Complete Thermal Systems to Optimize Your Process

WATLOW®

watlow makes it possible

The World's Leading Companies Start With Watlow

Watlow® is the industry leader in the design, manufacture and integration of complete thermal systems including electric heaters, temperature sensors, temperature controllers, power controllers and supporting software.

Watlow's spirit of innovation began in 1922 when founder, Louis Desloge Sr., replaced steam heat with electric heating elements. Today, Watlow is proud to be the industry leader in the development of unparalleled thermal systems for a wide variety of applications. From single components to high performance systems, our solutions are what you need to succeed.

Watlow offers:

- Superior product performance
- Over 400 technical resources worldwide providing customized and standard thermal solutions to diverse industries
- Dedication to research and development of new technologies
- Over 90 years of industry experience understanding and solving the complexities of thermal system challenges
- Compliance with many certification schemes including UL®, CE, NEMA, IECEx, etc. Contact your Watlow representative for specific details

Watlow Makes It Possible

WATLOW®

A Tradition of Engineering Excellence

1924 Watlow logo

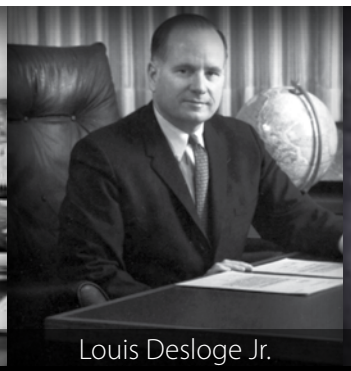
Watlow has been owned and managed by the Desloge family for all of its 90 plus year history. Three consecutive generations have guided the company on its leadership path, with a fourth generation preparing to continue the tradition.

The company employs 2000 team members working in 12 manufacturing and technology centers in the United States, Mexico, Europe and Asia. We have sales offices in 16 countries around the world and a global distributor network.

Watlow has adopted the Lean philosophy of manufacturing to provide products and services more efficiently while eliminating waste; therefore, producing greater value for our customers.


Louis Desloge Sr.


George Desloge

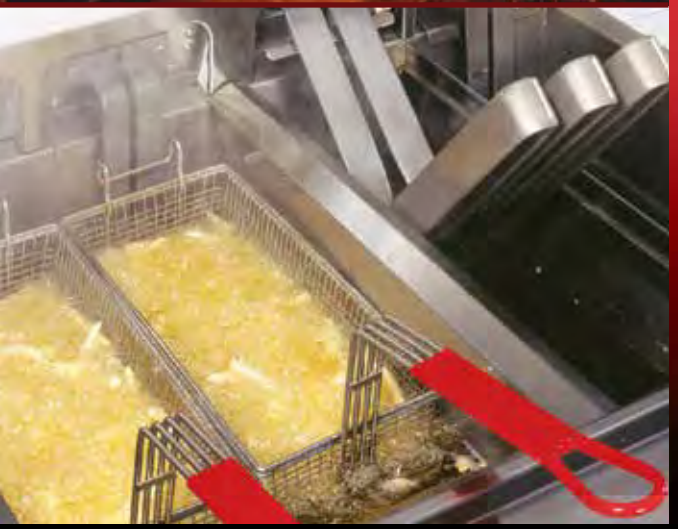

Louis Desloge Jr.


Peter Desloge

"At Watlow, we are constantly driven to do more to help our customers. We take on big technical challenges. We are committed to projects that help our fellow human beings and we strive to learn more."

Peter Desloge
Chairman, Chief Executive Officer
and President of Watlow

WATLOW®



A Deep Understanding of Customer Applications

At Watlow we customize our products based on experience and knowledge of how they perform in a variety of applications. Watlow's advanced heater, sensor and controller products are developed into comprehensive thermal solutions for a variety of industries.

Semiconductor Processing

Watlow's thermal systems are used to precisely control temperature at critical interfaces in the manufacturing of integrated circuits. Within the process chamber our innovations impact important parameters such as system cycle time and temperature uniformity such that wafers can be processed faster and with higher quality.

Energy Processes

Watlow uses its thermal expertise to improve the performance, life and safety of processing equipment while reducing the overall cost of ownership. We supply thermal products, as well as engineering design services for many applications including carbon capture and sequestration (CCS), enhanced oil recovery (EOR), nuclear power, catalytic cracking and regeneration, natural gas processing and others.

Foodservice Equipment

Watlow supplies thermal solutions for fryers, grills, ovens, dishwashers, steamers and holding equipment in restaurant equipment all over the world. Using Watlow's foodservice equipment solutions enables benefits such as energy-efficient cooking, reduced maintenance, faster cooking times and consistent and reliable food quality.

Life Sciences

With 50 years of experience in the life sciences' industries, Watlow is a leader in designing, manufacturing and supporting sophisticated thermal solutions to meet medical advancements and new industry requirements. Watlow's engineered thermal solutions improve diagnosis accuracy and patient comfort. Watlow provides solutions for patient care equipment, surgical devices, clinical diagnostic instruments and more.

Diesel Emissions

Watlow's thermal solutions optimize the performance of diesel engines and aftertreatment systems. Partnering with Watlow helps increase fuel economy, reduce harmful emissions, reduce the size and cost of the aftertreatment system and improve aftertreatment system performance.

Chambers / Furnaces / Ovens

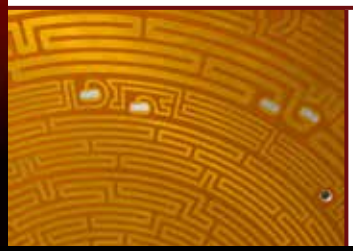
Watlow's heater, sensor and controller products can be easily customized to fit the exacting specifications of the chambers / furnaces / ovens market, without the high cost and long wait times of many custom products. Watlow's solutions are ready to use, but are modular, scalable and flexible. Watlow offers many benefits to the industry including one-stop thermal shopping, technical expertise and highly reliable solutions.

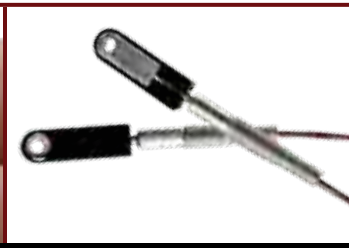
Product Leadership

1924 Watlow logo

Watlow was founded on innovation and we continue this tradition through the work we do every day. We currently hold more than 450 patents and our team members are encouraged to use their strengths to provide break-through products and customized services.

Watlow is a product leadership company that is backed by operational excellence, and we understand that being the best takes intelligence, creativity and responsibility. Partnering with Watlow provides you with the competitive edge needed to get your products to market first. We work with our customers and aggressively develop solutions that far exceed any competitive offerings.





Watlow offers a wide range of high-performance heater products that can be ordered off the shelf or customized for almost any application. Watlow's thermal solutions can help reduce equipment downtime, lower overall system cost and get your product to market faster.

HEATERS

Cartridge/Insertion Heaters

Watlow designed and manufactured the first swaged cartridge heater and revolutionized the heating element industry.

With premium materials and tight manufacturing controls, Watlow's cartridge/insertion heaters provide superior heat transfer, uniform temperatures, resistance to oxidation and corrosion and long life even at high temperatures. Customers benefit from Watlow's custom designs, on-time delivery, quality and technical assistance.

MULTICELL™
Tubular Heaters

FIREROD®
Cartridge Heaters

Product	Material	Maximum Operating Temperatures		Maximum Watt Densities	
		°F	°C	W/in²	W/cm²
FIREROD Cartridge Heaters	Alloy 800	1400	760	400	62
	Stainless steel	1000	538	400	62
High-Temperature FIREROD	Alloy 800	1800	982	100	15.5
Metric FIREROD Cartridge Heaters	Alloy 800	1400	760	330	50
MULTICELL Tubular Heaters	Alloy 600/800	2050	1120	30	4.6

Applications

- *Analytical instrumentation*
- *Semiconductor equipment*
- *Mold die and platen heating*
- *Burn-in test systems*
- *Foodservice equipment*
- *Hot plates*
- *Seal bars*
- *Medical equipment*
- *Aerospace equipment*

Tubular Heaters

Single- and double-ended tubular heaters lend themselves to virtually the entire range of immersion and air heating applications. They have a variety of mounting and termination options that make them ideal for industrial applications. Watlow tubular heaters are UL® and CSA component recognized up to 240V.

