

Flexible Heaters

Silicone Rubber

Rugged, yet thin, lightweight and flexible ... the use of Watlow silicone rubber heaters is limited only by your imagination. With these heaters, you can put the heat where it's needed and, in the process, improve heat transfer, speed warm-ups and decrease wattage requirements.

Fiberglass-reinforced silicone rubber gives your heater dimensional stability without sacrificing flexibility. Because very little material separates the element from the part, heat transfer is rapid and efficient.

Performance Capabilities

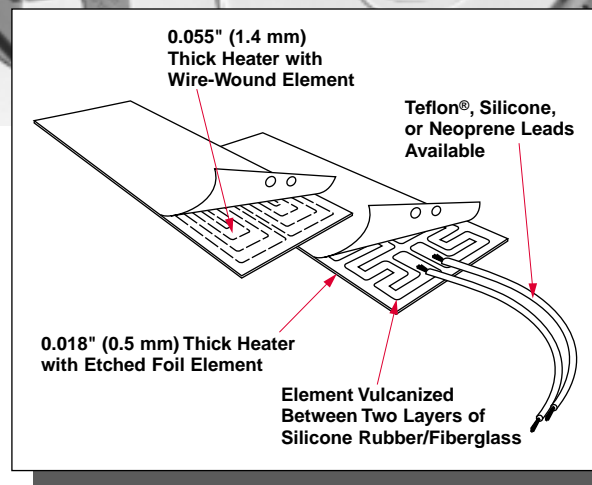
- Operating temperatures to 500°F (260°C)
- Watt densities to 80 W/in² (12.5 W/cm²) dependent upon application temperature
- 0.055 inch (1.4 mm) thick with a wire-wound element; only 0.018 inch (0.5 mm) with an etched foil element

Features and Benefits

- **Designed in the exact shape and size**, including 3-D geometries, to conform to your equipment.
- **More than 80 designs** available immediately from stock.
- **UR®, cUR® and VDE** recognitions are available on many designs.
- **Moisture and chemical-resistant** silicone rubber material provides longer heater life.
- **Easy to bond or attach** to your part through the use of vulcanizing, adhesives, or fasteners.

Applications

- Freeze protection and condensation prevention for many types of instrumentation and equipment
- Medical equipment such as blood analyzers, test tube heaters, etc.
- Computer peripherals such as laser printers
- Curing of plastic laminates
- Photo processing equipment



Flexible Heaters

Silicone Rubber

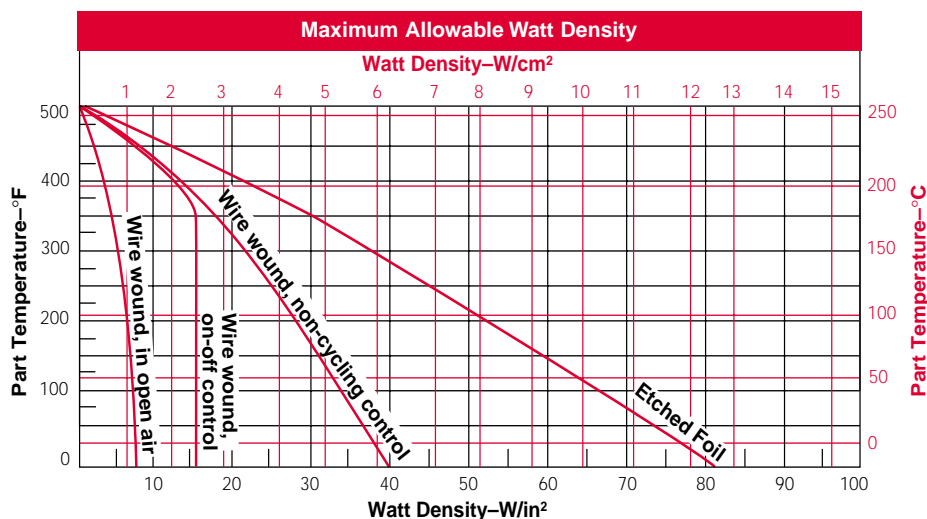
Applications and Technical Data

Determining Watt Density

The *Maximum Allowable Watt Density* graph illustrates the maximum recommended heater watt density at various metal part or ambient air temperatures. However, it does not indicate the watt density necessary to achieve a given part temperature. See the *Surface Temperature vs. Time* graph on the next page for assistance with those calculations. When using this graph, remember:

