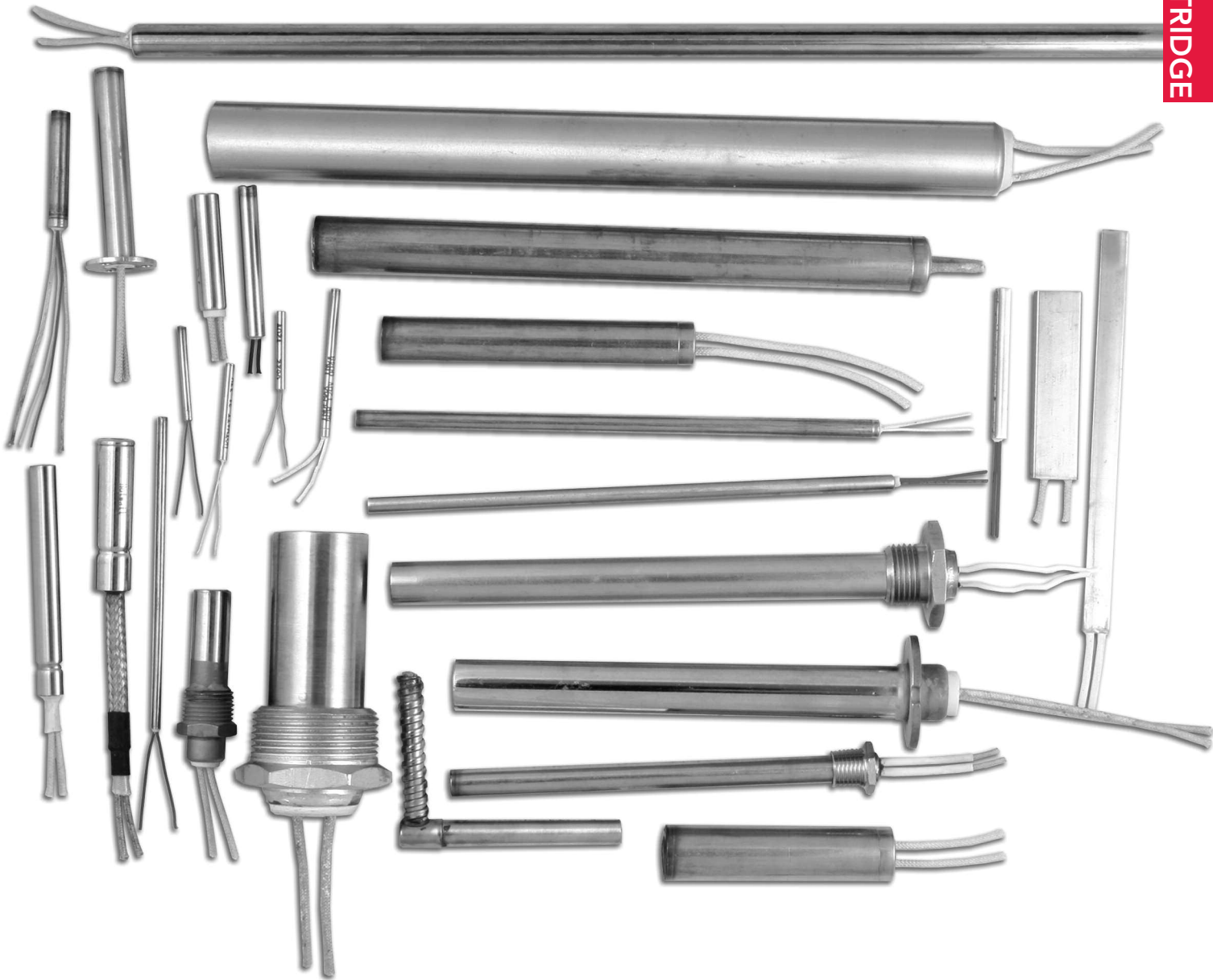




Cartridge Heaters

CARTRIDGE



Hotwatt manufactures a wide range of cartridge heating units for a variety of applications. This size, sheath, leads, terminals, wattage and voltage can be adapted to your heating requirements.

Hotwatt can provide you with heating units manufactured to your specifications to accommodate your application. Hotwatt stocks all material for the different diameter units listed in this catalog. Your order, specifying the wattage, voltage, diameter, length and lead type is readily and quickly fabricated from our inventory. In addition, many standard sizes are available from stock for immediate delivery.



Cartridge Heaters

Low to Medium Watt Density

U.L. Recognized – E56973
C.S.A. Certified 016386-0-000

CARTRIDGE



Applications:

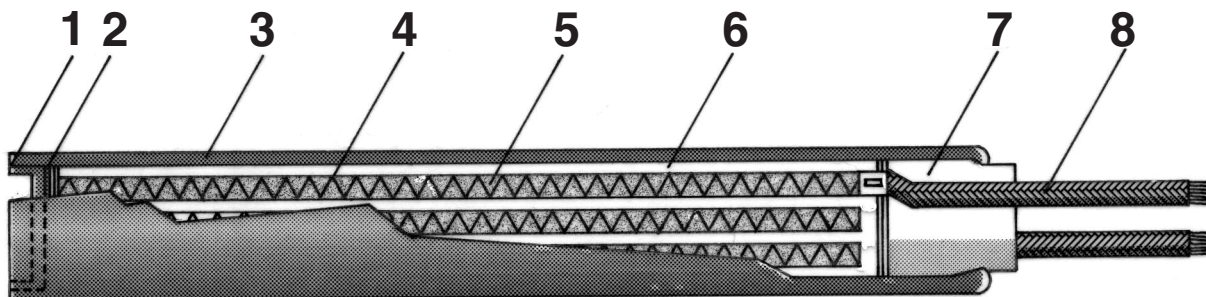
Compressor Crankcase Heating, Copiers, Dies, Food Processing, Glue Pots, Heat Sealing, Hot Melt Adhesive, Labeling, Medical Equipment, Packaging, Photographic Processing, Plastic Molding, Platens, Wax Pots.

Features:

- Hotwatt Precision Cartridge Heaters provided localized heat to restricted work areas requiring close thermal control. Dies, platens, and a variety of other types of processing equipment are efficiently heated. Closely controlled work temperatures up to 1250°F are obtained by a combination of heater location and proper wattage output.
- Basic designs are readily adaptable to a wide variety of special requirements, sizes, or ratings.
- Maximum surface temperatures up to 1250° F (677°C).
- Designations are etched on the sheath to preserve accurate shape.
- Heating elements arranged just beneath outside surface for maximum heat transfer, minimum core temperature and faster heating.
- Made in U.S.A.
- Where specified, units can be supplied liquid tight.
- Long, trouble free service.

Construction:

- 1 Heliarc welded end seal.
- 2 Mica.
- 3 Series 300 stainless steel sheath of precision dimensions and tolerances for intimate, stable, non-oxidizing contact with cavities machined for them.
- 4 Element wire situated in close proximity to outside surface for maximum heat transfer and minimum internal temperature while preserving good dielectric qualities.
- 5 Magnesium oxide packing.
- 6 Ceramic element support.
- 7 Ceramic cap.
- 8 Teflon insulated leads: ¼" diameter
Fiberglass leads: ⅜" – ¾" diameter
Post terminals: ⅛" – 2½"





Cartridge Heaters

Low to Medium Watt Density

CARTRIDGE

▼ Manufactured Items ▼

Round

Diameter:	1/8" (.124/.120)	5/32" (.155/.152)	3/16" (.186/.183)						
Maximum Amperage:	2 Not UL/CSA	2 Not UL/CSA	3.5						
Sheath Length	Cat. No.	Min. Watts	Max. Watts	Cat. No.	Min. Watts	Max. Watts	Cat. No.	Min. Watts	Max. Watts
1"	SC12-1	10	15	SC15-1	10	15	SC18-1	10	20
1 1/2"	SC12-1.5	10	25	SC15-1.5	10	25	SC18-1.5	10	32
2"	SC12-2	10	35	SC15-2	10	35	SC18-2	10	44
2 1/2"	SC12-2.5	10	45	SC15-2.5	10	45	SC18-2.5	10	55
3"	SC12-3	10	55	SC15-3	10	55	SC18-3	10	70
3 1/2"	SC12-3.5	10	65	SC15-3.5	10	65	SC18-3.5	10	80
4"	SC12-4	10	75	SC15-4	10	75	SC18-4	10	95
4 1/2"	SC12-4.5	10	85	SC15-4.5	10	85	SC18-4.5	10	105
5"	SC12-5	10	95	SC15-5	10	95	SC18-5	10	120
5 1/2"	SC12-5.5	10	105	SC15-5.5	10	105	SC18-5.5	10	132
6"	SC12-6	10	115	SC15-6	10	115	SC18-6	10	145
6 1/2"	SC12-6.5	10	125	SC15-6.5	10	125	SC18-6.5	10	157
7"	SC12-7	10	135	SC15-7	10	135	SC18-7	10	170
7 1/2"	SC12-7.5	10	145	SC15-7.5	10	145	SC18-7.5	10	182
8"	SC12-8	10	155	SC15-8	10	155	SC18-8	10	195
8 1/2"	SC12-8.5	10	165	SC15-8.5	10	165	SC18-8.5	10	207
9"	SC12-9	10	175	SC15-9	10	175	SC18-9	10	220
9 1/2"	SC12-9.5	10	185	SC15-9.5	10	185	SC18-9.5	10	232
10"	SC12-10	10	195	SC15-10	10	195	SC18-10	10	245
10 1/2"	SC12-10.5	10	205	SC15-10.5	10	205	SC18-10.5	10	257
11"	SC12-11	10	215	SC15-11	10	215	SC18-11	10	270
11 1/2"	SC12-11.5	10	225	SC15-11.5	10	225	SC18-11.5	10	282
12"	SC12-12	10	235	SC15-12	10	235	SC18-12	10	295

For longer lengths, compute wattage at: **10 watts per linear 1/2"** **10 watts per linear 1/2"** **12 watts per linear 1/2"**
 • Lengths longer than those listed may be ordered.