MULTICOIL™ Heaters

FIREBAR® Flat Tubular Heater

WATROD™ Round Tubular Heater

Product	Material	Maximum Operating Temperatures		Maximum Watt Densities	
		°F	°C	W/in²	W/cm²
WATROD	Alloy 840	1600	870	45	6.9
	Stainless steel	1200	650	60	9.3
	Steel	750	400	45	6.9
	Alloy 800	350	175	60	9.3
	Alloy 600	1800	982	45	6.9
High-Temperature Tubular Heaters	Alloy 600	1800	982	45	6.9
MULTICOIL	Alloy 840	1400	760	45	6.9
	304 Stainless steel	1200	650	45	6.9
	316 Stainless steel	1200	650	45	6.9
Milled Groove Tubular	304 Stainless steel	1200	650	60	9.3
	Alloy 800	1600	870	60	9.3
FIREBAR	Alloy 800	1400	760	60	9.3
	304 Stainless steel	1200	650	60	9.3
FINBAR Finned Heater	304 Stainless steel	1200	650	50	7.7

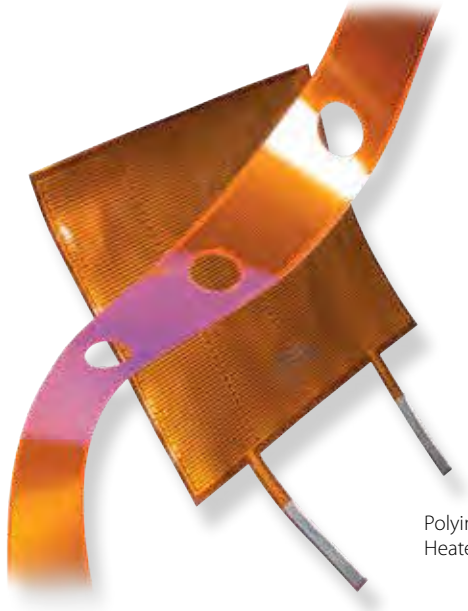
Consult a Watlow representative for suggested watt densities for specific applications. Values in this table are maximums and may not be suitable for all applications.

Applications

- *Furnaces and ovens*
- *Molten salt baths*
- *Foodservice equipment*
- *Semiconductor equipment*
- *Die casting equipment*
- *Metal melt and holding*
- *Fluidized beds*
- *Boilers*
- *Radiant heating*
- *Process air heating*
- *Drying and warming*

Flexible Heaters

Flexible heaters from Watlow are thin, bendable and shaped to fit almost any application. Heat can be applied to the most complex shapes, geometries, curves and pipes conceivable without sacrificing efficiency or dependability.



Polyimide Heaters

Silicone Rubber Heaters

Modular Gas and Pump Line Heaters

Product	Material	Maximum Operating Temperatures		Maximum Watt Densities	
		°F	°C	W/in²	W/cm²
Wire Wound	Silicone rubber	500	260	40	6.2
Etched Foil	Silicone rubber	500	260	80	12.4
Composite	Silicone rubber	500	260	5	0.8
STRETCH-TO-LENGTH	Silicone rubber	392	200	2	0.31
Gas Line	Silicone rubber	392	200	2.5	0.4
Pump Line	Silicone rubber	392	200	1.25	0.19
Polyimide	Polyimide	392	200	70	10.9

Applications

- *Medical equipment*
- *Freeze protection*
- *Battery heating*
- *Foodservice equipment*
- *HVAC*
- *Analytical equipment*
- *Aerospace equipment*
- *Transportation equipment*
- *Semiconductor equipment*
- *Any application requiring a flexible shape or design*

Immersion Heaters

Watlow's immersion heaters are designed primarily for direct immersion in liquids such as water, oils, solvents and process solutions, molten materials as well as air and gases. By generating all the heat within the liquid or process, these heaters are virtually 100 percent energy efficient. UL® and CSA component recognized elements are available.

Screw Plug
Immersion Heater

FIREROD
Immersion Heaters

WATROD ANSI
Flange Heater

Product	Material	Maximum Operating Temperatures		Maximum Watt Densities	
		°F	°C	W/in²	W/cm²
Screw Plug Immersion Heaters	Alloy 800	1600	870	120	18.6
	Stainless steel	1200	650	120	18.6
	Steel	750	400	120	18.6
Over-the-Side Heaters	Alloy 800	1600	870	60	9.3
	Titanium	1400	760	43	6.7
	Steel	750	400	23	3.6
	316 Stainless steel	1200	650	60	9.3
ANSI Flange Immersion Heaters	Alloy 800	1600	870	100	15.5
	Stainless steel	1200	650	100	15.5
	Steel	750	400	100	15.5
Flange Immersion Heaters	Alloy 800	1600	870	100	15.5
	304 Stainless steel	1200	650	100	15.5
	Steel	750	400	30	4.7
FIREROD Immersion Heaters	Alloy 800	212	100	300	46.5

Applications

- *Oil and gas field equipment*
- *Open tanks and heat treat baths*
- *Textile drying*
- *Food preparation*
- *Heat transfer and lube oil systems*
- *Semiconductor processing equipment*
- *Precision cleaning equipment*
- *Power generation systems*
- *Emission control systems*
- *Supercritical fluid heating*
- *In-line water boilers*
- *Laboratory equipment*

Circulation Heaters

Watlow's circulation heaters provide a ready-made means to install electric heating with a minimal amount of time and labor. This is accomplished by combining heating elements, vessel, insulation, terminal enclosure, mounting brackets and inlet and outlet connections into a complete assembly. These heaters are ideal for applications such as purified and inert gases, supercritical fluids and liquids like de-ionized water for use in semiconductor and electronics industries as well as for general liquid and gas heating applications.

WATROD and FIREBAR
Circulation Heater

STARFLOW™
Circulation Heater

Product	Material	Maximum Operating Temperatures		Maximum Watt Densities	
		°F	°C	W/in²	W/cm²
STARFLOW Circulation Heaters	316L Stainless steel	1000	537	30	4.6
WATROD and FIREBAR Circulation Heaters	Alloy 800	1600	870	120	18.6
	Stainless steel	1200	650	120	18.6
	Steel	750	400	120	18.6
	Alloy 840	350	175	120	18.6

Applications

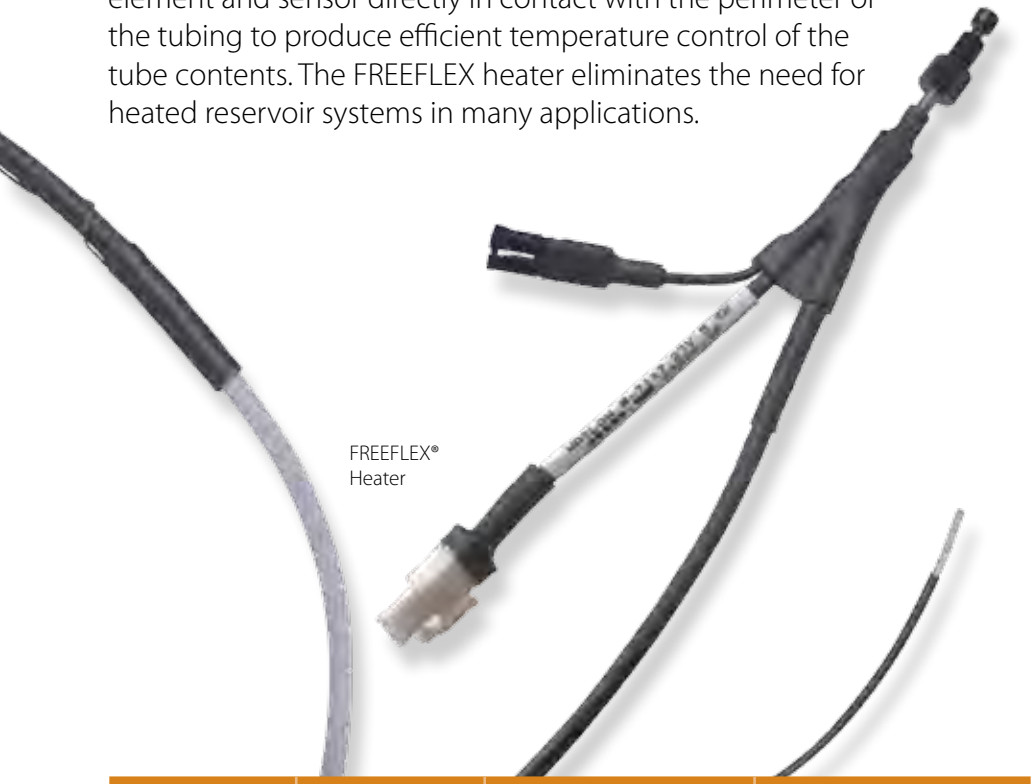
- *Oil and gas field equipment*
- *Solvent replacement*
- *Biomass extraction*
- *Refrigeration systems*
- *Epoxy resin components*
- *Refineries and petrochemical plants*
- *Chemical and industrial gas plants*
- *HVAC duct heating*
- *Open tanks and heat treat baths*
- *Semiconductor processing equipment*
- *Precision cleaning equipment*
- *Water purification systems*
- *Supercritical fluid heating*
- *In-line water boilers*
- *Sample preheating*
- *Aggressive chemicals*

Fluid Delivery Heaters

Watlow's innovative fluid delivery heaters produce consistent results by reducing temperature and viscosity variations.