- Part temperature is measured at the point where the heater contacts the metal part.
- Thermostats and on-off controls are typically bimetal or capillary bulb.
- Non-cycling controls are typically solid state, time-proportioning or SCR temperature controllers.
- Watt density values should be derated by one third if insulation is used.
- UL® recognition temperature limits are not detailed.
- Consult Watlow before doing any of the following: selecting high watt density etched-foil elements, or operating heaters with back side insulation or non-metallic parts, which are poor thermal conductors.

Example: A wire-wound heater with non-cycling control at a part temperature of 250°F (120°C) can be rated at 24 W/in² (3.7 W/cm²) maximum. An etched foil heater under the same conditions can be rated at 45 W/in² (7 W/cm²) maximum.



Standard Silicone Rubber Specifications

Maximum width x maximum length:

- Wire wound: 36 x 120 inches (915 mm x 3050 mm)
- Etched foil: 20 x 30 inches (510 mm x 760 mm)

Thickness (standard):

- Wire wound: 0.055 inch (1.4 mm)
- Etched foil: 0.018 inch (0.5 mm)

Weight (standard):

- Wire wound: 8 oz./ft² (0.24 g/cm²)
- Etched foil: 3 oz./ft² (0.09 g/cm²)

Maximum operating temperature: 500°F (260°C)

Maximum temperature for UL® recognition: 428°F (220°C)

Minimum ambient temperature: -80°F (-62°C)

Maximum voltage: 600V~(ac)

Maximum wattage: See watt density graph

Lead size: Sized to load

Lead length: 12 + 1 ½ - ½ inches (305 mm + 40 mm - 15 mm)

Wattage tolerance:

- Wire: ±5 percent
- Foil: +5 percent -10 percent

Dimensional tolerances:

- 0 to 6 inches (0 to 150 mm): ±1/16 inch (1.6 mm)
- 6 to 18 inches (150 to 455 mm): ±1/8 inch (3.2 mm)
- 18 to 36 inches (455 mm to 915 mm): ±3/16 inch (4.8 mm)
- Over 36 inches (915 mm): ±1 percent

Government Supply Code Number

Cage code = 78056

UL® is registered trademark of Underwriter's Laboratories, Inc.

Flexible Heaters

Silicone Rubber

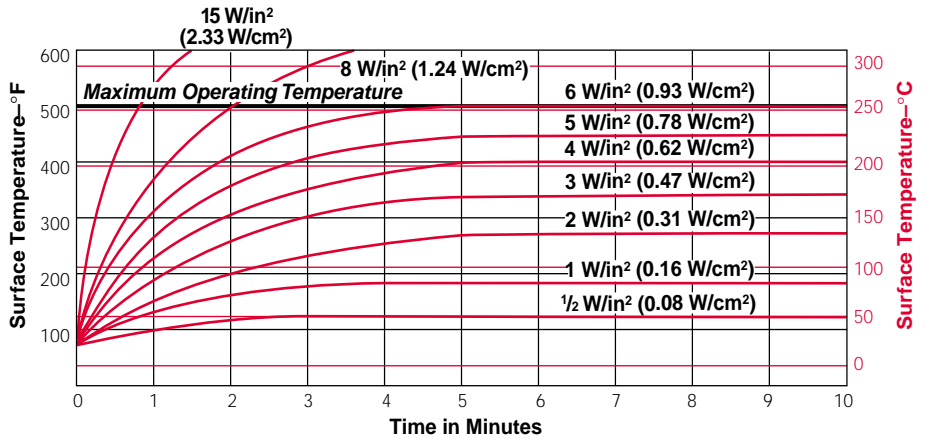
Applications and Technical Data

Continued

Surface Temperature vs. Time

This graph illustrates the surface temperature a silicone rubber heater will reach when the heater is uninsulated and is suspended

vertically in 70°F (20°C) still air. This data is based on 0.055 inch (1.4 mm) thick standard construction and is offered as a reference tool.