Wattage

Minimum Wattage

The following table should be used to determine the allowable voltage for low wattage miniature elements:

Size:	1/8" Dia.				5/32" Dia.				3/16" Dia.			
Length	30v	60v	120v	230v	30v	60v	120v	230v	30v	60v	120v	230v
1"	.6w	2.5w	10w	NA	.8w	3w	12w	NA	.8w	3w	12w	NA
1 1/2"	.6w	2.5w	10w	NA	.5w	2w	8w	30w	.5w	2w	8w	30w
2"	.5w	2w	8w	27w	.4w	1.5w	6w	22w	.4w	1.5w	6w	22w

NA-Not Available

▼ IN STOCK ITEMS ▼

Diameter: 1/8"

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
1"	SC12-1	10	120	35	.01
1"	SC12-1	15	120	50	.01
1 1/2"	SC12-1.5	20	120	40	.03
1 1/2"	SC12-1.5	25	120	50	.03
2"	SC12-2	35	120	50	.06

Diameter: 5/32"

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
1"	SC15-1	10	120	25	.05
1 1/2"	SC15-1.5	20	120	35	.07
2"	SC15-2	35	120	40	.09

Diameter: 3/16"

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
1 1/2"	SC18-1.5	30	120	40	.07
2"	SC18-2	35	120	35	.09
3"	SC18-3	65	120	40	.11
4"	SC18-4	90	120	40	.13
4"	SC18-4	60	120	25	.13
4"	SC18-4	100	120	45	.13



Cartridge Heaters

Low to Medium Watt Density

CARTRIDGE

▼ Manufactured Items ▼

Diameter:		¼" (.249/.245)	5/16" (.311/.307)	3/8" (.374/.370)					
Maximum Amperage:		3.5	6	6					
Sheath Length	Cat. No.	Min. Watts	Max. Watts	Cat. No.	Min. Watts	Max. Watts	Cat. No.	Min. Watts	Max. Watts
1"	SC25-1	10	25	SC32-1	10	35	SC37-1	10	35
1½"	SC25-1.5	10	50	SC32-1.5	10	70	SC37-1.5	10	70
2"	SC25-2	10	75	SC32-2	10	105	SC37-2	10	105
2½"	SC25-2.5	10	100	SC32-2.5	10	140	SC37-2.5	10	140
3"	SC25-3	10	125	SC32-3	10	175	SC37-3	10	175
3½"	SC25-3.5	10	150	SC32-3.5	10	210	SC37-3.5	10	210
4"	SC25-4	10	175	SC32-4	10	245	SC37-4	10	245
4½"	SC25-4.5	10	200	SC32-4.5	10	285	SC37-4.5	10	285
5"	SC25-5	10	225	SC32-5	10	325	SC37-5	10	325
5½"	SC25-5.5	10	250	SC32-5.5	10	360	SC37-5.5	10	360
6"	SC25-6	10	275	SC32-6	10	395	SC37-6	10	395
6½"	SC25-6.5	10	300	SC32-6.5	10	430	SC37-6.5	10	430
7"	SC25-7	10	325	SC32-7	10	465	SC37-7	10	465
7½"	SC25-7.5	10	350	SC32-7.5	10	500	SC37-7.5	10	500
8"	SC25-8	10	375	SC32-8	10	535	SC37-8	10	535
8½"	SC25-8.5	10	400	SC32-8.5	10	570	SC37-8.5	10	570
9"	SC25-9	10	425	SC32-9	10	605	SC37-9	10	605
9½"	SC25-9.5	10	450	SC32-9.5	10	640	SC37-9.5	10	640
10"	SC25-10	10	475	SC32-10	10	675	SC37-10	10	675
10½"	SC25-10.5	10	500	SC32-10.5	10	710	SC37-10.5	10	710
11"	SC25-11	10	525	SC32-11	10	745	SC37-11	10	745
11½"	SC25-11.5	10	550	SC32-11.5	10	780	SC37-11.5	10	780
12"	SC25-12	10	575	SC32-12	10	815	SC37-12	10	815

For longer lengths,
compute wattage at: **25 watts per linear ½"**
• Lengths longer than those listed may be ordered.

35 watts per linear ½"

35 watts per linear ½"

▼ IN STOCK ITEMS ▼

Diameter: ¼"						Diameter: ¼" (continued)					
Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)	Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
1"	SC25-1	20	120	35	.01	3"	SC25-3	25	120	11	.05
1¼"	SC25-1.25	20	120	25	.01	3"	SC25-3	100	240	45	.05
1½"	SC25-1.5	7	120	7	.02	3½"	SC25-3.5	25	120	9	.06
1½"	SC25-1.5	12	120	12	.02	3½"	SC25-3.5	90	120	35	.06
1½"	SC25-1.5	30	120	30	.02	3½"	SC25-3.5	90	240	35	.06
1½"	SC25-1.5	30	240	30	.02	4"	SC25-4	25	120	10	.07
1½"	SC25-1.5	50	120	50	.02	4"	SC25-4	110	120	40	.07
1½"	SC25-1.5	50	240	50	.02	4"	SC25-4	110	240	40	.07
2"	SC25-2	12	120	9	.03	4½"	SC25-4.5	25	120	7	.08
2"	SC25-2	50	120	35	.03	4½"	SC25-4.5	110	120	30	.08
2"	SC25-2	50	240	35	.03	4½"	SC25-4.5	110	240	30	.08
2¼"	SC25-2.25	20	120	12	.03	7"	SC25-7	40	120	8	.12
2¼"	SC25-2.25	75	240	50	.03	7"	SC25-7	150	120	29	.12
2½"	SC25-2.5	20	120	9	.04	7"	SC25-7	150	240	29	.12
2½"	SC25-2.5	65	120	35	.04						
2½"	SC25-2.5	65	240	35	.04						



Cartridge Heaters

Low to Medium Watt Density

▼ IN STOCK ITEMS (Continued) ▼

Diameter: $\frac{3}{8}$ "

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
1"	SC37-1	30	120	40	.04
1½"	SC37-1.5	10	120	5	.07
1½"	SC37-1.5	30	120	20	.07
1½"	SC37-1.5	30	240	20	.07
1½"	SC37-1.5	50	120	40	.07
1½"	SC37-1.5	50	240	40	.07
2"	SC37-2	15	120	9	.09
2"	SC37-2	70	120	35	.09
2"	SC37-2	70	240	35	.09
2"	SC37-2	100	120	50	.09
2½"	SC37-2.5	25	120	10	.12
2½"	SC37-2.5	100	120	40	.12
2½"	SC37-2.5	100	240	40	.12
3"	SC37-3	20	120	6	.15
3"	SC37-3	75	120	25	.15
3"	SC37-3	75	240	25	.15
3½"	SC37-3.5	40	120	12	.18
3½"	SC37-3.5	150	120	50	.18
3½"	SC37-3.5	150	240	50	.18
4"	SC37-4	20	120	5	.20
4"	SC37-4	55	120	12	.20
4"	SC37-4	75	240	20	.20
4"	SC37-4	220	120	50	.20
4"	SC37-4	220	240	50	.20
4½"	SC37-4.5	60	120	12	.23
4½"	SC37-4.5	250	120	50	.23
4½"	SC37-4.5	250	240	50	.23
5"	SC37-5	70	120	12	.27
5"	SC37-5	280	120	50	.27
5"	SC37-5	280	240	50	.27
5½"	SC37-5.5	25	120	4	.31
5½"	SC37-5.5	100	240	15	.31
6"	SC37-6	90	120	12	.36
6"	SC37-6	350	120	50	.36
6"	SC37-6	350	240	50	.36
8"	SC37-8	125	120	14	.16
8"	SC37-8	500	120	58	.16
8"	SC37-8	500	240	58	.18
9"	SC37-9	140	120	14	.18
9"	SC37-9	550	120	55	.18
9"	SC37-9	550	240	55	.18
10"	SC37-10	100	120	9	.20
10"	SC37-10	400	120	36	.20
10"	SC37-10	400	240	36	.20
12"	SC37-12	150	120	11	.22
12"	SC37-12	600	120	45	.22
12"	SC37-12	600	240	45	.22

CARTRIDGE



Cartridge Heaters

Low to Medium Watt Density

CARTRIDGE

▼ Manufactured Items ▼

Diameter:	½" (.499/.494)	⅝" (.624/.619)	¾" (.749/.741)						
Maximum Amperage:	10	10	15						
Sheath Length	Cat. No.	Min. Watts	Max. Watts	Cat. No.	Min. Watts	Max. Watts	Cat. No.	Min. Watts	Max. Watts
1"	SC50-1	10	55	SC62-1	10	60			
1½"	SC50-1.5	10	100	SC62-1.5	10	120	SC75-1.5	40	140
2"	SC50-2	10	145	SC62-2	10	180	SC75-2	40	210
2½"	SC50-2.5	10	190	SC62-2.5	10	240	SC75-2.5	40	280
3"	SC50-3	10	235	SC62-3	10	300	SC75-3	40	350
3½"	SC50-3.5	10	280	SC62-3.5	10	360	SC75-3.5	40	420
4"	SC50-4	10	325	SC62-4	10	420	SC75-4	40	490
4½"	SC50-4.5	10	370	SC62-4.5	10	480	SC75-4.5	40	560
5"	SC50-5	10	415	SC62-5	10	540	SC75-5	40	630
5½"	SC50-5.5	10	460	SC62-5.5	10	600	SC75-5.5	40	700
6"	SC50-6	10	505	SC62-6	10	660	SC75-6	40	770
6½"	SC50-6.5	10	550	SC62-6.5	10	720	SC75-6.5	40	840
7"	SC50-7	10	595	SC62-7	10	780	SC75-7	40	910
7½"	SC50-7.5	10	640	SC62-7.5	10	840	SC75-7.5	40	980
8"	SC50-8	10	685	SC62-8	10	900	SC75-8	40	1050
8½"	SC50-8.5	10	730	SC62-8.5	10	960	SC75-8.5	40	1120
9"	SC50-9	10	775	SC62-9	10	1020	SC75-9	40	1190
9½"	SC50-9.5	10	820	SC62-9.5	10	1080	SC75-9.5	40	1260
10"	SC50-10	10	865	SC62-10	10	1140	SC75-10	40	1330
10½"	SC50-10.5	10	910	SC62-10.5	10	1200	SC75-10.5	40	1400
11"	SC50-11	10	955	SC62-11	10	1260	SC75-11	40	1470
11½"	SC50-11.5	10	1000	SC62-11.5	10	1320	SC75-11.5	40	1540
12"	SC50-12	10	1045	SC62-12	10	1380	SC75-12	40	1610

For longer lengths,

compute wattage at: **45 watts per linear ½"**

60 watts per linear ½"

70 watts per linear ½"

• Lengths longer than those listed may be ordered.