Watlow's syringe heater was developed for the needs of medical injection applications. The special design provides a heated fluid and drug delivery system solution with long operational life, which improves system reliability while reducing equipment down time.

The unique design of Watlow's FREEFLEX® heater places the heating element and sensor directly in contact with the perimeter of the tubing to produce efficient temperature control of the tube contents. The FREEFLEX heater eliminates the need for heated reservoir systems in many applications.



FREEFLEX®
Heater

Syringe
Heater

Product	Material	Maximum Operating Temperatures		Maximum Watt Densities	
		°F	°C	W/in²	W/cm²
FREEFLEX Heated Tubing	Polymeric	212	100	10	1.5
Syringe Heaters	Polycarbonate laminate	185	85	2	0.3

Applications

- *Automated clinical analyzers*
- *Medical injection*
- *Wafer drying equipment*
- *Water purification systems*

Air Heaters

Watlow has developed a line of process air heaters that offer performance and versatility in medium to low temperature applications. This rugged and reliable line of industrial heaters efficiently transfers heat.

375 Finned Strip Heater

Silicone Rubber Enclosure Heater

WATROD Enclosure Heater

Product	Material	Maximum Operating Temperatures		Maximum Watt Densities	
		°F	°C	W/in²	W/cm²
Duct Heaters	Alloy 840	1200	650	45	7.0
375 Finned Strip Heaters	Aluminized steel	1100	595	33	5.1
FINBAR Finned Heaters	304 Stainless steel	1200	650	50	7.7
FIREROD Cartridge Heaters	Alloy 800	1400	760	400	62
Silicone Rubber Enclosure Heaters	Silicone rubber	500	260	10	1.6
WATROD Enclosure Heaters	Aluminized steel	390	200	15	2.3

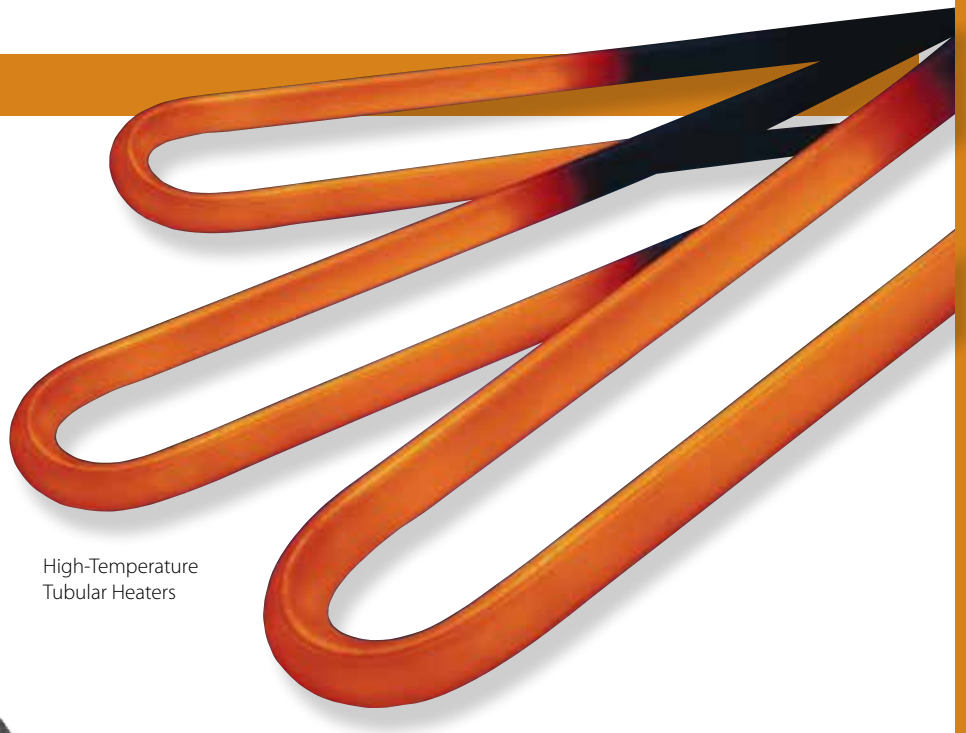
Duct Heater

Applications

- *Drying ovens*
- *Autoclaves*
- *HVAC*
- *Heat treating*
- *Condensation protection*
- *Shrink tunnels*
- *Incubators*
- *Ink drying*
- *Control panel and electronics*
- *Foodservice warming equipment*
- *Freeze protection*
- *Duct, space and air heating*

High-Temperature Heaters

Watlow leads the industry in developing high-temperature heating technologies and products in various sizes and constructions to fit a broad range of processes and applications. Watlow's MULTICELL, FIREROD, high-temperature tubular and ceramic fiber heaters offer capabilities such as ultra-fast ramp rates, precise temperature uniformity, zoned heating and high temperatures. Heaters are sized and designed to accommodate small to large applications and various environmental conditions.



High-Temperature Tubular Heaters

MULTICELL Insertion Heater

High-Temperature FIREROD Cartridge Heater

Ceramic Fiber Heaters

Product	Material	Maximum Operating Temperatures		Maximum Watt Densities	
		°F	°C	W/in²	W/cm²
MULTICELL Insertion Heaters	Alloy 800	2050	1120	30	4.6
High-Temperature FIREROD	Alloy 800	1600	871	100	15.5
High-Temperature Tubular Heaters	Alloy 600	1800	982	45	6.9
Ceramic Fiber Heaters	Ceramic fiber	2200	1204	30	4.6

Applications

- *Hot isothermal forming*
- *Heated platens*
- *Super plastic forming*
- *Diffusion bonding*
- *Thermo plastic*
- *High-temperature ovens and furnaces*
- *Radiant heating*
- *Environmental volatile organic compounds abatement*
- *Vacuum applications*

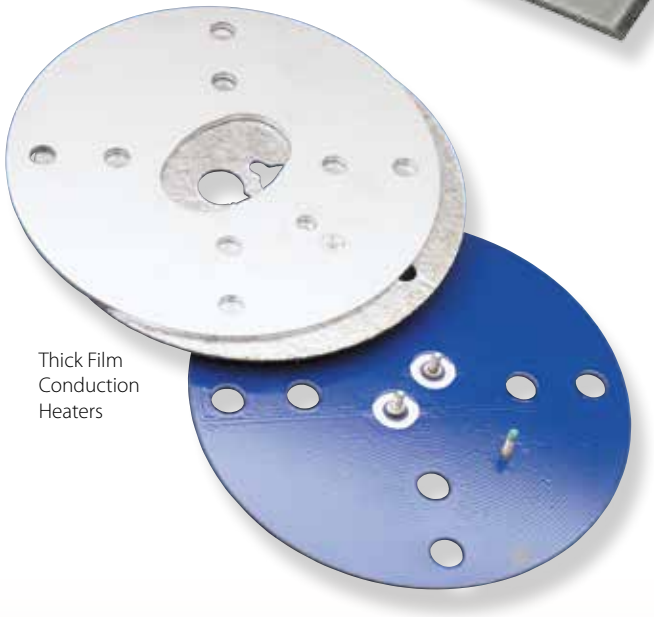
Specialty Heaters

Watlow's specialty heaters are designed for thermal applications where high performance, fast response and uniformity are essential.

Specialty heaters from Watlow have design flexibility to meet different applications requiring different construction methods. This flexibility allows the heaters to be configured in a variety of shapes and sizes depending on the application.

