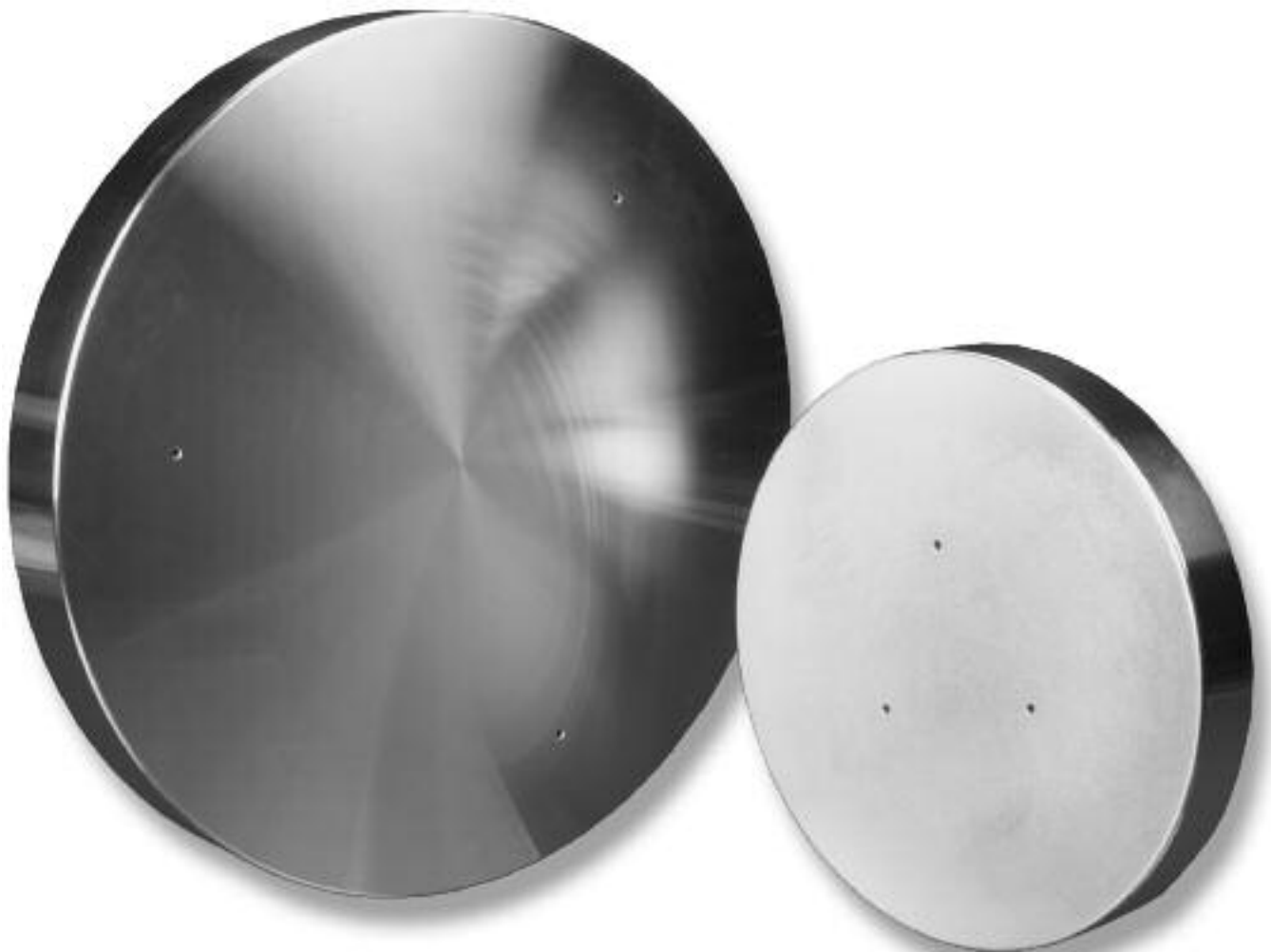


Cast-In Heaters

Cast-In Heaters

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Cast-In Heaters

Heated Part Capabilities

The Heated Part Concept

The heated part concept from Watlow® can help simplify many complex heating problems.

The heated part is much more than a heater, it is a functional component of equipment that can be designed in the exact shape and size needed.

Utilizing Watlow's heated part can alleviate time-consuming tasks such as purchasing, assembly or machining of parts. Customers can concentrate on meeting the other manufacturing challenges.