UR®, cUR® and VDE Recognition for Silicone Rubber Heaters

Watlow frequently works with customers requiring agency approvals such as UR®, cUR® and VDE. Many stock silicone rubber heaters are available with one or more of these certifications.

Watlow's technical letter #3, flexible heaters, provides in-depth information on agency approvals.

UL® Component Recognition (UR)

of factory-bonded heaters is available up to 392°F (200°C), and for customer installed heaters up to 428°F (220°C) (UL File No. E52951).

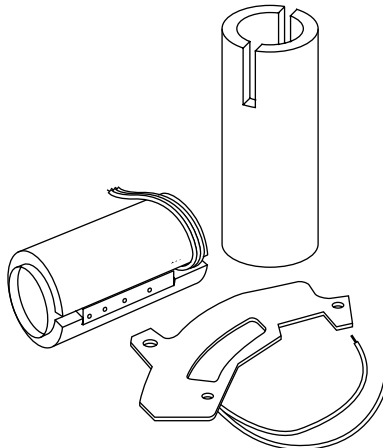
For Canadian recognition Watlow offers **cUR Recognized®** silicone rubber heaters under UL File #E52951. Several constructions are available with ratings to 600V~(ac) and 428°F (220°C) maximum surface temperature. Consult the factory for further information.

VDE Approval is available on several constructions of both wire-wound (File No. 62533) and etched foil (File No. 62535) silicone rubber heaters. The maximum ratings are 440V~(ac) and 428°F (220°C) surface temperature. Under VDE guidelines, minimum installed bend radius is 1/8 inch (3 mm) for etched foil and 1/4 inch (6 mm) for wire wound. VDE also states that the user is responsible for the safe application, installation and wiring of the heaters. Maximum working temperature must be maintained by an appropriate temperature control.

Options

Watlow offers a variety of options such as attachment techniques, thermostats, special leads, holes and cutouts and three-dimensional shapes. These are all described in the introduction to flexible heaters section. In addition, the following option is available only on silicone rubber heaters.

Thermal Insulation



To increase the heating efficiency of your application, silicone rubber heaters can be thermally insulated with silicone sponge rubber, bonded to one side in the following thicknesses: 1/16, 1/8, 1/4, 3/8 or 1/2 inch (1.6, 3, 6, 10 or 13 mm). Heaters with thermal insulation are still quite flexible.

An aluminized surface can be added to the back of the heater to reduce radiated heat losses. This aluminized surface, called "Low Loss Treatment," adds very little to the unit thickness and maintains a very clean appearance.



See pages 165 to 168 for more information on options.

Flexible Heaters

F.O.B.: Columbia, Missouri

Silicone Rubber Wire-Wound Element

Width in (mm)	Length in (mm)	Watts	Availability	120V~(ac) Code No.	240V~(ac) Code No.
1 (25)	2 (50)	10	Stock	010020C1	
	3 (75)	15	Stock	010030C1	
	4 (100)	20	Stock	010040C1	
	5 (125)	25	Stock	010050C1	
	5 (125)	25	Stock		010050C2
	10 (255)	50	Stock	010100C1	
	10 (255)	50	Stock		010100C2
	15 (380)	75	Stock	010150C1	
	15 (380)	75	Stock		010150C2
	20 (510)	100	Stock	010200C1	
	20 (510)	100	Stock		010200C2
	25 (635)	125	Stock	010250C1	
	30 (760)	150	Stock	010300C1	
	35 (890)	175	Stock	010350C1	
	40 (1015)	200	Stock	010400C1	
80 (2030)	400	Stock	010800C1		
120 (3050)	600	Stock	010F10C1 ^①		
2 (50)	2 (50)	20	Stock	020020C1	
	5 (125)	50	Stock	020050C1	
	5 (125)	50	Stock		020050C2
	10 (255)	100	Stock	020100C1	
	10 (255)	100	Stock		020100C2
	15 (380)	150	Stock	020150C1	
	15 (380)	150	Stock		020150C2
	20 (510)	200	Stock	020200C1	
	20 (510)	200	Stock		020200C2
	25 (635)	250	Stock	020250C1	
	30 (760)	300	Stock	020300C1	
	35 (890)	350	Stock	020350C1	
	40 (1015)	400	Stock	020400C1	

CONTINUED 

① 010F10C1 - F = feet (i.e. 10 feet = 120 inches)

Approx. net weight: 8 ounces/ft² (0.24 g/cm²). Standard thickness: 0.055 inch. Standard lead length: 12 inches UL 1180 Teflon®.