Coil/Cable Heaters

ULTRAMIC® Advanced Ceramic Heaters



Thick Film Conduction Heaters

Product	Material	Maximum Operating Temperatures		Maximum Watt Densities	
		°F	°C	W/in²	W/cm²
ULTRAMIC Advanced Ceramic Heaters	Aluminum nitride	1112	600	1000	155
Thick Film Conduction Heaters	430 Stainless steel	1025	550	75	11.6
Coil/Cable Heaters	304 Stainless steel or Alloy 600	1200	650	30	4.6

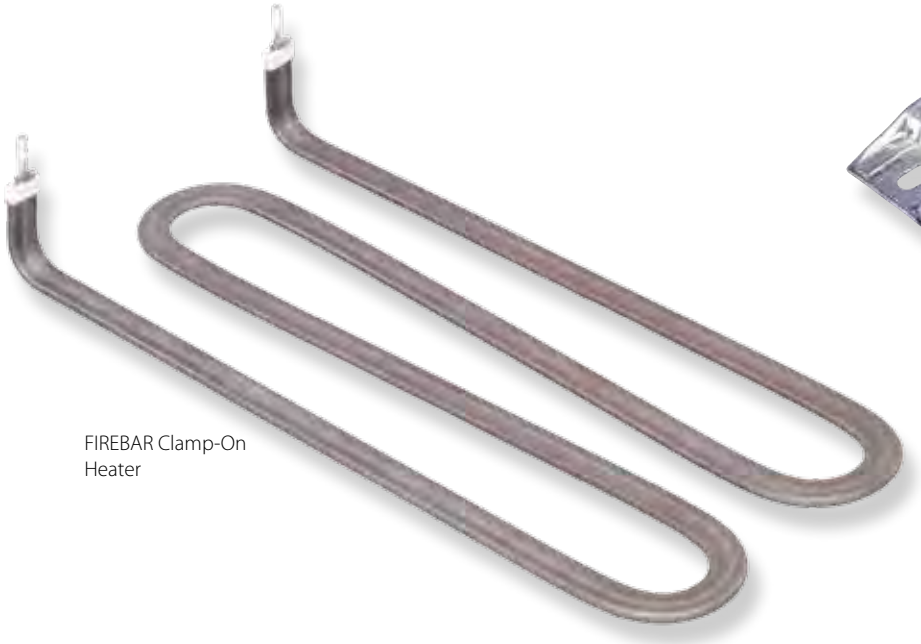
Applications

- *Wire and die bonding*
- *Integrated circuit chip testing*
- *Mass spectrometry*
- *Medical devices*
- *Foodservice warming cabinets*
- *Load dump resistors*
- *Air heating*
- *Hot metal forming*
- *Foodservice processing equipment*
- *Sealing and cutting*
- *Plastics injection molding nozzles*

Strip/Clamp-On Heaters

Watlow's strip/clamp-on heaters are a versatile solution for a number of applications. They can be bolted or clamped to a solid surface for freeze and moisture protection, food warming and other applications.

375 Strip Heaters



FIREBAR Clamp-On Heater

Mineral Insulated Strip Heaters

Product	Material	Maximum Operating Temperatures		Maximum Watt Densities	
		°F	°C	W/in²	W/cm²
Mineral Insulated Strip Heaters	304 Stainless steel	1400	760	140	21.7
375 Strip Heaters	Aluminized steel	1100	595	100	15.5
FIREBAR Clamp-On Heaters	Alloy 800	1400	760	120	18.6
	304 Stainless steel	1200	650	120	18.6
Thick Film Conduction Heaters	430 Stainless steel	1025	550	75	11.6

Applications

- *Dies and molds*
- *Tank and platen heating*
- *Thermoforming*
- *Packaging and sealing equipment*
- *Ovens*
- *Foodservice warming equipment*
- *Vulcanizing presses*
- *Incubators*
- *Autoclaves*
- *Freeze and moisture protection*
- *Plastics processing*

Band/Barrel Heaters

The mineral insulated (MI) band heater from Watlow is a high-performance heater that incorporates Watlow's exclusive mineral insulation. This material offers much higher thermal conductivity than mica and hard ceramic insulators that are used in conventional heaters.

Mineral Insulated
Band Heaters

Product	Material	Maximum Operating Temperatures		Maximum Watt Densities	
		°F	°C	W/in²	W/cm²
Mineral Insulated Band Heaters	Stainless steel	1400	760	100	15.5

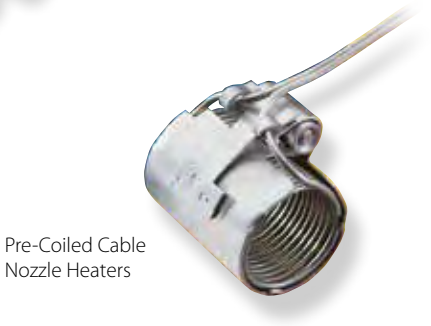
Applications

- *Extruders*
- *Blown film dies*
- *Cylinder heating applications*
- *Injection molding machines*

Nozzle Heaters

Watlow offers a full line of compact nozzle heaters for a variety of industries such as plastics and analytical. While every heater has a unique set of capabilities, each nozzle heater is designed to meet specific application requirements. Whether an application requires high performance, high temperature or high watt density Watlow has the heater to fit the application.

Mineral Insulated
Nozzle Heaters



Pre-Coiled Cable
Nozzle Heaters

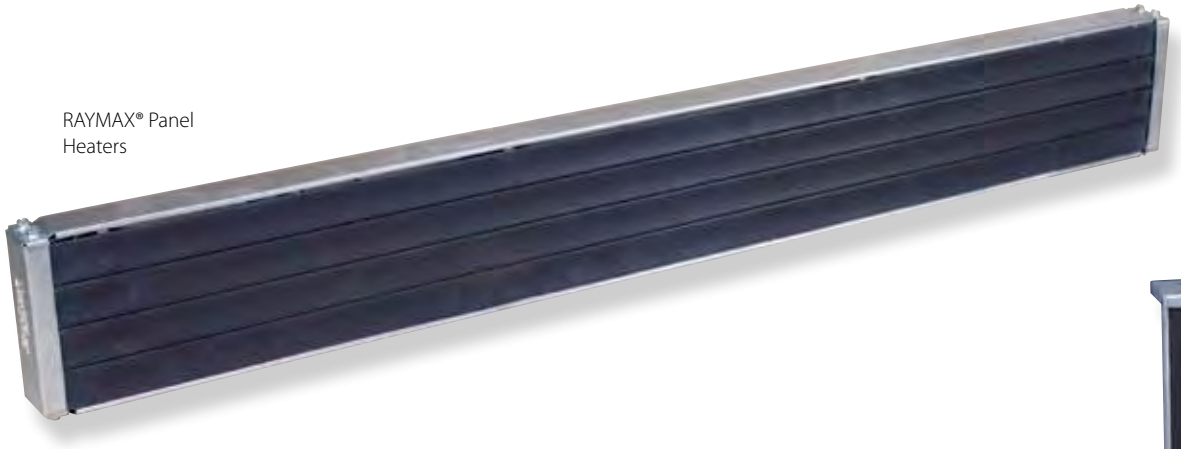
Product	Material	Maximum Operating Temperatures		Maximum Watt Densities	
		°F	°C	W/in²	W/cm²
Mineral Insulated Nozzle Heaters	Stainless steel	1400	760	230	35.6
Pre-Coiled Cable Nozzle Heaters	Stainless steel	1200	650	152	23.5

Applications

- *Hot runner nozzles*
- *Hot runner molds*
- *Analytical instrumentation*
- *Extruders*
- *Blown film dies*
- *Plastics injection molding*

Radiant Heaters

Watlow's diverse radiant heater line provides a solution for almost any application requiring radiant heat. Watlow's capabilities cover a wide range of needs, from contamination-resistant panel heaters to rugged tubular elements and high temperature ceramic fiber panels.



RAYMAX® Panel Heaters

RAYMAX Panel Heaters

Product	Material	Maximum Operating Temperatures		Maximum Watt Densities	
		°F	°C	W/in²	W/cm²
RAYMAX Panel Heaters	Stainless steel or Aluminized steel	2200	1204	30	4.7
Mineral Insulated (MI) Band and Strip Emitters	Stainless steel	1300	700	30	4.7

Applications

- *Thermoforming*
- *Foodservice warming equipment*
- *Paint and epoxy curing*
- *Heat treating*
- *Tube ovens*
- *Tempering and annealing processes*
- *Small spot heating*
- *Rotating drums and rollers*
- *Heat shrinking and curing wire coatings*
- *Laminating wheels*
- *High-temperature furnaces*

Thermostats and Accessories

Watlow designs and manufactures all of the components of a thermal system. This allows Watlow to recommend, develop and deliver the optimal thermal solution for our customer's equipment.