The heated part consists of a formed cable or tubular heater cast into aluminum. The part is then customized to meet specific application needs including machining, termination, coatings and assembly.

Watlow offers heated parts in a variety of materials, such as stainless steel for higher temperature applications or for those where cast aluminum cannot be used.

From state-of-the-art CNC machines to the high tech research lab, Watlow invested in the technology necessary to develop high quality custom heat solutions.

Watlow's heated parts are manufactured by Watlow's ISO 9001 registered facility in Batavia, Illinois.

Performance Capabilities

- Operating temperatures: up to 752°F (400°C) with 319 or 356 aluminum
- Operating temperatures: up to 842°F (450°C) with 99.7 pure aluminum alloy 170.1
- Operating temperatures: up to 1202°F (650°C) with non aluminum designs

Features and Benefits

Watlow's complete foundry capabilities

- Ensures precise and uniform placement of the element in the casting

UL® component recognition

- Exclusively available from Watlow

ISO 9001 registered

- Assures quality management control from product design through production and servicing

Patented pressure-casting system

- Produces castings with low porosity for better heat transfer
- Minimizes internal voids and defects by precisely controlling molten metal temperature and feed rate



Optional cast-in tubing

- Provides faster cooling or can be used to heat liquids or gasses that run through it, functioning as a circulation heater

High thermal conductivity of aluminum

- Provides extremely uniform surface temperatures to avoid damaging hot or cold spots when operating the heaters.

Reusable molds

- Provide excellent part-to-part uniformity and are economical through production and servicing.

Cast-In Heaters

Heated Part Capabilities

The Heated Part Concept

Applications and Technical Data

Capabilities Include:

- 3-D CAD/CAM design
- CNC equipment for precision machining and repeatable results from one order to the next
- Metallurgical expertise in foundry practice as well as machining technology
- Coordinate Measuring Machines (CMM) for in-process and final inspection with printed reports
- Assembly and termination options
- Services such as Finite Element Analysis (FEA)
- Special coatings including Teflon®, anodizing and electroless nickel plating
- X-ray techniques to check castings for quality and proper heater location
- Additional treatment of the heated part such as chemical cleaning, and packaging for cleanroom acceptance
- Specially-designed packaging

R & D Efforts

To remain at the forefront of technological advancements in the industry, Watlow's heated part facility features a full lab in which extensive product and process research is conducted.

On-going laboratory tests at the heated part facility include

- Temperature uniformity
- Heating and cooling ramp rates
- Structural characteristics
- Coating performance

Watlow has created heated parts for a variety of industries including

- Semiconductor
- Medical
- Foodservice

Properties and Characteristics of Aluminum Alloys

Alloy Number	Thermal Properties				Mechanical Properties			
	Solidus Temperature		Thermal Conductivity		Tensile		Yield	
	°C	(°F)	W/m-K	(BTU/ft*h*°F)	MPa	(ksi)	MPa	(ksi)
Casting Alloys								
319.0	515	(960)	109	(63)	235	(34)	130	(19)
356.0	555	(1035)	159	(92)	207	(30)	165	(24)
170.1	646	(1195)	234	(135)	76	(11)	28	(4)
Wrought Alloys								
1100	643	(1190)	222	(128.0)	90	(13)	34	(5)
5052	607	(1125)	91	(110.0)	193	(28)	90	(13)
5086	585	(1085)	127	(73.4)	60	(38)	115	(17)
6061	582	(1080)	180	(104.0)	310	(45)	276	(40)

Cast-In Heaters

Heated Part Capabilities

The Heated Part Concept

Applications and Technical Data *(Continued)*

Chemical Compositions Comparisons of Common Aluminum Alloys (Maximum Limits)

AA#	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Sn	Ti	Other	% Al
Casting Alloys												
319	6.50	1.00	4.00	0.50	0.01	-	0.35	1.00	-	0.25	0.50	85.9
356	7.50	0.60	0.25	0.35	0.45	-	-	0.35	-	0.25	0.15	90.1
170.1	0.05	0.09	0.07	-	0.01	-	-	-	-	0.03	0.10	99.7
Wrought Alloys												
1100	1.00	-	0.05/0.20	0.05	-	-	-	0.10	-	-	0.15	99.0
5052	0.25	0.40	0.10	0.10	2.2/2.8	0.15/0.35	-	0.10	-	-	0.15	96.2
5086	0.40	0.50	-	0.2/0.7	3.5/4.5	-	-	0.25	-	0.15	0.15	94.1
6061	0.4/0.8	0.70	0.15/0.4	0.15	0.8/1.2	0.04/0.35	-	0.25	-	0.15	0.15	96.5