▼ IN STOCK ITEMS ▼

Diameter: ½"

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
1½"	SC50-1.5	18	120	12	.07
1½"	SC50-1.5	75	120	50	.07
1½"	SC50-1.5	75	240	50	.07
1½"	SC50-1.5	90	120	60	.07
2"	SC50-2	30	120	12	.11
2"	SC50-2	120	120	50	.11
2"	SC50-2	120	240	50	.11
2½"	SC50-2.5	40	120	12	.14
2½"	SC50-2.5	80	120	25	.14
2½"	SC50-2.5	150	120	50	.14
2½"	SC50-2.5	150	240	50	.14
3"	SC50-3	50	120	12	.17
3"	SC50-3	200	120	50	.17
3"	SC50-3	200	240	50	.17
4"	SC50-4	70	120	12	.23

Diameter: ½" (continued)

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
4"	SC50-4	275	120	50	.23
4"	SC50-4	275	240	50	.23
5"	SC50-5	85	120	12	.27
5"	SC50-5	350	120	50	.27
5"	SC50-5	350	240	50	.27
6"	SC50-6	110	120	12	.33
6"	SC50-6	425	120	50	.33
6"	SC50-6	425	240	50	.33
7"	SC50-7	135	120	14	.48
7"	SC50-7	550	120	55	.48
7"	SC50-7	550	240	55	.48
8"	SC50-8	160	120	14	.53
8"	SC50-8	650	120	55	.53
8"	SC50-8	650	240	55	.53
10"	SC50-10	210	120	14	.62



Cartridge Heaters

Low to Medium Watt Density

▼ IN STOCK ITEMS (Continued) ▼

Diameter: 1/2" (continued)

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
10"	SC50-10	850	120	55	.62
10"	SC50-10	850	240	55	.62
12"	SC50-12	250	120	14	.69
12"	SC50-12	1000	120	55	.69
12"	SC50-12	1000	240	55	.69
14"	SC50-14	250	120	12	.48
14"	SC50-14	1000	240	48	.48
16"	SC50-16	250	120	10	.52
16"	SC50-16	1000	240	41	.52
18"	SC50-18	300	120	11	.57
18"	SC50-18	1200	240	44	.57
24"	SC50-24	450	120	12	1.34
24"	SC50-24	1800	240	49	1.34

Diameter: 5/8"

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
2 1/2"	SC62-2.5	20	120	5	.15
2 1/2"	SC62-2.5	50	120	12	.15
2 1/2"	SC62-2.5	75	240	20	.15
2 1/2"	SC62-2.5	200	120	50	.15
2 1/2"	SC62-2.5	200	240	50	.15
3"	SC62-3	65	120	12	.21
3"	SC62-3	250	120	50	.21
3"	SC62-3	250	240	50	.21
3 1/2"	SC62-3.5	75	120	12	.25
3 1/2"	SC62-3.5	300	120	50	.25
3 1/2"	SC62-3.5	300	240	50	.25
3 1/2"	SC62-3.5	350	120	60	.25
4"	SC62-4	90	120	12	.29
4"	SC62-4	350	120	50	.29
4"	SC62-4	350	240	50	.29
5"	SC62-5	115	120	12	.35
5"	SC62-5	450	120	50	.35
5"	SC62-5	450	240	50	.35
6"	SC62-6	100	120	7	.44
6"	SC62-6	135	120	123	.44
6"	SC62-6	350	120	30	.44
6"	SC62-6	400	240	30	.44
6"	SC62-6	540	120	50	.44
6"	SC62-6	540	240	50	.44
7"	SC62-7	160	120	12	.57
7"	SC62-7	635	120	50	.57
7"	SC62-7	635	240	50	.57
8"	SC62-8	190	120	12	.55
8"	SC62-8	750	120	57	.55
8"	SC62-8	750	240	57	.55
9"	SC62-9	235	120	14	.63

Diameter: 5/8" (continued)

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
9"	SC62-9	950	120	55	.63
9"	SC62-9	950	240	55	.63
10"	SC62-10	250	120	53	.68
10"	SC62-10	1000	120	53	.68
10"	SC62-10	1000	240	53	.68
12"	SC62-12	300	120	12	.75
12"	SC62-12	1200	240	53	.75
18"	SC62-18	375	120	11	1.03
18"	SC62-18	1500	240	44	1.03
20"	SC62-20	375	120	10	1.25
20"	SC62-20	1500	240	40	1.25
24"	SC62-24	500	120	11	1.47
24"	SC62-24	625	120	14	1.47
24"	SC62-24	2000	240	44	1.47
24"	SC62-24	2500	240	65	1.47

Diameter: 3/4"

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
2 1/2"	SC75-2.5	60	120	12	.21
2 1/2"	SC75-2.5	230	120	50	.21
2 1/2"	SC75-2.5	230	240	50	.21
3 1/2"	SC75-3.5	90	120	12	.29
3 1/2"	SC75-3.5	350	120	50	.29
3 1/2"	SC75-3.5	350	240	50	.29
3 1/2"	SC75-3.5	350	120	60	.25
5"	SC75-5	125	120	12	.43
5"	SC75-5	500	120	50	.43
5"	SC75-5	500	240	50	.43
6"	SC75-6	160	120	12	.49
6"	SC75-6	650	120	50	.49
6"	SC75-6	650	240	50	.49
7"	SC75-7	190	120	12	.57
7"	SC75-7	760	120	50	.57
7"	SC75-7	760	240	50	.57
8"	SC75-8	220	120	12	.70
8"	SC75-8	750	120	40	.70
8"	SC75-8	885	120	50	.70
8"	SC75-8	885	240	50	.70
10"	SC75-10	275	120	11	.80
10"	SC75-10	1100	240	45	.80
12"	SC75-12	325	120	11	.92
12"	SC75-12	1300	240	45	.92
14"	SC75-14	315	120	10	1.03
14"	SC75-14	625	120	20	1.03
14"	SC75-14	1250	240	40	1.03
16"	SC75-16	450	120	12	1.14
16"	SC75-16	1800	240	49	1.14

CARTRIDGE



Cartridge Heaters

Low to Medium Watt Density

CARTRIDGE

▼ IN STOCK ITEMS (Continued) ▼

Diameter: 3/4" (continued)

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
18"	SC75-18	500	120	12	1.25
18"	SC75-18	2000	240	49	1.25
20"	SC75-20	565	120	12	1.40
20"	SC75-20	2250	240	49	1.40
24"	SC75-24	595	120	11	1.50
24"	SC75-24	690	120	13	1.50
24"	SC75-24	2375	240	43	1.50
24"	SC75-24	2750	240	50	1.50
36"	SC75-36	625	120	8	2.05
36"	SC75-36	2500	240	36	2.05

▼ Manufactured Items ▼

Diameter: 1 5/16" (.936/.928)				1" (.999/.991)			1 1/4" (1.249/1.241)		
Maximum Amperage: 25				25			30		
Sheath Length	Cat. No.	Min. Watts	Max. Watts	Cat. No.	Min. Watts	Max. Watts	Cat. No.	Min. Watts	Max. Watts
2"	SC93-2	50	280	SC1.0-2	50	280	SC1.2-2	100	350
2 1/2"	SC93-2.5	50	375	SC1.0-2.5	50	375	SC1.2-2.5	100	470
3"	SC93-3	50	470	SC1.0-3	50	470	SC1.2-3	100	590
3 1/2"	SC93-3.5	50	565	SC1.0-3.5	50	565	SC1.2-3.5	100	710
4"	SC93-4	50	660	SC1.0-4	50	660	SC1.2-4	100	830
4 1/2"	SC93-4.5	50	755	SC1.0-4.5	50	755	SC1.2-4.5	100	950
5"	SC93-5	50	850	SC1.0-5	50	850	SC1.2-5	100	1070
5 1/2"	SC93-5.5	50	945	SC1.0-5.5	50	945	SC1.2-5.5	100	1190
6"	SC93-6	50	1040	SC1.0-6	50	1040	SC1.2-6	100	1310
6 1/2"	SC93-6.5	50	1135	SC1.0-6.5	50	1135	SC1.2-6.5	100	1430
7"	SC93-7	50	1230	SC1.0-7	50	1230	SC1.2-7	100	1550
7 1/2"	SC93-7.5	50	1325	SC1.0-7.5	50	1325	SC1.2-7.5	100	1670
8"	SC93-8	50	1420	SC1.0-8	50	1420	SC1.2-8	100	1790
8 1/2"	SC93-8.5	50	1515	SC1.0-8.5	50	1515	SC1.2-8.5	100	1910
9"	SC93-9	50	1610	SC1.0-9	50	1610	SC1.2-9	100	2030
9 1/2"	SC93-9.5	50	1705	SC1.0-9.5	50	1705	SC1.2-9.5	100	2150
10"	SC93-10	50	1800	SC1.0-10	50	1800	SC1.2-10	100	2270
10 1/2"	SC93-10.5	50	1895	SC1.0-10.5	50	1895	SC1.2-10.5	100	2390
11"	SC93-11	50	1990	SC1.0-11	50	1990	SC1.2-11	100	2510
11 1/2"	SC93-11.5	50	2085	SC1.0-11.5	50	2085	SC1.2-11.5	100	2630
12"	SC93-12	50	2180	SC1.0-12	50	2180	SC1.2-12	100	2750

For longer lengths, compute wattage at: 95 watts per linear 1/2"

95 watts per linear 1/2"

120 watts per linear 1/2"



Cartridge Heaters

Low to Medium Watt Density

CARTRIDGE

▼ Manufactured Items ▼

Diameter:	1.90" (1.890/1.910)			2 3/8" (2.365/2.385)			
Maximum Amperage:	40			40			
	Sheath Length	Cat. No.	Min. Watts	Max. Watts	Cat. No.	Min. Watts	Max. Watts
	6"	SC1.9-6	500	1400			
	7"	SC1.9-7	500	1700			
	8"	SC1.9-8	500	1960	SC2.3-8	500	2300
	9"	SC1.9-9	500	2240	SC2.3-9	500	2650
	10"	SC1.9-10	500	2500	SC2.3-10	500	3000
	12"	SC1.9-12	500	3100	SC2.3-12	500	3630
	14"	SC1.9-14	500	3650	SC2.3-14	500	4300
	16"	SC1.9-16	500	4200	SC2.3-16	500	5000
	18"	SC1.9-18	500	4750	SC2.3-18	500	5600
	20"	SC1.9-20	500	5300	SC2.3-20	500	6270
	22"	SC1.9-22	500	5900	SC2.3-22	500	6930
	24"	SC1.9-24	500	6450	SC2.3-24	500	7600
	26"	SC1.9-26	500	7000	SC2.3-26	500	8250
	28"	SC1.9-28	500	7550	SC2.3-28	500	8900
	30"	SC1.9-30	500	8100	SC2.3-30	500	9570
	32"	SC1.9-32	500	8700	SC2.3-32	500	10250
	34"	SC1.9-34	500	9250	SC2.3-34	500	10900
	36"	SC1.9-36	500	9800	SC2.3-36	500	11550
	38"	SC1.9-38	500	10350	SC2.3-38	500	12200
	40"	SC1.9-40	500	10900	SC2.3-40	500	12870
	42"	SC1.9-42	500	11500	SC2.3-42	500	13530
	44"	SC1.9-44	500	12000	SC2.3-44	500	14200
	46"	SC1.9-46	500	12600	SC2.3-46	500	14850
	48"	SC1.9-48	500	13200	SC2.3-48	500	15500

For longer lengths, compute wattage at: **280 watts per linear 1"** **330 watts per linear 1"**
 • Lengths longer than those listed may be ordered.