Silicone rubber wire-wound elements rated at 5 W/in².

UL® Component Recognition (UR®).

How to Order

To order stock silicone rubber heaters, specify the Watlow code number and the quantity. To order a heater with options, specify the code number, quantity and options desired (**see page 165**). Consult Watlow before combining options.

Made-to-Order:

Consult factory. For **made-to-order** units, Watlow will need the following application information from you:

- Size (dimensions)
- Voltage
- Wattage/watt density
- Operating temperature
- Options (leads, thermostats, attachment techniques, etc.)
- Will heater be subject to flexing?
- Element type, if you have a preference
- Agency approvals
- Quantity

Availability

Stock: Same day shipment of orders received by 11:00 a.m. CST.

Stock with Options: Shipment in five working days or less. Not all options are available with stock heaters.

Flexible Heaters

Silicone Rubber Wire-Wound Element

Width in (mm)	Length in (mm)	Watts	Availability	120V~(ac) Code No.	240V~(ac) Code No.
3 (75)	3 (75)	45	Stock	030030C1	
	5 (125)	75	Stock	030050C1	
	5 (125)	75	Stock		030050C2
	10 (255)	150	Stock	030100C1	
	10 (255)	150	Stock		030100C2
	15 (380)	225	Stock	030150C1	
	15 (380)	225	Stock		030150C2
	20 (510)	300	Stock	030200C1	
	20 (510)	300	Stock		030200C2
	25 (635)	375	Stock	030250C1	
	30 (760)	450	Stock	030300C1	
	35 (890)	525	Stock	030350C1	
40 (1015)	600	Stock	030400C1		
4 (100)	4 (100)	80	Stock	040040C1	
	5 (125)	100	Stock	040050C1	
	5 (125)	100	Stock		040050C2
	10 (255)	200	Stock	040100C1	
	10 (255)	200	Stock		040100C2
	15 (380)	300	Stock	040150C1	
	15 (380)	300	Stock		040150C2
	20 (510)	400	Stock	040200C1	
	20 (510)	400	Stock		040200C2
	25 (635)	500	Stock	040250C1	
	30 (760)	600	Stock	040300C1	
	35 (890)	700	Stock	040350C1	
40 (1015)	800	Stock	040400C1		
5 (125)	5 (125)	125	Stock	050050C1	
	5 (125)	125	Stock		050050C2
	10 (255)	250	Stock	050100C1	
	10 (255)	250	Stock		050100C2
	15 (380)	375	Stock	050150C1	
	15 (380)	375	Stock		050150C2
	20 (510)	500	Stock	050200C1	
	20 (510)	500	Stock		050200C2
	25 (635)	625	Stock	050250C1	
	30 (760)	750	Stock	050300C1	
	35 (890)	875	Stock	050350C1	
	40 (1015)	1000	Stock	050400C1	
6 (150)	5 (125)	150	Stock	060050C1	
	5 (125)	150	Stock		060050C2
	10 (255)	300	Stock	060100C1	
	10 (255)	300	Stock		060100C2
	15 (380)	450	Stock	060150C1	
	15 (380)	450	Stock		060150C2
	20 (510)	600	Stock	060200C1	
	20 (510)	600	Stock		060200C2
	25 (635)	750	Stock	060250C1	
	30 (760)	900	Stock	060300C1	
	35 (889)	1050	Stock	060350C1	
	40 (1016)	1200	Stock	060400C1	

Approx. net weight: 8 ounces/ft² (0.24 g/cm²). Standard thickness: 0.055 inch. Standard lead length: 12 inches UL 1180 Teflon®.
Silicone rubber wire-wound elements rated at 5 W/in². UL® Component Recognition (UR®).