How to Order

All cast-in heaters are **made-to-order**. Please have the following information available when placing an order or requesting a quote:

- Wattage: (see either the WATROD tubular section, page 73 or cable heater section, page 579, for engineering information)
- Voltage: Maximum is 600V~(ac)
- Part design: Provide drawings with all dimensions and critical tolerances
- Heater exit locations
- Electrical termination details
- Quantity

Availability

Contact your Watlow representative for design and manufacturing time required.

Cast-In Heaters

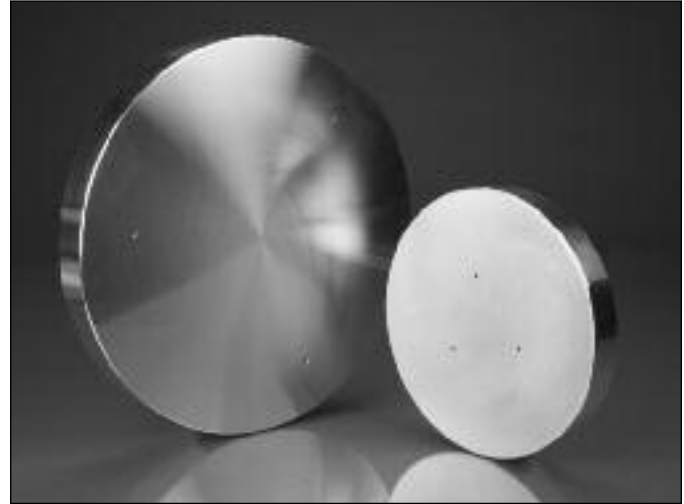
Standard Aluminum Platen Heaters

Standard 200 and 300 mm Platen Heaters

Watlow has 200 and 300 mm aluminum platen heaters in stock to quickly solve wafer fabrication needs. Customers can save thousands of dollars with off-the-shelf designs since there are no additional costs for engineering, tooling or casting mold creation.

Watlow's platen heater design is ideal for prototype machine trials or engineering experiments as well as temporary repairs until custom heaters can be manufactured. Watlow's platen heaters provide a complete turnkey solution and are available in anodized finish, or in bare machined aluminum 356 with optional add-on features.

The stock anodized cast aluminum platen heaters are complete, ready to install parts and are available for shipment within one business day.



Features and Benefits

Delivery from Stock

- WR200-2A and WR300-2A ship within one business day to reduce down time
- Assures a cost effective option for 200 and 300 mm wafer processing

World class performance

- Cast-in reliability assures long product life
- Operating temperatures up to 752°F (400°C) for a wide range of process applications
- Surface temperature uniformity of $\pm 0.3\%$ of set point assures wafer processing accuracy

Applications

- Semiconductor processing
- Semiconductor research and development

Cast-In Heaters

Standard Aluminum Platen Heaters

Standard 200 and 300 mm Platen Heaters

Specifications— Model WR200-2A (Anodized) and Model WR200-2B (Bare)

- Diameter: 9 in. (229 mm)
- Thickness: 1.25 in. (32 mm)
- (3X) Lift Pin Holes diameter 0.125 in. (3.2 mm) equally spaced 120° on 3.25 in. (83 mm) perfect circle diameter
- (1X) Thermocouple hole diameter 0.066 in. (1.7 mm) with 1/16 NPT tap for fitting
- “Cast-in” cable heater rated 1681 W at 208V (or 2241 W when operated at 240V)

WR200-2A SERIES Platen With Hardcoat Anodize Finish

- Reference drawing below
- Rating: Typical 208V, 1681 W, max. 240V, 2241 W
- Part is ultrasonic washed followed by IPA wipe down prior to packaging
- Delivery 6-8 weeks