ST Thermostats

SERIES EHG®

SERIES EHG SL10

Product	Description
SERIES EHG	Includes a compact temperature control, thermocouple sensor and power switching device integrated into a heater's power cord used to control process temperatures
SERIES EHG SL10 **SERIES EHG CL**	Integrates a heater, an adjustable set point temperature controller, high/low temperature alert, power switching device and high temperature safety limit all within the power cord system
ST10 and ST207	Pre-set thermostats used with flexible heaters are available mounted to the heater or as a separate device used to control processes
Bulb and Capillary	Regulates temperature in non-critical applications within a preset range and cycles heaters on and off
Protective Wells	Provides protection for thermostat bulbs and other sensors while directly immersed in process fluids

Applications

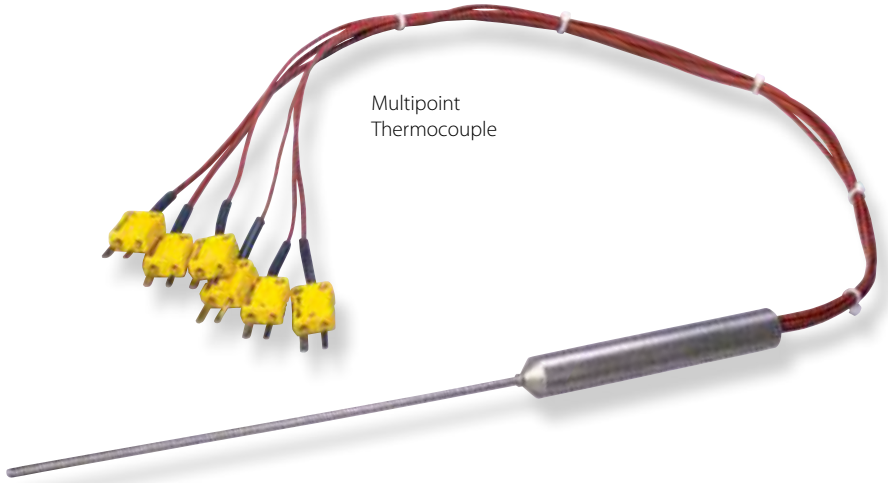
- *Freeze protection*
- *Aerospace composite repair*
- *Warming and foodservice equipment*
- *Gas delivery lines*

Watlow has decades of experience in designing and developing temperature sensor solutions for various markets including: foodservice equipment, semiconductor, medical, petrochemical, plastics, diesel engines and aerospace.

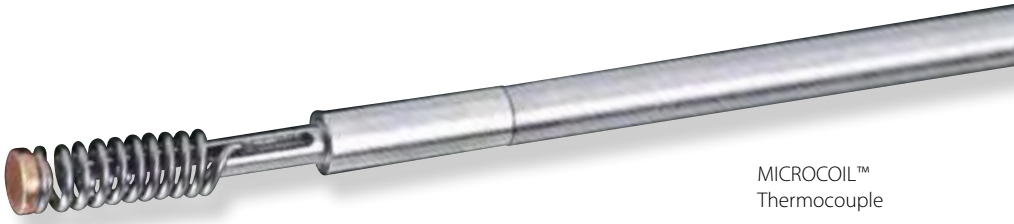
SENSORS

Thermocouples

Watlow provides over 90 years of manufacturing, research and product development experience for your temperature sensing needs. Watlow manufactures an extensive selection of general application, mineral insulated, base metal, high temperature, surface temperature and multipoint thermocouples.



Multipoint
Thermocouple



MICROCOIL™
Thermocouple

Radio Frequency
Thermocouple

Product	Description	Temperature		Outside Diameter	
		°F	°C	in.	mm
MICROCOIL	Surface temperature measurement	up to 1292	up to 700	0.125	3.2
Radio Frequency Thermocouple	Reads surface temperature measurement through radio frequency energy	up to 932	up to 500	0.19	5
True Surface Thermocouple	Flat surface temperature sensor that isolates the thermocouple from ambient airflow	up to 400	up to 200	n/a	n/a
Multipoint	Accurately measures temperatures at various locations	up to 2200	up to 1200	0.125, 0.1875 or 0.25	3.2, 4.8 or 6

Applications

- *Plastic injection molding machinery*
- *Semiconductor processing*
- *Medical equipment*
- *Aerospace industries*
- *Packaging equipment*
- *Test stands*
- *Chemical processing plants*

Thermocouples (continued)

EXACTSENSE®
Thermocouple

General Applications
Thermocouple

High Temperature/
Platinum Thermocouple

Base Metal
Thermocouple

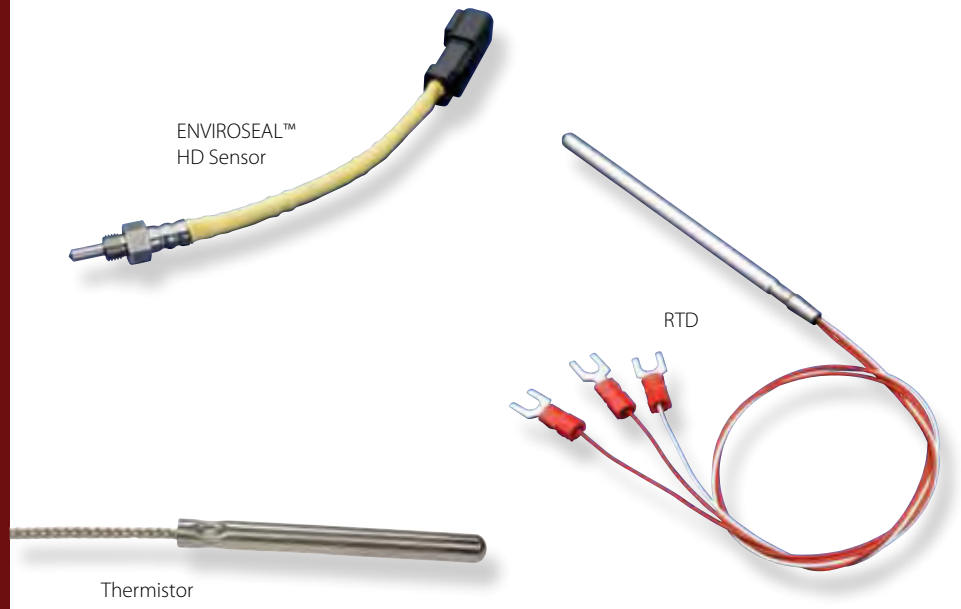
Product	Description	Temperature		Outside Diameter	
		°F	°C	in.	mm
General Applications	Fiberglass and PFA-insulated leads for industrial and commercial equipment	up to 900	up to 480	0.125, 0.1875, or 0.25	3.2, 4.8 or 6.3
Mineral Insulated	Fast-responding, durable and capable of handling high temperatures	up to 2200	up to 1200	0.020 to 0.5	0.50 to 13
EXACTSENSE®	Combines rugged thermocouple technology with signal conditioning into one package	-40 to 2012	-40 to 1100	0.083 to 0.188	2.1 to 4.8
Base Metal	Large gauge bare alloy available with ceramic insulated elements and protection tubes	up to 2300	up to 1260	n/a	n/a
High Temperature/ Platinum	Capable of withstanding high temperatures	up to 3050	up to 1677	0.125 to 0.250	3.2 to 6.3

Applications

- *Foodservice processing equipment*
- *Engine turbine exhaust gas*
- *Heat treating and metals processing*

Resistance Temperature Sensors

Watlow manufactures a complete line of resistance temperature sensors including RTDs, thermistors and the ENVIROSEAL™ HD temperature sensor for heavy-duty applications in harsh environments.



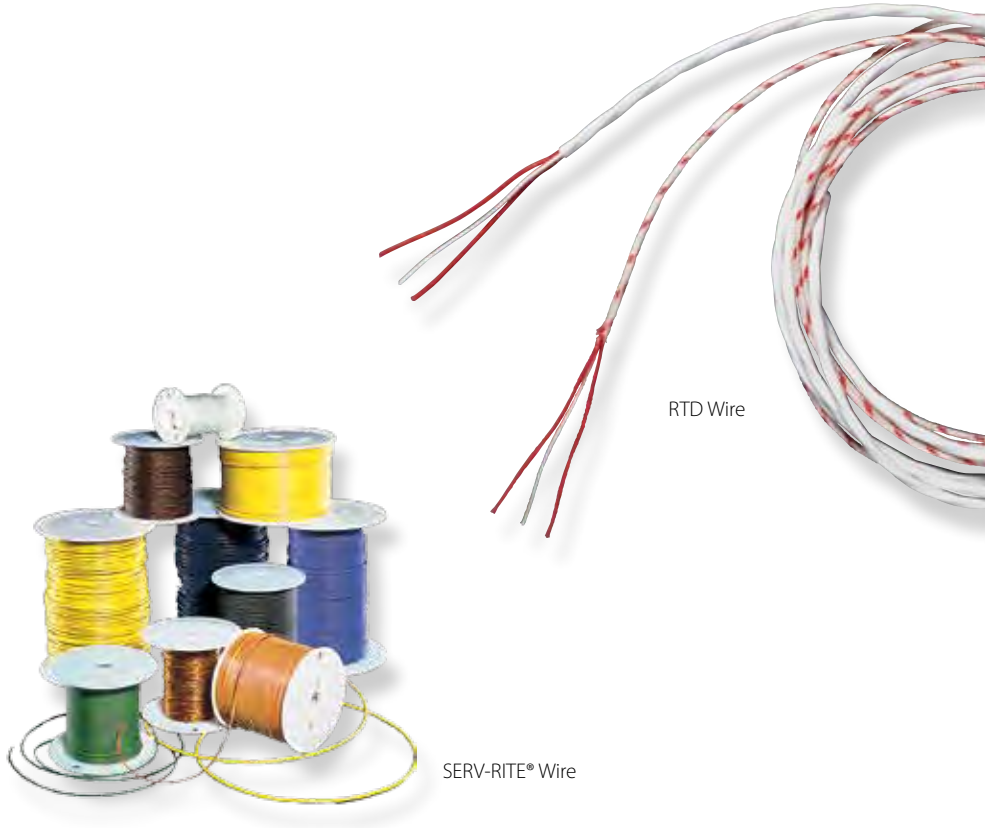
Product	Description	Temperature °F	Temperature °C	Accuracy
RTDs	Accurate, repeatable over a wide operating range	-328 to 1200	-200 to 650	DIN Class A ± 0.06% at 32°F (0°C) DIN Class B ± 0.12% at 32°F (0°C)
Thermistors	Highly sensitive to small changes in temperature	-75 to 500	-60 to 260	± 1% at 77°F (25°C) to ±15% at 32°F (0°C)
ENVIROSEAL HD Sensor	Suited for heavy-duty applications and harsh environments	-40 to 392	-40 to 200	Same as RTD and thermistor accuracies above