Flexible Heaters

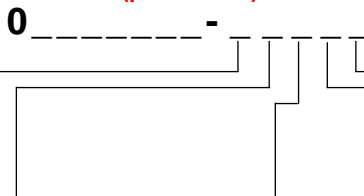
Silicone Rubber

Wire-Wound Stock Heater Coding Configured Options

How to order

To order, complete the code number with the information below:

Wire wound (p. 172-173)



Modification Options	
0	= None
A	= PSAS Bottom
B	= PSAS Top
E	= With Plate. Heater on Side Opposite Flange
F	= With Plate. Heater on Flange Side
G	= Flaps + Grommets
H	= Flaps + Boot Hooks
J	= Flaps + Latch Fasteners
K	= PSAS and Low Loss
L	= Low Loss
M	= Low Loss + Flaps + Grommets
N	= Low Loss + Flaps + Boot Hooks
P	= Low Loss + Flaps + Latch Fasteners
R	= 1/16 inch Sponge
S	= 1/8 inch Sponge
T	= 1/4 inch Sponge
U	= 3/8 inch Sponge
V	= 1/2 inch Sponge
W	= PSAS + 1/16 inch Sponge
Y	= PSAS + 1/8 inch Sponge
1	= PSAS + 1/4 inch Sponge
2	= PSAS + 3/8 inch Sponge
3	= PSAS + 1/2 inch Sponge
4	= Tip Plugs
6	= Tip Plugs/PSAS

• Heaters with flaps must be minimum 10 inches long.

Sensors		
Type	LOC	WIR
0	= None	
L	= T10 STD	STD
M	= T10 STD	ALT
N	= T10 ALT	STD
P	= T10 ALT	ALT
R	= T207 STD	STD
S	= T207 STD	ALT
T	= T207 ALT	STD
U	= T207 ALT	ALT
V	= T207E on heater	STD
W	= T207E Remote	STD
Y	= B200 STD	STD
1	= B200 STD	ALT
2	= B200 ALT	STD
3	= B200 ALT	ALT
4	= JSTD STD	STD
6	= JALT STD	STD
7	= KSTD STD	STD

• For thermostats, standard location is as shown in catalog; standard wiring is integral or series with the heater; alternate location is rotated parallel with heater width; alternate wiring is separate leads for pilot control.

• For thermocouples, J standard is Teflon® insulation; J alternate is fiberglass insulation; K standard is fiberglass insulation.

T10 Set °F*	
0	= None
A	= 125
B	= 150
E	= 175
F	= 200
G	= 225
H	= 250
J	= 275
K	= 300

T207 Set °F*	
0	= None
1	= 40/55
2	= 60/75
3	= 95/110
4	= 145/1600

B200 Set °F*	
0	= None
2	= 500
3	= 330

T/C Length	
0	= None
A	= 8 in
B	= 12 in
E	= 18 in
F	= 24 in
G	= 30 in
H	= 36 in
J	= 40 in
K	= 4 ft
L	= 5 ft
M	= 6 ft
N	= 7 ft
P	= 8 ft
R	= 9 ft
S	= 10 ft
T	= 12 ft
U	= 15 ft
V	= 18 ft
W	= 20 ft
Y	= 22 ft
1	= 25 ft
2	= 30 ft

* For all thermostats, the heater must be two inches minimum width and five inches minimum length.

Lead Insulation	
0	= None
1	= 1180 Teflon®
2	= 1180 cJR®
3	= 3133 22 GA
4	= 3134 18 GA
6	= 1199 cJR®
7	= HPN
8	= 6 foot HPN Set
9	= Type E Teflon®
A	= 1180VDE*
B	= 1199VDE*

* 1180VDE denotes a cJR® heater plus a VDE stamp.

Lead Length	
A	= 8 in
B	= 12 in
E	= 18 in
F	= 24 in
G	= 30 in
H	= 36 in
J	= 40 in
K	= 4 ft
L	= 5 ft
M	= 6 ft
N	= 7 ft
P	= 8 ft
R	= 9 ft
S	= 10 ft
T	= 12 ft
U	= 15 ft
V	= 18 ft
W	= 20 ft
Y	= 22 ft
1	= 25 ft
2	= 30 ft

Availability:
Modified Stock: Shipment within five working days