Wattage

The maximum wattages listed are computed at 60 watts per square inch of heated surface. With proper fit in a heat sink, long life can be expected at this watt density. Consult factory for higher watt density applications. Lower watt density will result in longer life. Any wattage within standard limits may be ordered without affecting price.

Voltage

Standard voltages are either 120V or 240V (subject to limits above). Lower voltages are available.

Termination

All units up to 1/8" diameter, within published amperage limits, are manufactured with 6" (type SF1) leads, longer length leads are available. Standard insulation on 1/8" units is Teflon (200°C); Fiberglass (250°C) is standard on units 3/16" in diameter and larger. All units 1/8" and larger are manufactured with post terminals (type SF-3). Optional Type SF1 leads are available. Stock units supplied with 12" leads.

Tolerances

Wattage tolerances are held to +5%, -10% at rated voltage. Diameter is always .001" less, but not more than .009" less, than the nominal (fractional) heater diameter except for 1.90" and 2 3/8" diameters. This sizing is maintained so that all units are a slide fit into a standard reamed hole of the size ordered. Thermal action will expand the unit to a snug fit for best heat conduction. If close hole tolerances are not maintained, operating life may be drastically reduced. See specific heater size for exact tolerances. Length tolerances are ±2% with a 1/16" minimum. Consult factory for closer tolerances.

How to Order

After determining the wattage required and the line voltage available, determine the physical space available for heaters and the number of heaters required. Review Stock lists for In-Stock Items. Review Special Features, see page 22-27. **Specify:** catalog number, wattage, voltage, lead type, and special features, if required. **Example:** SC62-8.5/600W240V/SF1-16/SF14-10



Cartridge Heaters

Superwatt® High Watt Density

U.L. Recognized - E56973
C.S.A. Certified - LR - 016386-0-000

CARTRIDGE



Applications:

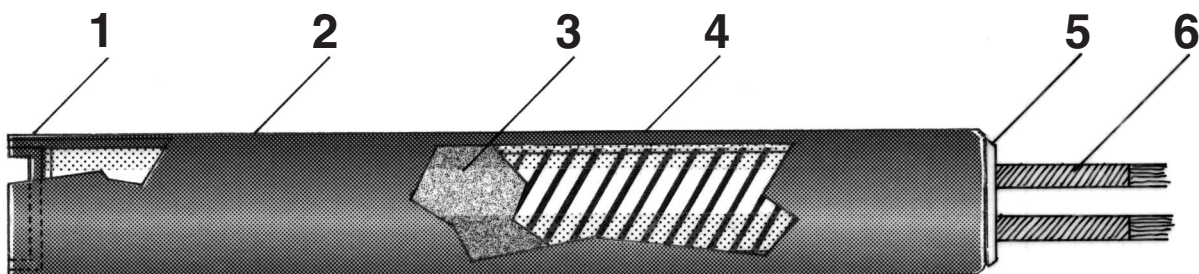
Dies, Heat Sealing, Hot Melt Adhesive, Plastic Molding, Platens, Shoe Machinery.

Features:

- **Elements are designed for maximum:** Watt density, temperature, heat transfer and heater life.
- The useful life of a Cartridge heating element is determined by how quickly the heat generated in the resistance wire can be dissipated to the outside sheath. With low and moderate watt density elements, such as Hotwatt's standard line, the conventional method of inserting helical coils in formed ceramics is an entirely satisfactory method of construction because the wire temperature relative to sheath temperature, even though considerably higher, is still well within safe long-life operating temperatures.
- The Superwatt® cartridge heater accelerates the transfer of heat from the resistance wire to the sheath. This is accomplished by relocating the wire so that it is closer to the sheath; and swaging the outside diameter of the heater, thereby compressing the magnesium oxide filler so that it becomes an improved conductor of heat from the wire while maintaining its dielectric properties. (See diagram this page). By improving the heat transfer rate, it is possible to manufacture elements of higher densities because the differential between the wire temperature and the sheath temperature has been minimized.
- Long, trouble free service.
- Made in U.S.A.

Construction:

- 1 Heliarc welded end seal.
- 2 Series 300 stainless steel sheath of precision dimensions and tolerances for intimate, stable, non-oxidizing contact with cavities machined for them.
- 3 Pure magnesium oxide compressed to an optimum density for best heat transfer and electrical insulation at elevated temperatures.
- 4 Element wire situated in close proximity to outside surface for maximum heat transfer and minimum internal temperature while preserving good dielectric qualities.
- 5 Ceramic cap.
- 6 Fiberglass insulated leads.





Cartridge Heaters

Superwatt® High Watt Density

CARTRIDGE

▼ Manufactured Items ▼

Diameter: 1/8" (.124/.120)
Maximum Amperage: 3.5 Not UL/CSA

Sheath Length	Cat. No.	Min. Watts	Max. Volts	Sheath Length	Cat. No.	Min. Watts	Max. Volts
1"	HS12-1	CONSULT	FACTORY	2 1/2"	HS12-2.5	50	120
1 1/2"	HS12-1.5	CONSULT	FACTORY	3"	HS12-3	60	120
2"	HS12-2	CONSULT	FACTORY	3 1/2"	HS12-3.5	70	120
				4"	HS12-4	80	120

▼ Manufactured Items ▼

Diameter: 1/4" (.249/.245) 3/8" (.374/.370) 1/2" (.499/.495)
Maximum Amperage: 4 6 10

Sheath Length	Cat. No.	Min. Watts	Max. Volts	Cat. No.	Min. Watts	Max. Volts	Cat. No.	Min. Watts	Max. Volts
1"	HS25-1	70	120	HS37-1	70	120			
1 1/2"	HS25-1.5	70	120	HS37-1.5	80	120	HS50-1.5	110	240
2"	HS25-2	100	120	HS37-2	120	240	HS50-2	160	240
2 1/2"	HS25-2.5	130	120	HS37-2.5	160	240	HS50-2.5	210	240
3"	HS25-3	150	240	HS37-3	200	240	HS50-3	270	240
3 1/2"	HS25-3.5	180	240	HS37-3.5	240	240	HS50-3.5	330	240
4"	HS25-4	210	240	HS37-4	280	240	HS50-4	380	240
4 1/2"	HS25-4.5	240	240	HS37-4.5	320	240	HS50-4.5	430	240
5"	HS25-5	260	240	HS37-5	360	240	HS50-5	490	240
5 1/2"	HS25-5.5	290	240	HS37-5.5	400	240	HS50-5.5	550	240
6"	HS25-6	320	240	HS37-6	440	240	HS50-6	600	240
6 1/2"	HS25-6.5	350	240	HS37-6.5	480	240	HS50-6.5	650	240
7"	HS25-7	380	240	HS37-7	520	240	HS50-7	700	240
7 1/2"	HS25-7.5	410	240	HS37-7.5	560	240	HS50-7.5	750	240
8"	HS25-8	440	240	HS37-8	600	240	HS50-8	800	240
8 1/2"	HS25-8.5	470	240	HS37-8.5	640	240	HS50-8.5	850	240
9"	HS25-9	500	240	HS37-9	680	240	HS50-9	900	240
9 1/2"	HS25-9.5	530	240	HS37-9.5	720	240	HS50-9.5	950	240
10"	HS25-10	560	240	HS37-10	760	240	HS50-10	1000	240
10 1/2"	HS25-10.5	590	240	HS37-10.5	800	240	HS50-10.5	1050	240
11"	HS25-11	620	240	HS37-11	840	240	HS50-11	1100	240
11 1/2"	HS25-11.5	650	240	HS37-11.5	880	240	HS50-11.5	1150	240
12"	HS25-12	680	240	HS37-12	920	240	HS50-12	1200	240

▼ IN STOCK ITEMS ▼

Diameter: 1/4"

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
1"	HS25-1	100	120	250	.02
1 1/4"	HS25-1.25	100	120	165	.02
1 1/2"	HS25-1.5	70	120	85	.02
1 1/2"	HS25-1.5	100	120	125	.02
1 1/2"	HS25-1.5	120	120	150	.02
2"	HS25-2	100	120	85	.03
2"	HS25-2	150	120	125	.03
2"	HS25-2	200	240	173	.03
2 1/2"	HS25-2.5	135	120	85	.03
2 1/2"	HS25-2.5	185	120	115	.03

Diameter: 1/4" (continued)

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
2 1/2"	HS25-2.5	250	120	159	.03
2 1/2"	HS25-2.5	250	240	159	.03
3"	HS25-3	75	120	38	.04
3"	HS25-3	170	120	90	.04
3"	HS25-3	220	120	115	.04
3"	HS25-3	300	120	156	.04
3"	HS25-3	300	240	156	.04
3 1/2"	HS25-3.5	50	120	21	.04
3 1/2"	HS25-3.5	65	120	27	.04
3 1/2"	HS25-3.5	200	120	85	.04



Cartridge Heaters

Superwatt® High Watt Density

CARTRIDGE

▼ IN STOCK ITEMS (Continued) ▼

Diameter: 1/4" (continued)

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
3 1/2"	HS25-3.5	200	240	85	.04
3 1/2"	HS25-3.5	260	120	110	.04
3 1/2"	HS25-3.5	260	240	110	.04
4"	HS25-4	60	120	21	.04
4"	HS25-4	75	120	27	.04
4"	HS25-4	100	120	27	.04
4"	HS25-4	235	120	85	.04
4"	HS25-4	235	240	85	.04
4"	HS25-4	300	120	110	.04
4"	HS25-4	300	240	110	.04
4"	HS25-4	400	120	150	.04
4"	HS25-4	400	240	150	.04
4 1/2"	HS25-4.5	70	120	21	.05
4 1/2"	HS25-4.5	90	120	27	.05
4 1/2"	HS25-4.5	270	120	85	.05
4 1/2"	HS25-4.5	270	240	85	.05
4 1/2"	HS25-4.5	350	120	110	.05
4 1/2"	HS25-4.5	350	240	110	.05
5"	HS25-5	75	120	21	.06
5"	HS25-5	100	120	28	.06
5"	HS25-5	305	120	85	.06
5"	HS25-5	305	240	85	.06
5"	HS25-5	400	120	115	.06
5"	HS25-5	400	240	115	.06
6"	HS25-6	100	120	23	.06
6"	HS25-6	400	120	94	.06
6"	HS25-6	400	240	94	.06
7"	HS25-7	90	120	18	.12
7"	HS25-7	300	120	69	.12
7"	HS25-7	300	240	69	.12

Diameter: 3/8"

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
1"	HS37-1	100	120	165	.04
1 1/4"	HS37-1.25	100	120	110	.04
1 1/4"	HS37-1.25	150	120	165	.04
1 1/2"	HS37-1.5	25	120	22	.05
1 1/2"	HS37-1.5	50	120	26	.05
1 1/2"	HS37-1.5	100	120	90	.05
1 1/2"	HS37-1.5	100	240	90	.05
1 1/2"	HS37-1.5	150	120	125	.05
1 1/2"	HS37-1.5	200	120	105	.05
1 1/2"	HS37-1.5	200	240	105	.05