Applications

- *Air conditioning and refrigeration servicing*
- *Furnace servicing*
- *Textile production*
- *Foodservice processing equipment*
- *Medical research*
- *Plastics processing*
- *Petrochemical processing*
- *Microelectronics*
- *Air, gas and liquid temperature measurement*

Wire

Since 1914, Watlow's SERV-RITE® wire has been known for premium performance and reliability.



Product	Description
Thermocouple and Extension Wire	Wide variety of calibration types and insulation materials available from stock
RTD Wire	2, 3 and 4-wire nickel or tin plated copper conductor constructions in a variety of gauge sizes

Applications

- *Aerospace industries*
- *Composite component manufacturing*
- *Automotive*
- *Cryogenic applications*
- *Glass, ceramic and brick manufacturing*
- *Electric power plants*
- *Foodservice processing equipment*
- *Laboratories*
- *Medical equipment*
- *Metal processing*

Mineral Insulated Cable

XACTPAK® mineral insulated cable is ideally suited to solve a wide variety of problem applications. The outer sheath protects the thermocouple from oxidation and hostile environments, and the mineral insulation provides excellent high temperature dielectric strength.

XACTPAK® Mineral Insulated Cable

Product	Description
XACTPAK Mineral Insulated Cable	XACTPAK cable is fireproof, high-pressure rated, cold and thermal shock resistant, gas tight, moisture proof, formable, weldable, corrosion resistant and high-temperature rated

Applications

- *Atomic research / nuclear reactors*
- *Blast furnaces / vacuum furnaces*
- *Catalytic reformers*
- *Diesel engines*
- *Foodservice processing equipment*
- *Glass and ceramic*
- *Heat treating*
- *Jet engines / rocket engines*
- *Power stations / steam generators*
- *Refineries and oil processing*

Accessories

Watlow offers a full line of accessories to accommodate your varying sensor requirements.

Transmitters

Connectors

Thermowells

Fittings

Product	Description
Fittings	A variety of sensor mounting fittings are available such as fixed, adjustable, and non-adjustable compression and bayonet style
Thermowells	These thick-wall thermowells are sturdy enough to handle high pressure, high velocity and corrosive environments
Protection Tubes	The metal protection tubes are suited for high thermal conductivity for fast, precise readings. The ceramic tubes resist deformation, corrosion, abrasion and oxidation
Connectors	Many varieties of connectors are available such as standard, quick-attach, high-temperature, three-pole and miniature connectors. All Watlow connectors meet the ASTM E1129 requirement and are color coded
Connection Heads and Blocks	Watlow offers standard cast iron or aluminum, explosion proof and polypropylene heads. Terminal blocks are available to complement the connection heads
Transmitters	Watlow's temperature transmitters offer accurate measurement and improved reliability which reduces downtime and costs. The two-wire signal conditioner is constructed using surface mount and digital technology

Applications

- *Plugs, jacks and mini-connectors*
- *Wide range of analog transmitters*
- *Heads and connector blocks*
- *Protection tubes and thermowells*

Lab Services

General Information

Watlow offers a wide variety of product test capabilities to verify that the products developed and produced by Watlow meet the most rigorous industry standards.

Watlow continuously invests in developing capabilities to ensure that the proper testing is completed for optimum sensor performance in the customer's application. Below is a list of current Watlow test capabilities.

- Time response
- Vibration
- High temperatures
- Cryogenic temperatures
- Tensile and compression
- Humidity
- Life testing
- Cycle and drift
- Wire insulation abrasion testing
- Micro-hardness
- Dielectric breakdown testing
- Customized testing for your application

Quality Certification Lab

Today's global demand for products that perform better, last longer, are more accurate and withstand harsher environments has led to an increased demand for certified compliance to industry standards. Watlow meets these demands by having a calibration lab that is ISO 17025 accredited. Watlow certification verifies that the finished sensor complies with initial calibration tolerances as established by ASTM Standard E 230 and provides consistent and reliable high quality products.

- ASTM E207
- ASTM E220
- ASTM E230
- ASTM E644
- AMS 2750

Certification Testing Offered

Service	Description	Specifications
End-to-end calibration	Compares each end of a length of thermocouple wire, utilizing a common junction measurement test. This is a requirement to verify homogeneity requirements.	ASTM E207, E220, E230
Dielectric testing	Performance levels of wire insulations in the presence of high, local fields caused by electrical discharges. Routinely used in Watlow quality control testing.	ASTM D149
Helium leak test	Verifies the sheath integrity in metal-sheathed cable and sensors to 1000psi (70 kg/cm^2) in specially designed pressure chambers.	ASTM E235
Radiographic inspection	Determines dimensions and detects and evaluates cracks, voids, inclusions and discontinuities. Technicians are qualified under SNT-TC-1A.	ASTM E94, E142
Metallographic examination	Reveals the constituents and structures of metals. Photomicrographs are also available to determine and document average grain size and structure of prepared specimens.	ASTM E3, E112, E235
Compaction density test	Determines compaction of insulating materials in metal-sheathed cable.	ASTM D2771
Drift test	Determines long-term stability and drift characteristics.	ASTM E601, E644
Thermal cycle test	Subjects individual sensors to repeated cycling through a temperature range.	ASTM E235
Insulation resistance	Measures electrical insulation resistance properties between thermoelements and the sheath at ambient as well as elevated temperatures to determine presence of moisture or impurities which could affect sensor performance.	ASTM E780, E235, E644
Micro-hardness	Determines hardness of sheath or conductors used to measure a material's resistance to penetration (hardness) as a predictor of strength, machinability, brittleness, ductility and wear resistance.	Vicker's

Watlow's temperature control products are designed and manufactured at Watlow's fully integrated facility in the United States. This assures our customers superior support and service that is unmatched by competitors.

CONTROLLERS

Integrated Multi-Function Controllers

By integrating related features including control, safety limit, power switching, communications and data logging, EZ-ZONE® controllers decrease design and assembly time, require less space, reduce system complexity and lower the total cost of ownership.

Loops, limits and a wide variety of outputs are available in individual increments. Specifications and features right down to the terminal labelling are consistent across the controller family. This flexibility and modularity means using these products leverage learning, design, documentation, startup and training across multiple applications and ensure a nimble response when requirements change.

Features include communication protocol options, TRU-TUNE®+ adaptive control, timer and counter application blocks, on-board data logging, user-customizable menus, SENSOR GUARD sensor backup, AUTO CLONE configuration restore, NEMA 4X/IP66, Class I, Div. 2 and free configuration software.

EZ-ZONE® RM
Integrated Controller

EZ-ZONE ST
Integrated Solid State Controller

SERIES EHG
Thermal Solution

SERIES EHG SL10
Multi-Function Controller

EZ-ZONE PM
Panel Mount Controllers

Product	Control Loops/ Limits	Mounting	Profiling	Max. Output	Communication Protocols
EZ-ZONE RM	152/192	DIN-rail	Yes	15A	Standard Bus, EtherNet/IP®, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU
EZ-ZONE ST	1/1	DIN-rail	Yes	75A	
EZ-ZONE PM	2/1	1/32, 1/16, 1/8, 1/4 DIN front panel	Yes	15A	
EZ-ZONE PM Express	1/1	1/32, 1/16 DIN front panel	No	15A	Standard Bus
SERIES EHG SL10	1/1	In-line/ Sub-panel	No	10A	Modbus® RTU
SERIES EHG	1/0	In-line	No	10A	n/a

Applications

- *Foodservice equipment*
- *Semiconductor processing*
- *Plastics processing*
- *Analytical instrumentation*
- *General equipment*

Temperature and Process Controllers

Temperature and process controllers offer easy-to-use, accurate and reliable solutions for applications requiring single and multiple loops of control.