WR200-2B SERIES Platen With Bare Machined Aluminum Finish

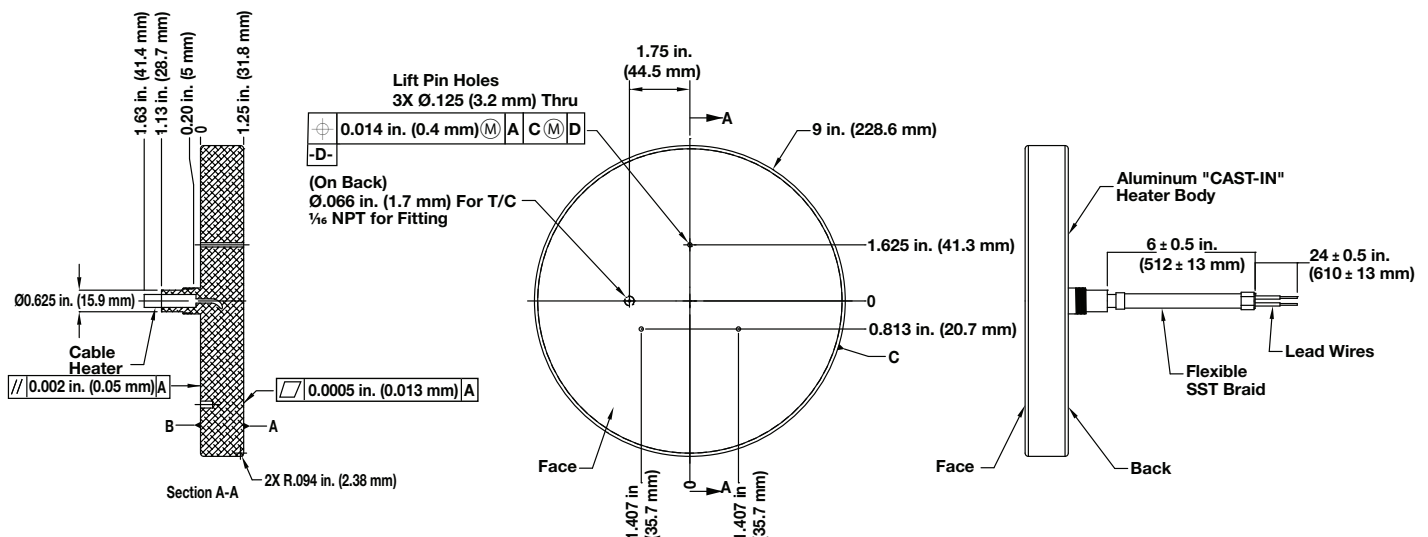
- Reference drawing below, except no hardcoat anodize will be provided
- Rating: Typical 208V, 1681 W, max. 240V, 2241 W
- Part is ultrasonic washed followed by IPA wipe down prior to packaging
- Delivery 4-6 weeks

Item	Code Number
No thermocouple included	WR200-2B
RAPID SHIP thermocouple, Type K, 6 in. (152 mm) sheath + fitting	WR200-3B
RAPID SHIP thermocouple, Type J, 6 in. (152 mm) sheath + fitting	WR200-4B
RAPID SHIP thermocouple, Type K, 12 in. (305 mm) sheath + fitting	WR200-5B
RAPID SHIP thermocouple, Type J, 12 in. (305 mm) sheath + fitting	WR200-6B

Item	Code Number
No thermocouple included	WR200-2A
RAPID SHIP thermocouple, Type K, 6 in. (152 mm) sheath + fitting	WR200-3A
RAPID SHIP thermocouple, Type J, 6 in. (152 mm) sheath + fitting	WR200-4A
RAPID SHIP thermocouple, Type K, 12 in. (305 mm) sheath + fitting	WR200-5A
RAPID SHIP thermocouple, Type J, 12 in. (305 mm) sheath + fitting	WR200-6A

Dimensional Drawing

200 mm Standard Aluminum Platen Heater



Cast-In Heaters

Standard Aluminum Platen Heaters

Standard 200 and 300 mm Platen Heaters

Specifications—Model WR300-2A (Anodized) and Model WR300-2B (Bare)

- Diameter: 13.78 in. (350 mm)
- Thickness: 1.575 in. (40 mm)
- (3X) Lift Pin Holes diameter 0.125 in. (3.2 mm) equally spaced 120° on 10 in. (254 mm) perfect circle diameter
- (1X) Thermocouple hole diameter 0.128 in. (3.3 mm) with 1/8 NPT tap for fitting
- “Cast-in” cable heater rated 3350 W at 208V