Diameter: 3/8" (continued)

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
2"	HS37-2	40	120	21	.06
2"	HS37-2	50	120	27	.06
2"	HS37-2	60	120	34	.06
2"	HS37-2	150	120	85	.06
2"	HS37-2	150	240	85	.06
2"	HS37-2	200	120	110	.06
2"	HS37-2	200	240	110	.06
2"	HS37-2	250	120	135	.06
2"	HS37-2	250	240	135	.06
2 1/2"	HS37-2.5	50	120	21	.07
2 1/2"	HS37-2.5	75	120	31	.07
2 1/2"	HS37-2.5	200	120	85	.07
2 1/2"	HS37-2.5	200	240	85	.07
2 1/2"	HS37-2.5	300	120	125	.07
2 1/2"	HS37-2.5	300	240	125	.07
3"	HS37-3	60	120	21	.08
3"	HS37-3	100	120	25	.08
3"	HS37-3	250	120	85	.08
3"	HS37-3	250	240	85	.08
3"	HS37-3	400	120	135	.08
3"	HS37-3	400	240	135	.08
3 1/2"	HS37-3.5	75	120	21	.09
3 1/2"	HS37-3.5	300	120	85	.09
3 1/2"	HS37-3.5	450	120	130	.18
3 1/2"	HS37-3.5	300	240	85	.09
4"	HS37-4	90	120	21	.10
4"	HS37-4	125	120	30	.10
4"	HS37-4	350	120	85	.10
4"	HS37-4	350	240	85	.10
4"	HS37-4	500	120	120	.10
4"	HS37-4	500	240	120	.10
5"	HS37-5	125	120	23	.11
5"	HS37-5	500	240	95	.11
6"	HS37-6	150	120	22	.13
6"	HS37-6	600	120	90	.13
6"	HS37-6	600	240	90	.13
9 1/2"	HS37-9.5	250	120	24	.19
9 1/2"	HS37-9.5	1000	240	96	.19
10"	HS37-10	250	120	22	.20
10"	HS37-10	1000	240	90	.20
12"	HS37-12	250	120	19	.22
12"	HS37-12	1000	240	79	.22

• Lengths longer than those listed may be ordered.



Cartridge Heaters

Superwatt® High Watt Density

CARTRIDGE

▼ IN STOCK ITEMS (Continued) ▼

Diameter: 1/2"

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
1 1/2"	HS50-1.5	35	120	21	.07
1 1/2"	HS50-1.5	135	120	85	.07
1 1/2"	HS50-1.5	135	240	85	.07
1 1/2"	HS50-1.5	335	120	210	.07
2"	HS50-2	50	120	21	.08
2"	HS50-2	200	120	85	.08
2"	HS50-2	200	240	85	.08
2"	HS50-2	400	120	165	.08
2 1/2"	HS50-2.5	70	120	21	.09
2 1/2"	HS50-2.5	120	120	37	.09
2 1/2"	HS50-2.5	270	120	85	.09
2 1/2"	HS50-2.5	270	240	85	.09
2 1/2"	HS50-2.5	470	120	150	.09
2 1/2"	HS50-2.5	470	240	150	.09
3"	HS50-3	85	120	21	.10
3"	HS50-3	135	120	34	.10
3"	HS50-3	335	120	85	.10
3"	HS50-3	335	240	85	.10
3"	HS50-3	535	120	135	.10

Diameter: 1/2" (continued)

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
3"	HS50-3	535	240	135	.10
4"	HS50-4	120	120	21	.11
4"	HS50-4	470	120	85	.11
4"	HS50-4	470	240	85	.11
5"	HS50-5	125	120	17	.13
5"	HS50-5	500	120	70	.13
5"	HS50-5	500	240	70	.13
6"	HS50-6	185	120	21	.15
6"	HS50-6	735	120	85	.15
6"	HS50-6	735	240	85	.15
8"	HS50-8	250	120	21	.17
8"	HS50-8	1000	120	85	.17
8"	HS50-8	1000	240	85	.17
10"	HS50-10	300	120	20	.22
10"	HS50-10	1200	240	80	.22
12"	HS50-12	500	120	28	.40
12"	HS50-12	2000	240	112	.40
14"	HS50-14	575	120	27	.48
14"	HS50-14	2300	240	110	.48

▼ Manufactured Items ▼

Diameter: 5/8" (.624/.620)

Maximum Amperage: 20

Sheath Length	Cat. No.	Min. Watts	Max. Volts
1 1/2"	HS62-1.5	130	240
2"	HS62-2	200	240
2 1/2"	HS62-2.5	270	240
3"	HS62-3	340	240
3 1/2"	HS62-3.5	410	240
4"	HS62-4	480	240
4 1/2"	HS62-4.5	550	240
5"	HS62-5	620	240
5 1/2"	HS62-5.5	690	240
6"	HS62-6	760	240
6 1/2"	HS62-6.5	830	240
7"	HS62-7	900	240
7 1/2"	HS62-7.5	970	240
8"	HS62-8	1040	240
8 1/2"	HS62-8.5	1110	240
9"	HS62-9	1180	240
9 1/2"	HS62-9.5	1250	240
10"	HS62-10	1320	240
10 1/2"	HS62-10.5	1390	240
11"	HS62-11	1460	240
11 1/2"	HS62-11.5	1530	240
12"	HS62-12	1600	240
14"	HS62-14	1740	240
16"	HS62-16	1880	240
18"	HS62-18	2020	240
20"	HS62-20	2090	240

3/4" (.749/.745)

28

Cat. No.	Min. Watts	Max. Volts
HS75-2.5	330	240
HS75-3	410	240
HS75-3.5	495	240
HS75-4	575	240
HS75-4.5	660	240
HS75-5	740	240
HS75-5.5	825	240
HS75-6	910	240
HS75-6.5	980	240
HS75-7	1075	240
HS75-7.5	1150	240
HS75-8	1240	240
HS75-8.5	1325	240
HS75-9	1400	240
HS75-9.5	1475	240
HS75-10	1560	240
HS75-10.5	1645	240
HS75-11	1730	240
HS75-11.5	1820	240
HS75-12	1890	240
HS75-14	2050	240
HS75-16	2210	240
HS75-18	2370	240
HS75-20	2450	240

1" (.999/.993)

30

Cat. No.	Min. Watts	Max. Volts
HS1.0-3	475	240
HS1.0-3.5	570	240
HS1.0-4	665	240
HS1.0-4.5	760	240
HS1.0-5	855	240
HS1.0-5.5	950	240
HS1.0-6	1045	240
HS1.0-6.5	1140	240
HS1.0-7	1235	240
HS1.0-7.5	1330	240
HS1.0-8	1425	240
HS1.0-8.5	1520	240
HS1.0-9	1615	240
HS1.0-9.5	1710	240
HS1.0-10	1805	240
HS1.0-10.5	1900	240
HS1.0-11	1995	240
HS1.0-11.5	2090	240
HS1.0-12	2185	240
HS1.0-14	2545	240
HS1.0-16	2920	240
HS1.0-18	3300	240
HS1.0-20	3675	240



Cartridge Heaters

Superwatt® High Watt Density

CARTRIDGE

▼ IN STOCK ITEMS ▼

Diameter: 5/8"

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
2"	HS62-2	65	120	21	.13
2"	HS62-2	250	120	85	.13
2"	HS62-2	250	240	85	.13
2½"	HS62-2.5	85	120	21	.15
2½"	HS62-2.5	335	120	85	.15
2½"	HS62-2.5	335	240	85	.15
3"	HS62-3	105	120	21	.17
3"	HS62-3	415	120	85	.17
3"	HS62-3	415	240	85	.17
4"	HS62-4	145	120	21	.20
4"	HS62-4	585	120	85	.20
4"	HS62-4	585	240	85	.20
6"	HS62-6	230	120	21	.30
6"	HS62-6	920	120	85	.30
6"	HS62-6	920	240	85	.30
8"	HS62-8	250	120	17	.40
8"	HS62-8	375	120	25	.40
8"	HS62-8	1000	240	70	.40
8"	HS62-8	1500	240	100	.40
10"	HS62-10	400	120	21	.70
10"	HS62-10	1600	240	85	.70
12"	HS62-12	435	120	20	.80
12"	HS62-12	1750	240	80	.80
14"	HS62-14	925	120	35	.79
14"	HS62-14	3700	240	140	.79
16"	HS62-16	625	120	21	.91
16"	HS62-16	1125	120	37	.91
16"	HS62-16	2500	240	82	.91
16"	HS62-16	4500	240	148	.91
18"	HS62-18	750	120	22	1.03
18"	HS62-18	3000	240	87	1.03
20"	HS62-20	875	120	23	1.25
20"	HS62-20	3500	240	92	1.25

Diameter: 3/4"

Length	Cat.No.	Watts	Volts	Watt Density w/in. ²	Approx. Wght. (lbs.)
6"	HS75-6	250	120	20	.44
6"	HS75-6	1000	240	80	.44
6"	HS75-6	1500	240	115	.44
8"	HS75-8	375	120	21	.58
8"	HS75-8	500	120	27	.58
8"	HS75-8	1500	240	85	.58
8"	HS75-8	2000	240	110	.58
10"	HS75-10	500	120	22	.85
10"	HS75-10	2000	240	90	.85
12"	HS75-12	550	120	20	1.00
12"	HS75-12	2200	240	80	1.00
14"	HS75-14	1125	120	35	1.03
14"	HS75-14	2500	240	79	1.03
14"	HS75-14	4500	240	142	1.03
16"	HS75-16	1125	120	32	1.14
16"	HS75-16	4700	240	129	1.14
18"	HS75-18	1250	120	30	1.25
18"	HS75-18	5000	240	122	1.25



Cartridge Heaters

Superwatt® High Watt Density

Obtaining maximum heat transfer and long life.

Fit

High watt density heaters require careful fit to insure optimum performance and long life. Hotwatt recommends that installation holes not be drilled and reamed over .002" or larger than the nominal hole size required. The heaters are sized so that they never exceed .005" less than the nominal diameter and always at least .001" under the nominal diameter for a slide fit. These close fits insure rapid heat transfer from the heater and also help keep the unit as cool as possible, which contributes to long life. See chart A for allowable watt densities at different fit tolerances and operating temperatures.

Cycling

Rapid cycling of heaters from very low to very high temperatures shortens their life considerably. It is recommended therefore, that care be taken to compute the correct wattage for any given installation. Optimum wattage should result in a 50/50 off/on cycle. For very high temperature operation (over 750°F), off/on control might well be replaced by input voltage regulation through variable transformers or silicon rectifiers so that great temperature fluctuations in the heater wire are minimized.