Temperature and process controllers include one or more sensor inputs and one or more of a wide variety of outputs for control and alarms.

Features include communication protocol options, auxiliary analog inputs, automatic tuning, TRU-TUNE®+ adaptive control, cascade control, ramp and soak profiling, user-customizable menus, burst fire output control, failed heater/load detection, NEMA 4X (IP65, IP66) and free configuration software.

EZ-ZONE ST

EZ-ZONE RM

Product	Control Loops/ Limits	Mounting	Profiling	Max. Output	Communication Protocols
EZ-ZONE RM	152/192	DIN-rail	Yes	15A	Standard Bus, EtherNet/IP®, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU
EZ-ZONE ST	1/1	DIN-rail	Yes	75A	
EZ-ZONE PM	2/1	1/32, 1/16, 1/8, 1/4 DIN front panel	Yes	15A	
EZ-ZONE PM Express	1/1	1/32, 1/16 DIN front panel	No	15A	Standard Bus
SERIES F4 Ramping	2/0	1/4 DIN front panel	Yes	2A	Modbus® RTU
SERIES F4 Process	1/0	1/4 DIN front panel	No	2A	Modbus® RTU
SERIES CV	1/0	DIN-rail, Front panel	No	8A	n/a
SERIES CF	1/0	DIN-rail, Front panel, Sub-Panel	No	8A	n/a
SERIES EHG SL10	1/1	In-line/ Sub-panel	No	10A	Modbus® RTU
SERIES EHG	1/0	In-line	No	10A	n/a

SERIES CV

SERIES CF

SERIES CF
Potted

Applications

- *Foodservice equipment*
- *General process control*
- *Chambers, furnaces and ovens*
- *Plastics and textile processing*
- *Heat or cool control*
- *HVAC*
- *Oil and gas processing*

Limits and Scanners

Single and multi-channel limits provide cost-effective solutions for monitoring one or more temperatures. Limits monitor a process where thermal protection is needed, closing a contact output for normal operation and opening that contact to shut down the process or equipment when the temperature is outside the safe range.

Sensor options include thermocouples, process, RTDs and thermal switches. Limit settings may be user-adjustable or fixed. Other features include sensor break protection, additional inputs and outputs for integrating with other automation and UL® and CSA approval. Limits have FM approval for performance in safety limit applications.

EZ-ZONE PM Limit

Product	Channels	Mounting	Temperature Limit	Communication Protocols
EZ-ZONE RM High-Density Limit	192	DIN-rail	Yes	Standard Bus, EtherNet/IP®, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU
EZ-ZONE RM High-Density Scanner	256	DIN-rail	n/a	
EZ-ZONE PM Limit	1	1/32, 1/16, 1/8, 1/4 DIN front panel	Yes	
EZ-ZONE PM Express Limit	1	1/32, 1/16, DIN front panel	Yes	Standard Bus
SERIES LV	1	DIN-rail, front panel	Yes	n/a
SERIES LF	1	DIN-rail, front panel	Yes	n/a
TLM-8	8	DIN-rail, sub-panel	Yes	n/a

EZ-ZONE RM Limit

SERIES LV Limit

Applications

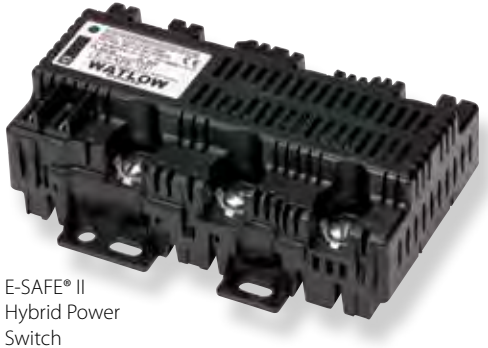
- *High and low safety limit control*
- *Environmental chambers*
- *Furnace / ovens*
- *Boiler*
- *Foodservice equipment*

Power Switching Devices

Watlow solid state power switching devices complement the rapid switching required by PID temperature controllers and help deliver optimum system performance and service life. They are available for single phase and three-phase power and feature touchsafe terminations, input indicators, zero-cross and phase-angle fire options, ratings from 18 to 1,000 amperes and agency approvals including CE and UL® 508. Various configurations offer short circuit current ratings (SCCR) of 200,000 amperes, extensive system and heater diagnostic capabilities, heater bake out, integrated heat sinks, on-board fuses, RoHS compliance and serial communications.

Watlow DIN-A-MITE® and E-SAFE® II power switching devices provide convenient DIN-rail mount packages and are a good replacement for mercury displacement relays.

Additionally the EZ-ZONE ST offers an integrated temperature and process controller with optional over- and under-temperature limit and safety shutdown contactor.



E-SAFE® II
Hybrid Power
Switch

Solid State Relay

DIN-A-MITE®
Power Controller

POWER SERIES™
Solid State
Controller

Product	Max. Output	Output Firing	Phase Configurations	Agency Approvals
E-SAFE II	35A	Zero Cross	1, 2 or 3	UL®, C-UL®, CE, W.E.E.E., RoHS
SERIES CZR	42A	Zero Cross	1	UL®, CSA, CE, SCCR
EZ-ZONE ST	75A	Zero Cross, Phase Angle	1	UL® , CSA, CE, RoHS, W.E.E.E., FM, SCCR
Solid State Relays	75A	Zero Cross	1	UL®, CSA
DIN-A-MITE	80A	Zero Cross, Phase Angle	1 or 3	UL® 508, C-UL®, CE, SCCR
	100A	Zero Cross	1	
POWER SERIES	250A	Zero Cross, Phase Angle	1 or 3	UL®, C-UL®, CE, SCCR
QPAC	1000A	Zero Cross, Phase Angle	1 or 3	UL®, C-UL®, SCCR

Applications

- *Semiconductor processing*
- *Plastics processing*
- *Heat treating*
- *Drying ovens*
- *Foodservice equipment*
- *Lighting equipment*
- *Glass processing*
- *Oil and gas processing*

Operator Interfaces

Watlow offers easy-to-use, reliable and affordable operator interfaces for machines and systems.

Silver Series touchscreen operator interface terminals (OIT) are available in various sizes and feature data logging, password security and multiple languages.

The EZ-ZONE RUI remote user interface features shallow panel depth, IP66, a programmable EZKey and communications protocol options to connect a network of EZ-ZONE products to other automation equipment or computer software.

These operator interfaces paired with Watlow controllers are the perfect solution for your industrial process or machine control applications.

Silver Series EM Operator Interface Terminals

EZ-ZONE RUI and Gateway

Product	Description	Communication Protocols	Display Height
Silver Series EM	Rugged, touchscreen operator interface terminal	Ethernet, Modbus® RTU, Modbus® TCP	4.3, 7 or 10.2 in. diagonal
EZ-ZONE RUI and Gateway	Remote user interface and communications device	Standard Bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU	Upper: 0.40 in. (10 mm) Lower: 0.24 in. (6 mm)

Applications

- *Industrial processing*
- *Machine control*

Indicators

Watlow's indicators are ideal for displaying temperatures and other process variables such as flow, pressure and relative humidity. They feature four, bright LED digits, user-selectable temperature units, sensor break protection, agency approvals including UL®, CE, NEMA 4X (IP65 and IP66), RoHS compliance and multiple mounting options.

EZ-ZONE PM Panel Mount Controllers

Product	Mounting	Display Height
EZ-ZONE PM	1/32, 1/16, 1/8, 1/4 DIN front panel	0.41 in. (11 mm) to 1.60 in. (41 mm)
EZ-ZONE RUI and Gateway	1/16 DIN	Upper: 0.40 in. (10 mm) Lower: 0.24 in. (6 mm)
SERIES TM	DIN-rail, front panel	0.28 in. (7.11 mm)

Applications

- *Foodservice equipment*
- *Plastics processing*
- *Industrial machinery*
- *Chambers, furnaces and ovens*

Data Loggers

Watlow offers Windows®-based software and embedded solutions for time-stamped collections of critical, process data. Data loggers reduce labor, increase accuracy and help companies comply with regulatory requirements.