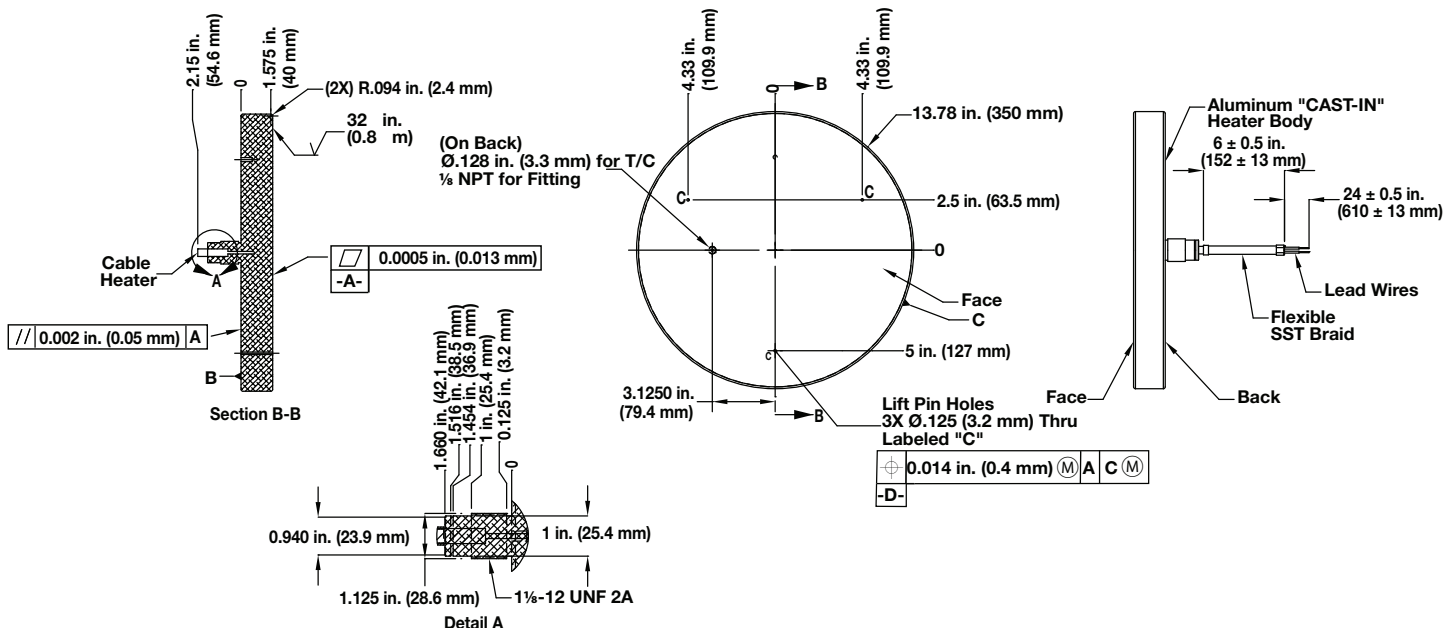
WR300-2A SERIES Platen With Hardcoat Anodize Finish

- Reference drawing below
- Rating: Typical 208V, 3350 W
- Part is ultrasonic washed followed by IPA wipe down prior to packaging
- Delivery 6-8 weeks

Item	Code Number
No thermocouple included	WR300-2A
RAPID SHIP thermocouple, Type K, 6 in. (152 mm) sheath + fitting	WR300-3A
RAPID SHIP thermocouple, Type J, 6 in. (152 mm) sheath + fitting	WR300-4A
RAPID SHIP thermocouple, Type K, 12 in. (305 mm) sheath + fitting	WR300-5A
RAPID SHIP thermocouple, Type J, 12 in. (305 mm) sheath + fitting	WR300-6A

Dimensional Drawing

300 mm Standard Aluminum Platen Heater



WR300-2B SERIES Platen With Bare Machined Aluminum Finish

- Reference drawing below, except no hardcoat anodize will be provided
- Rating: Typical 208V, 3350 W
- Part is ultrasonic washed followed by IPA wipe down prior to packaging
- Delivery 4-6 weeks

Item	Code Number
No thermocouple included	WR300-2B
RAPID SHIP thermocouple, Type K, 6 in. (152 mm) sheath + fitting	WR300-3B
RAPID SHIP thermocouple, Type J, 6 in. (152 mm) sheath + fitting	WR300-4B
RAPID SHIP thermocouple, Type K, 12 in. (305 mm) sheath + fitting	WR300-5B
RAPID SHIP thermocouple, Type J, 12 in. (305 mm) sheath + fitting	WR300-6B