Location of temperature control point

When thermostats are used, the sensing element ought not to be placed further than 1/2" away from the heater wherever possible. Location further away could conceivably cause the unit to run too hot and thereby shorten life.

Wattage

Minimum wattage is based on 60 watts per square inch. Units with lower watt densities may be manufactured for special conditions such as high temperature or vibration. Minimum wattage available can be determined using the following formula and the values in Table 1:

$$\text{Minimum Watts} = \frac{\text{Voltage Squared}}{\text{Ohms/inch} \times \text{Heated Length}}$$

Table 1: Maximum allowable Ohms per inch by diameter.

Superwatt Diameter	Maximum Ohms per Inch of Heated Length
1/8"	500
1/4"	600
3/8"	800
1/2"	600
5/8"	500
3/4"	400
1"	300

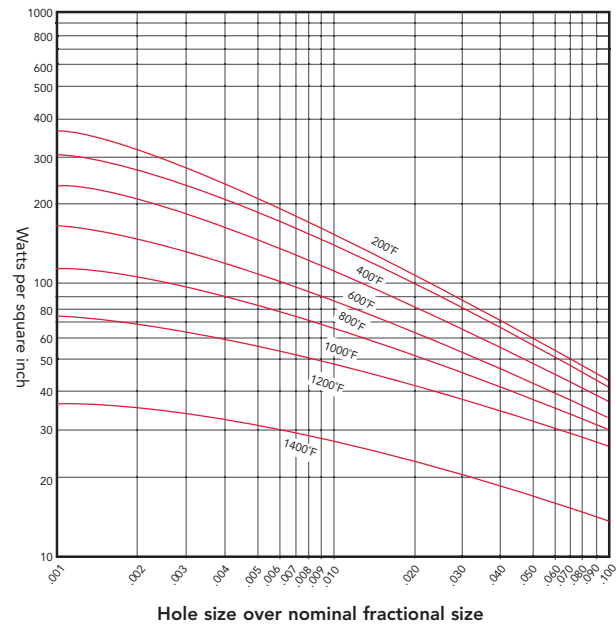
Voltage

Standard Voltage is either 120V or 240V. Other voltages are available.

Termination

All units up to 1" diameter, within published amperage limits, are manufactured with 6" (type SF1) leads. 1" diameter units are manufactured with 6" (type SF2). Longer length leads are available. Stock units supplied with 12" leads.

Graph A: Maximum watts/sq. in. with various increasing temperatures and hole tolerances.



The watt densities are based on a unit installed in mild steel. Different materials affect the above values i.e. the lower the thermal conductivity of the material, the lower the maximum allowable watts per square inch.

Formula for determination of allowable element wattage:

Element Wattage: 3.142 x Diameter x Heated Length x Maximum watts/square inch from Graph A.

Formula for determination of watts/sq.in.:

$$\text{Watts/sq. in.} = \frac{\text{Unit Wattage}}{3.142 \times \text{Diameter} \times \text{Heated Length}}$$

Heated Length is 1/2" less than sheath length

Tolerances

Wattage tolerances is +5% -10% at rated voltage. Length tolerances are ±2% with a ±1/16" minimum. Length tolerances apply to element sheath length.

Camber tolerances for units up to 12" long is .005" per six inch length. For units over 12" long, tolerance is .020" per foot of length. This value varies as the square of the length in feet. (i.e.—a 36" unit has a camber tolerance of .020" x (3)² = .180"). Normally camber does not present a problem since the unit will flex enough to fit a straight, close fit hole.

How To Order

After determining the wattage required and the line voltage available: determine the physical space available for heaters and the number of heaters required. Review Stock List for In-Stock Items.

Specify: catalog number, wattage, voltage, lead type, and special features if required.

Example: HS37-4.25/375W120V/SF1-18/SF26

CARTRIDGE



Cartridge Heaters

Metric Low to High Watt Density

U.L. Recognized – E56973
C.S.A. Certified 016386-0-000

CARTRIDGE

▼ Manufactured Items ▼

Features:

- Both Standard (MS) and Superwatt® (MH) constructions are available.
- Wattages other than those listed are available.
- Made in U.S.A.

Diameter: 6 MM (5.87-5.97) Maximum Amp. 3.5

Length/mm	Catalog No.	Min. Watts	Max. Watts
40	MS6-40	10	30
50	MS6-50	10	40
60	MS6-60	10	50
70	MS6-70	10	60
80	MS6-80	10	70
90	MS6-90	10	80
100	MS6-100	10	90
110	MS6-110	10	100
120	MS6-120	10	110
130	MS6-130	10	120
140	MS6-140	10	130
150	MS6-150	10	140

Diameter: 6.5 MM (6.38-6.48) Max. Amps. MS3.5, MH4

Length/mm	Catalog No.	Min. Watts	Max. Watts
40	MS6.5-40	10	50
40	MH6.5-40	60	*
50	MS6.5-50	10	65
50	MH6.5-50	70	*
60	MS6.5-60	10	75
60	MH6.5-60	90	*
70	MS6.5-70	10	90
70	MH6.5-70	105	*
80	MS6.5-80	10	110
80	MH6.5-80	130	*
90	MS6.5-90	10	125
90	MH6.5-90	145	*
100	MS6.5-100	10	145
100	MH6.5-100	165	*
110	MS6.5-110	10	160
110	MH6.5-110	185	*
120	MS6.5-120	10	170
120	MH6.5-120	205	*
130	MS6.5-130	10	185
130	MH6.5-130	225	*
140	MS6.5-140	10	200
140	MH6.5-140	240	*
150	MS6.5-150	10	215
150	MH6.5-150	260	*

Diameter: 8 MM (7.87-7.98) Max. Amp. 6

Length/mm	Catalog No.	Min. Watts	Max. Watts
40	MS8-40	10	60
50	MS8-50	10	75
60	MS8-60	10	95
70	MS8-70	10	115
80	MS8-80	10	135
90	MS8-90	10	155
100	MS8-100	10	170
110	MS8-110	10	190
120	MS8-120	10	215
130	MS8-130	10	230
140	MS8-140	10	250
150	MS8-150	10	270

Diameter: 10 MM (9.85-9.96) Max. Amps. 6

Length/mm	Catalog No.	Min. Watts	Max. Watts
40	MS10-40	10	65
40	MH10-40	75	*
50	MS10-50	10	90
50	MH10-50	105	*
60	MS10-60	10	115
60	MH10-60	135	*
70	MS10-70	10	135
70	MH10-70	165	*
80	MS10-80	10	165
80	MH10-80	195	*
90	MS10-90	10	190
90	MH10-90	225	*
100	MS10-100	10	210
100	MH10-100	255	*
110	MS10-110	10	235
110	MH10-110	285	*
120	MS10-120	10	260
120	MH10-120	315	*
130	MS10-130	10	285
130	MH10-130	345	*
140	MS10-140	10	310
140	MH10-140	370	*
150	MS10-150	10	335
150	MH10-150	400	*
160	MS10-160	10	355
160	MH10-160	430	*
170	MS10-170	10	380
170	MH10-170	460	*
180	MS10-180	10	405
180	MH10-180	490	*



Cartridge Heaters

Metric Low to High Watt Density

CARTRIDGE

▼ Manufactured Items ▼

Diameter: 12 MM (11.86-11.96) Max. Amp. 6

Length/mm	Catalog No.	Min. Watts	Max. Watts
40	MS12-40	10	75
50	MS12-50	10	105
60	MS12-60	10	135
70	MS12-70	10	165
80	MS12-80	10	190
90	MS12-90	10	220
100	MS12-100	10	250
110	MS12-110	10	280
120	MS12-120	10	310
130	MS12-130	10	335
140	MS12-140	10	365
150	MS12-150	10	395
160	MS12-160	10	420
170	MS12-170	10	450
180	MS12-180	10	480

Diameter: 13 MM (12.85-12.98) Max. Amp.10

Length/mm	Catalog No.	Min. Watts	Max. Watts
40	MH13-40	105	*
50	MH13-50	140	*
60	MH13-60	180	*
70	MH13-70	215	*
80	MH13-80	255	*
90	MH13-90	295	*
100	MH13-100	330	*
110	MH13-110	370	*
120	MH13-120	405	*
130	MH13-130	445	*
140	MH13-140	480	*
150	MH13-150	520	*
160	MH13-160	560	*
170	MH13-170	600	*
180	MH13-180	635	*
190	MH13-190	675	*
200	MH13-200	710	*

Diameter: 12.5 MM (12.34-12.47) Max. Amp.10

Length/mm	Catalog No.	Min. Watts	Max. Watts
40	MS12.5-40	10	85
40	MH12.5-40	100	*
50	MS12.5-50	10	115
50	MH12.5-50	135	*
60	MS12.5-60	10	145
60	MH12.5-60	175	*
70	MS12.5-70	10	175
70	MH12.5-70	210	*
80	MS12.5-80	10	205
80	MH12.5-80	245	*
90	MS12.5-90	10	235
90	MH12.5-90	285	*
100	MS12.5-100	10	265
100	MH12.5-100	325	*
110	MS12.5-110	10	295
110	MH12.5-110	355	*
120	MS12.5-120	10	335
120	MH12.5-120	390	*
130	MS12.5-130	10	350
130	MH12.5-130	430	*
140	MS12.5-140	10	385
140	MH12.5-140	465	*
150	MS12.5-150	10	415
150	MH12.5-150	500	*
160	MS12.5-160	10	445
160	MH12.5-160	535	*
170	MS12.5-170	10	475
170	MH12.5-170	575	*
180	MS12.5-180	10	500
180	MH12.5-180	605	*

Diameter: 15 MM (14.86-14.99) Max. Amp.10

Length/mm	Catalog No.	Min. Watts	Max. Watts
40	MS15-40	10	90
50	MS15-50	10	135
60	MS15-60	10	170
70	MS15-70	10	205
80	MS15-80	10	245
90	MS15-90	10	275
100	MS15-100	10	315
110	MS15-110	10	350
120	MS15-120	10	390
130	MS15-130	10	425
140	MS15-140	10	460
150	MS15-150	10	500
160	MS15-160	10	535
170	MS15-170	10	570
180	MS15-180	10	605
190	MS15-190	10	640
200	MS15-200	10	670

* Maximum wattage is determined by heater fit and operating temperature of the part to be heated using the watt density formula and values from graph A on page 15.