EZ-ZONE RM
Integrated Controllers

Silver Series EM
Operator Interface
Terminals

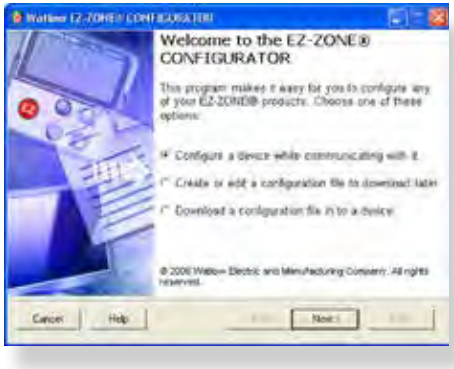
Product	Description
EZ-ZONE RM	Multi-loop controller with data logging ability
Silver Series EM	Rugged, touchscreen operator interface terminal
SpecView HMI Software	Human machine interface for Watlow controllers
WATVIEW	Human machine interface for Watlow controllers

Applications

- *Industrial applications requiring process data collection*

Software

Watlow software products provide an interface for users to controllers and other automation equipment that is more powerful and flexible than built-in product interfaces. Configuration software simplifies setting up, saving and copying configurations from one controller to another. Human machine interface (HMI) software is easy-to-use and ideal for data logging, trending, managing recipes, monitoring alarms and creating customized user interfaces for machines and systems with Watlow controllers.



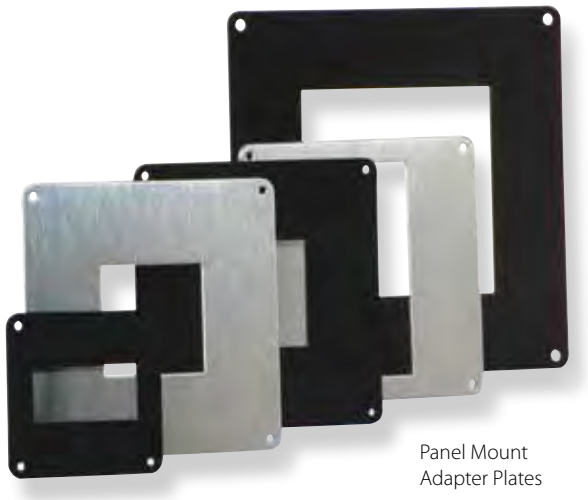
Product	Description
SERIES EHG SL10	Software for configuring and monitoring EHG SL10 process controllers
EZware-5000	Software for configuring Silver Series OITs
EZ-ZONE Configurator	Software for configuring EZ-ZONE products
EZ-ZONE GSD Editor	Software for creating PROFIBUS GSD files for EZ-ZONE products
EZ-ZONE LabVIEW™ Driver	Virtual instruments (VIs)/driver to interface LabVIEW™ with EZ-ZONE products via Standard Bus
SpecView HMI Software	Human machine interface for Watlow controllers
WATVIEW	Human machine interface for Watlow controllers

Applications

- *Data logging*
- *Trending*
- *Monitoring alarms*
- *Creating user interfaces*
- *Managing recipes*

Accessories

Watlow provides a selection of accessories from communication gateways to fuses that improve the usability and flexibility and safety of your application.



Panel Mount Adapter Plates

Serial Converters

Fuses

EZ-ZONE RUI and Gateway

Product	Description
EZ-ZONE RUI and Gateway	Remote user interface and communications gateway for EZ-ZONE RM and ST controllers
Serial Converters	Devices that bridge between serial networks
Fuses and Fuse Holders	Disconnect loads from power sources when excessive current is drawn
Current Transformers	Detect and measure load currents
Panel Mount Adapter Plates	Convenient, cost saving way to replace large, old controllers with new, modern, smaller models
Arc Suppression and EMI Filters	Protect controller outputs and reduce noise emissions
Power Supplies	UL® Class 2 power supplies for controllers that require DC power

Power Supplies

Applications

- *Control processes requiring full communications*
- *Solid state power protection*
- *Applications or processes requiring multiple devices*
- *Process requiring modification to existing control panels*

Technical Compliance and Agency Approvals

Safety is embedded into every aspect of our organization, from our employees to our operations to the products and systems we manufacture. Watlow is proud that many of our components, systems and facilities comply with industry regulations ensuring that our products are safe to use and can be incorporated into your application without worry.

We strive for compliance with the following agencies, and more. For specific certifications on a Watlow product or service, please contact your local Watlow representative.

ASME

British Standards

CE

CSA

Ex

IECEx

Inmetro

ISO

Korea Gas Safety Corporation

SEMI® International Standards

Sira Certification

Standards Australia

UL®

Watlow products are not guaranteed to have specific adherence to a compliance directive. Please contact your local Watlow representative for more information.

Quality Products that Perform

At Watlow, quality means producing either a single product, or an entire thermal system, that matches or exceeds customer expectations. Our products are so well made that many of our customers request ship-to-stock without inspecting the incoming products . . . because they know we control our processes through every step.

This confidence is a result of Watlow's strong quality programs:

- Acquiring an extensive list of agency approvals that require quality system auditing throughout our company, worldwide.
- Organizing our company into functional teams and strategic business units for greater creativity and productivity.
- Training team members on company goals and values, participative management and the use of Lean methodologies.
- Empowering those teams to make operating improvements to eliminate waste and improve cycle times.
- Establishing measurements to chart our progress toward our four key operational objectives:
  - ► Quality
  - ► Cost
  - ► Service
  - ► Innovation
- Developing process standards to assure the production and on-time delivery of high-quality products.

Expert Technical and Global Application Support

We Ask the Right Questions to Solve Your Problem

In addition to low-quality materials and poorly controlled processes and standards, products can fail because a supplier does not ask the right questions. It is important to know how your application relates to temperature, watt density requirements, temperature sensing, control systems and the process environment. We provide dedicated technical support throughout your project to optimize performance in your application.

You can count on Watlow to ask the right questions to understand and solve your problem – no matter how complex – correctly, quickly and cost effectively, to meet your application and product lifecycle needs.

Your One-Stop Thermal Solution Provider

Unlike most suppliers that sell a single thermal product, Watlow's expertise is designing, recommending, building and delivering a complete thermal solution to fit your exact needs. Choosing a single source supplier means that you have one-stop access to expert design, products and engineering services for all of your thermal system needs.

Delivering the Complete Solution with Subassemblies

A subassembly can be as simple as attaching a special connector with a lead wire to developing a complex integration of heaters, sensors and controllers. Watlow will partner with you throughout the process to develop a fully functional, complete thermal subassembly into a modular unit that can be easily integrated with your application or process.

Engineering Expertise with Scalable Models and Prototypes

Our engineers can translate a concept into a model of a custom design using state-of-the-art, 3-D modeling tools. This can eliminate the need to test multiple prototypes that may not fit specific application requirements. Watlow utilizes the latest computational and finite element analysis (FEA) modeling techniques to measure system performance prior to production start up. Design revisions can be easily incorporated into a model, resulting in a significant reduction in the lead time and cost to develop new products.

WATLOW®

Find out more about Watlow and how we can provide thermal solutions for your company:

Phone: 1-800-WATLOW2 (1-800-928-5692)

E-mail: inquiry@watlow.com **Web site: www.watlow.com**

Watlow Products and Technical Support Delivered Worldwide

North American Technical Support & Sales Offices

United States & Canada
1-800-WATLOW2
(1-800-928-5692)

Asian Technical Support & Sales Offices

Australia	+61 3 9335 6449
China	+86 21 3532 8532
India	+91 40 6661 2700
Japan	+81 3 3518 6630
Korea	+82 2 2628 5770
Malaysia	+60 3 8076 8745
Singapore	+65 6773 9488
Taiwan	+886 7 288 5168

European Technical Support & Sales Offices

France	+33 (0) 1 41 32 79 70
Germany	+49 (0) 7253 / 9400-0
Italy	+39 02 4588841
Spain	+34 91 675 1292
United Kingdom	+44 115 964 0777

Latin American Technical Support & Sales Office

Mexico	+52 442 256 2200

About Watlow

Watlow designs and manufactures industrial heaters, temperature sensors, controllers and supporting software as well as assemblies – all of the components of a thermal system. The company partners with its customers to optimize thermal performance, decrease design time and improve efficiency of their products and applications.

Watlow brings its experience to numerous industries, including semiconductor processing, environmental chambers, energy processes, diesel emissions, medical and foodservice equipment.

Since 1922, Watlow has grown in product capability, market experience and global reach. The company holds more than 450 patents and employs 2,000 employees working in nine manufacturing facilities and three technology centers in the United States, Mexico, Europe and Asia. Watlow also has sales offices in 16 countries around the world. The company continues to grow, while the commitment remains the same – to provide its customers with superior products and services for their individual needs.

Your Authorized Watlow Distributor is: