Fiberglass & Teflon)
- High-Temperature Leads (Fiberglass)
- Teflon Leads
- Solid Pins
- Threaded Post Terminal
- Extruded Silicone



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Custom Configurations

Lead Wire Protection Options

- Stainless Steel Flexible Conduit
- Stainless Steel Braid
- Shrink Tube
- SS Convoluted Tubing

Connectors & Sleeving

- Quick Disconnect Lead Termination
- Ring Terminal Lead Termination
- Silicone Sleeving
- Very High Temp. (VHT) Sleeving
- Fiberglass Sleeving

Heater Accessories

- Straight Header
- Right Angle Header
- Clip Support
- Mounting Bracket
- Flange
- External Thermocouple (Side or Center Grooves)
- NPT Fitting
- Threaded Removal Collar

Thousands of cartridge heater configurations, available to ship within two weeks.

Contact Us

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