Cartridge Heaters

Metric Low to High Watt Density

CARTRIDGE

▼ Manufactured Items ▼

Diameter: 16 MM (15.82-15.95) Max. Amps. MS10, MH20

Length/mm	Catalog No.	Min. Watts	Max. Watts
40	MS16-40	10	105
40	MH16-40	130	*
50	MS16-50	10	140
50	MH16-50	175	*
60	MS16-60	10	180
60	MH16-60	220	*
70	MS16-70	10	220
70	MH16-70	270	*
80	MS16-80	10	260
80	MH16-80	315	*
90	MS16-90	10	300
90	MH16-90	360	*
100	MS16-100	10	335
100	MH16-100	410	*
110	MS16-110	10	375
110	MH16-110	455	*
120	MS16-120	10	415
120	MH16-120	500	*
130	MS16-130	10	450
130	MH16-130	550	*
140	MS16-140	10	490
140	MH16-140	595	*
150	MS16-150	10	530
150	MH16-150	640	*
160	MS16-160	10	570
160	MH16-160	690	*
170	MS16-170	10	605
170	MH16-170	735	*
180	MS16-180	10	645
180	MH16-180	780	*
190	MS16-190	10	680
190	MH16-190	830	*
200	MS16-200	10	720
200	MH16-200	875	*

Diameter: 17.5 MM (17.27-17.47) Max. Amp. 15

Length/mm	Catalog No.	Min. Watts	Max. Watts
40	MS17.5-40	10	105
50	MS17.5-50	10	155
60	MS17.5-60	10	195
70	MS17.5-70	10	235
80	MS17.5-80	10	280
90	MS17.5-90	10	315
100	MS17.5-100	10	360
110	MS17.5-110	10	400
120	MS17.5-120	10	440
130	MS17.5-130	10	485
140	MS17.5-140	10	525
150	MS17.5-150	10	565
160	MS17.5-160	10	605
170	MS17.5-170	10	650
180	MS17.5-180	10	690
190	MS17.5-190	10	730
200	MS17.5-200	10	770

Diameter: 20 MM (19.76-19.96) Max. Amp. 15

Length/mm	Catalog No.	Min. Watts	Max. Watts
40	MS20-40	40	120
50	MS20-50	40	180
60	MS20-60	40	225
70	MS20-70	40	275
80	MS20-80	40	320
90	MS20-90	40	365
100	MS20-100	40	420
110	MS20-110	40	465
120	MS20-120	40	515
130	MS20-130	40	560
140	MS20-140	40	610
150	MS20-150	40	660
160	MS20-160	40	705
170	MS20-170	40	755
180	MS20-180	40	800
190	MS20-190	40	840
200	MS20-200	40	900

* Maximum wattage is determined by heater fit and operating temperature of the part to be heated using the watt density formula and values from graph A on page 15.

Wattage

Wattages other than those listed are available. Consult factory.

Voltage

Standard voltages are either 120V or 240V. Other voltages are available.

Tolerances

Wattage tolerance is +5%, -10% at rated voltage.

Diameter is always .001" less, but not more than .009" less, than the nominal (fractional) heater diameter.

Length tolerances are ±2% with a ±1/16" minimum. Should tighter dimensions be required, Hotwatt can provide closer control.

How to Order

After determining the wattage required and the line voltage available, determine the physical space available for heaters and the numbers of heaters required.

Review Special Features, see page 22-27.

Specify: catalog number, wattage, voltage, lead length and special features required.

Example: MS17.5-110/400W220V/SF1-6.

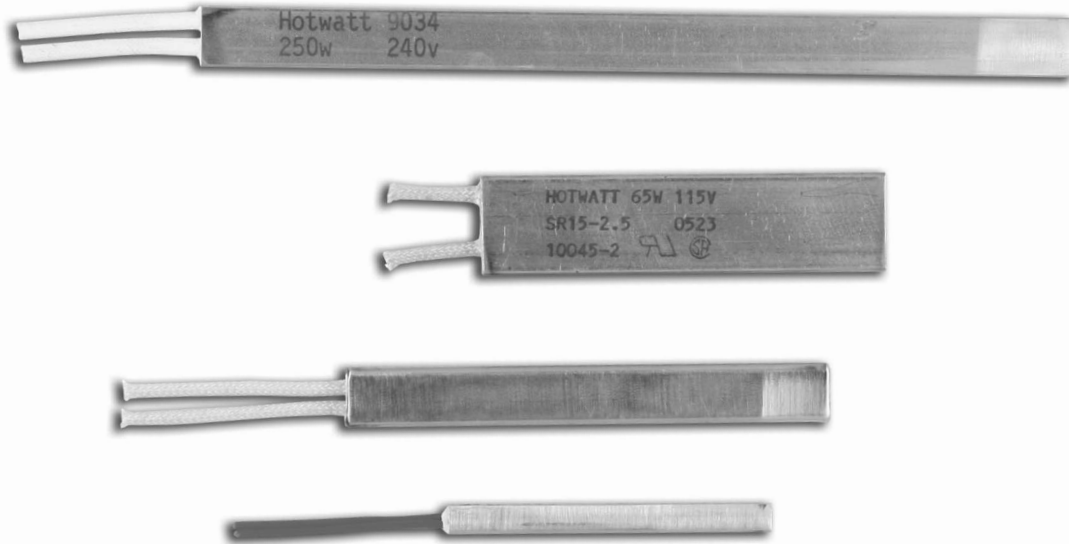


Cartridge Heaters

Square and Rectangular Low to Medium Watt Density

U.L. Recognized – E56973
C.S.A. Certified 016386-0-000

CARTRIDGE

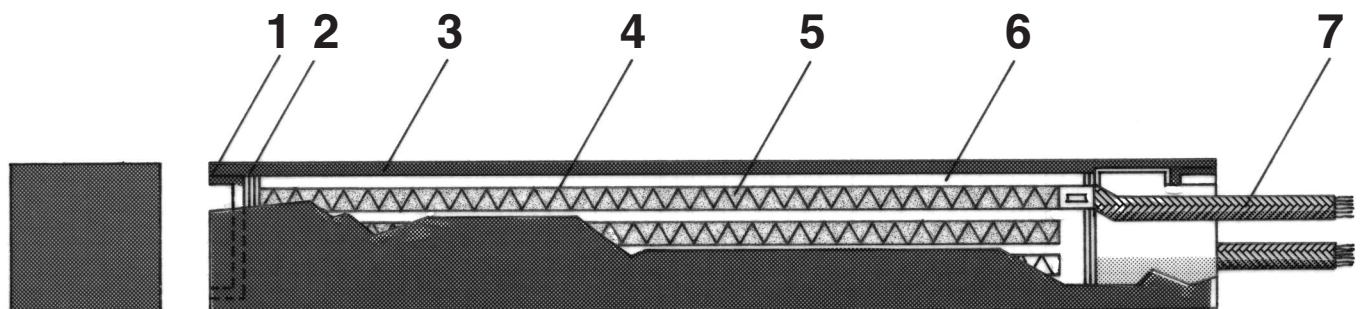


Features:

- The Hotwatt Square and Rectangular Cartridge Heater is designed to distribute maximum heat within a desired area. Because they are completely enclosed, square units will furnish more usable heat for a given wattage than a comparable strip heater attached to the exterior of a mold, platen or other equipment.
- The units are inserted in a milled slot, permitting greater lengths than would be feasible with a drilled or reamed hole. Close dimensional tolerances are held to permit intimate fit for best transfer to surrounding medium.
- Heating elements arranged just beneath outside surface for maximum heat transfer, minimum wire temperature, and faster heating.
- Maximum surface temperatures up to 1200°F (649°C). Designations are etched on the sheath to preserve accurate shape.
- Long, trouble free service.
- Made in U.S.A.

Construction:

- 1 Sealed end.
- 2 Mica.
- 3 Series 300 stainless steel sheath for non-oxidizing, stable service with cavities machined for them.
- 4 Element wire situated in close proximity to outside surface for maximum heat transfer, minimum wire temperature and faster heating.
- 5 Magnesium oxide packing.
- 6 Ceramic element support.
- 7 Teflon insulated leads: ¼" square.
Fiberglass insulated leads: ⅜" to ½" square, ¼" x ⅜" and ¼" x 1" rectangular.





Cartridge Heaters

Square—Low to Medium Watt Density

CARTRIDGE

▼ Manufactured Items ▼

Square

Size: 1/8" x 1/8" (.124/.120 x .124/.120)
Maximum Amperage: 1 Not UL/CSA

3/16" x 3/16" (.186/.183 x .186/.183)
3.5

Sheath Length	Cat. No.	Min. Watts	Max. Watts
1"	SS12-1	10	15
2"	SS12-2	10	35
3"	SS12-3	10	55
4"	SS12-4	10	75
5"	SS12-5	10	95
6"	SS12-6	10	115
7"	SS12-7	10	135
8"	SS12-8	10	155
9"	SS12-9	10	175
10"	SS12-10	10	195
11"	SS12-11	10	215
12"	SS12-12	10	235

Cat. No.	Min. Watts	Max. Watts
SS18-1	10	20
SS18-2	10	45
SS18-3	10	70
SS18-4	10	105
SS18-5	10	135
SS18-6	10	165
SS18-7	10	195
SS18-8	10	225
SS18-9	10	255
SS18-10	10	270
SS18-11	10	295
SS18-12	10	320

For longer lengths,
 compute wattage at: **10 watts per linear 1/2"**
 • Lengths longer than those listed may be ordered.

12 watts per linear 1/2"

Square

Size: 1/4" (.249/.245 x .249/.245)
Maximum Amperage: 3.5

3/8" (.374/.370 x .374/.370)
6

1/2" (.499/.495 x .499/.495)
10

Sheath Length	Cat. No.	Min. Watts	Max. Watts
2"	SS25-2	10	60
3"	SS25-3	10	100
4"	SS25-4	10	150
6"	SS25-6	10	225
8"	SS25-8	10	350
10"	SS25-10	10	450
12"	SS25-12	10	550
16"	SS25-16	10	750
18"	SS25-18	10	840
24"	SS25-24	10	840

Cat. No.	Min. Watts	Max. Watts
SS37-2	10	90
SS37-3	10	150
SS37-4	10	210
SS37-6	10	330
SS37-8	10	450
SS37-10	10	570
SS37-12	10	690
SS37-16	10	930
SS37-18	10	1050
SS37-24	10	1410

Cat. No.	Min. Watts	Max. Watts
SS50-2	10	130
SS50-3	10	210
SS50-4	10	300
SS50-6	10	500
SS50-8	10	700
SS50-10	10	850
SS50-12	10	1000
SS50-16	10	1280
SS50-18	10	1440
SS50-24	10	1920

For longer lengths,
 compute wattage at: **840 watts max.**
 • Lengths longer than those listed may be ordered.

30 watts per linear 1/2"

40 watts per linear 1/2"

Wattage

Minimum Wattage

The following table should be used to determine the allowable voltage for low wattage miniature elements:

Size:	1/8" Square				3/16" Square			
	30v	60v	120v	230v	30v	60v	120v	230v
1"	.6w	2.5w	10w	NA	.8w	3w	12w	NA
1 1/2"	.6w	2.5w	10w	NA	.5w	2w	8w	30w
2"	.5w	2w	8w	27w	.4w	1.5w	6w	22w

NA = Not Available

Voltage

Standard voltage is either 120V or 240V. Other voltages are available.

Termination

All units within published amperage limits are manufactured with 6" (type SF1) leads; longer length leads are available. Standard insulation on 1/4" square units is Teflon (200°C). Fiberglass (250°C) is standard on all other sizes.



Cartridge Heaters

Rectangular—Low to Medium Watt Density

CARTRIDGE

▼ Manufactured Items ▼

Rectangular

Size: 1/8" x 1/4" (.124/.120 x .249/.245)
Maximum Amperage: 2

Sheath Length	Cat. No.	Min. Watts	Max. Watts
1"	SR14-1	10	20
2"	SR14-2	10	55
3"	SR14-3	10	85
4"	SR14-4	10	110
5"	SR14-5	10	135
6"	SR14-6	10	170
7"	SR14-7	10	200
8"	SR14-8	10	230
9"	SR14-9	10	260
10"	SR14-10	10	290
11"	SR14-11	10	320
12"	SR14-12	10	350

1/8" x 3/8" (.124/.120 x .374/.370)
3.5

Cat. No.	Min. Watts	Max. Watts
SR13-1	10	35
SR13-2	10	90
SR13-3	10	140
SR13-4	10	190
SR13-5	10	240
SR13-6	10	290
SR13-7	10	340
SR13-8	10	390
SR13-9	10	440
SR13-10	10	490
SR13-11	10	540
SR13-12	10	590

For longer lengths, compute wattage at: **15 watts per linear 1/2"**
 • Lengths longer than those listed may be ordered.

25 watts per linear 1/2"

Rectangular

Size: 1/4" x 5/8" (.249/.245 x .624/.620)
Maximum Amperage: 6

Sheath Length	Cat. No.	Min. Watts	Max. Watts
1"	SR15-1	10	35
2"	SR15-2	10	100
3"	SR15-3	10	175
4"	SR15-4	10	250
5"	SR15-5	10	320
6"	SR15-6	10	455
7"	SR15-7	10	560
8"	SR15-8	10	640
9"	SR15-9	10	720
10"	SR15-10	10	800
11"	SR15-11	10	880
12"	SR15-12	10	960
16"	SR15-16	10	1280
18"	SR15-18	10	1440
24"	SR15-24	10	1440

1/4" x 1" (.249/.245 x .999/.993)
10

Cat. No.	Min. Watts	Max. Watts
SR16-1	10	50
SR16-2	10	150
SR16-3	10	300
SR16-4	10	400
SR16-5	10	500
SR16-6	10	600
SR16-7	10	700
SR16-8	10	800
SR16-9	10	900
SR16-10	10	1000
SR16-11	10	1100
SR16-12	10	1200
SR16-16	10	1600
SR16-18	10	1800
SR16-24	10	2400

For longer lengths, compute wattage at: **35 watts per linear 1/2"**
 • Lengths longer than those listed may be ordered.

50 watts per linear 1/2"

Tolerances

Wattage tolerances are held to +5%, -10% at rated voltage. Width and height are always .001" less but not more than .010" less than the nominal (fractional) heater size; length tolerances are ±2% with a ±1/16" minimum. This sizing is maintained so that all units are a slide fit into a standard milled slot of the size required. Thermal action will expand the unit to a snug fit for best heat conduction.

How to Order

After determining the wattage required and the line voltage available, determine the physical space available for heaters and the numbers of heaters required.

Review Special Features, see page 22-27.

Specify: catalog number, wattage, voltage, lead length and special features required.

Example: SR16-7.5/750W240V/SF1-48



Cartridge Heaters

Special Features

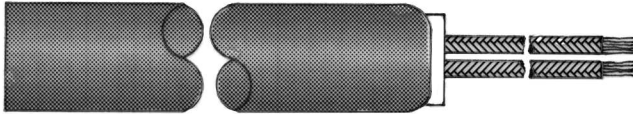
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Electric Heater Special Features and Modifications

The following is an outline of Special Features and Modifications available with Hotwatt Electric Heating Elements. It applies to all Standard, Superwatt, Square and Rectangular Cartridge Heaters and Immersion Heaters. Catalog Numbers have been assigned to all special features and modifications. Please provide an adequate description to avoid confusion when a special feature applies to more than one size or item. Special features for other heaters are covered in each specific section.

Lead Configurations

SF1: Flexible leads for applications where leads can be bent close to end of unit. See specific unit size for maximum allowable amperage.



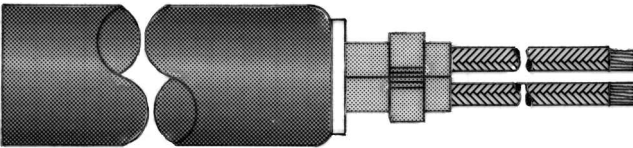
Standard on:

- In-Stock Standard and Superwatt Cartridge.
- Standard Cartridge: 1/8" to 3/4" and 1.9" and 2 3/8" diameter.
- Superwatt Cartridge: 1/4" to 3/4" diameter.
- Square and Rectangular: all sizes.
- Immersion: 1/4" to 3/4" and 1.9", and 2 3/8" diameter.

Available on:

- Standard Cartridge: 1 5/8" to 1 1/4" diameter.
- Immersion: 1" and 1 1/4" diameters.

SF2: Leads for application where repairable leads are desired or when unit amperage will not allow the use of Type SF-1 leads.



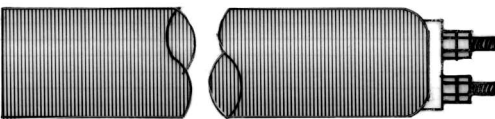
Standard on:

- Superwatt Cartridge: 1" diameter.

Available on:

- Standard Cartridge: 3/8" to 3/4" diameter.
- Immersion: 1/4" to 3/4" diameter.

SF3: Post terminals.



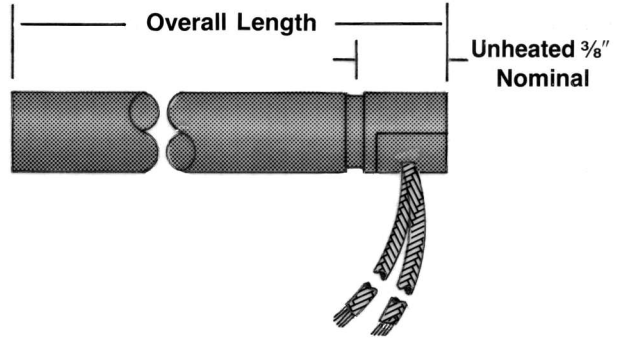
Standard on:

- Standard Cartridge: 1 5/8" to 1 1/4" diameter.
- Immersion: 1" to 1 1/4" diameter.

Available on:

- Standard Cartridge: 3/4" diameter.
- Immersion: 3/4" diameter.

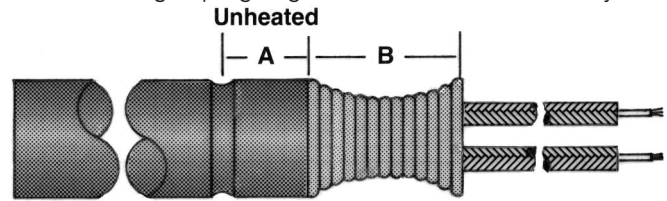
SF4: Leads for application where lead space is minimum and it is desirable to bring leads out at right angles to sheath. Specify overall length of heater when ordering.



Available on:

- Standard Cartridge: 3/8" to 3/4" diameter.
- Superwatt Cartridge: 1/4" to 3/4" diameter.
- Square and Rectangle Cartridge: All sizes.

SF5: Lead spring protector. Leads reinforced with steel spring for applications where excessive flexing is encountered. Standard spring length is 1" on 1/4" to 1/2" diameters and 1 1/2" on 3/8" to 3/4" diameters. Longer spring lengths are available. Consult factory.



Cat. No.	Unit Dia.	A	B
SF5A	1/4"	1/4"	1"
SF5B	3/8"	1/4"	1"
SF5C	1/2"	1/4"	1"
SF5D	5/8"	1/2"	1 1/2"
SF5E	3/4"	1/2"	1 1/2"

Available on:

- Standard Cartridge: 1/4" to 3/4" diameter.
- Superwatt Cartridge: 1/4" to 3/4" diameter.

SF6: Ground wire.

Available on:

- All products.

SF7: Fiberglass sleeving. Additional sleeving over leads for protection. Leads are normally 2" longer than sleeve.

SF7A: Common sleeve. Single sleeve over both leads.

SF7B: Individual sleeve. Single sleeve over each lead. Specify length of sleeve.

Available on:

- All products.



Cartridge Heaters

Special Features

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SF8: Silicone rubber sleeving. Additional sleeving over leads for protection and moisture resistance.

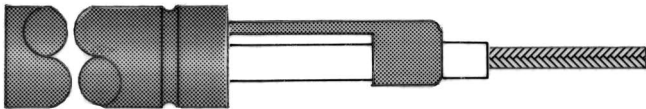
SF8A: Common sleeve. Single sleeve over both leads.

SF8B: Individual sleeve. Single sleeve over each lead. Specify length of sleeve. Leads are normally 2" longer than sleeve.

Available on:

- All products with leads.

SF9: Strain relief clip for leads subject to strain and pull.



Available on:

- Standard Cartridge: 1/4" to 3/8" diameter with Type SF1 leads only.
- Superwatt Cartridge: 1/4" to 3/8" diameter with Type SF1 leads only.

SF10: Ceramic bead insulation for leads subject to high temperatures up to 1000°F. Specify lengths of beads required when ordering.

Available on:

- All products with leads.

Lead End Termination

SF11: Lugs, rings, quick connect terminals attached to the end of lead wires. Specify terminal type and size when ordering. Special terminals are available.

Available on:

- All products with leads.

SF11A: Ring terminals. Specify size: #6, #8, #10.



SF11B: Straight quick connect terminals. Specify male or female and size: 3/16" or 1/4".



SF11C: Flag quick connect terminals. Specify male or female and size: 3/16" or 1/4".



SF11D: Spade terminals. Specify size: #6, #8, #10.



SF12: Male dead front armored plug. May be mounted directly to heater.

Available on:

- Products with leads. Consult factory for availability.
- Ground wire (SF6) should be specified when using any 3 prong plug.

SF12-P1: 2 prong/straight blade/2 pole/2wire/UL&CSA Listed/NEMA 1-15P/125 volts/15 amps.



SF12-P2: 2 prong/twist lock/2 pole/2 wire/UL Listed/NEMA L1-15P/125 volts/15 amps.



SF12-P3: 3 prong/twist lock/2 pole/3 wire/UL&CSA Listed/NEMA L6-15P/250 volts/15 amps.



SF12-P4: 3 prong/twist lock/2 pole/3 wire/UL &CSA Listed/NEMA L6-20/250 volts/20 amps.

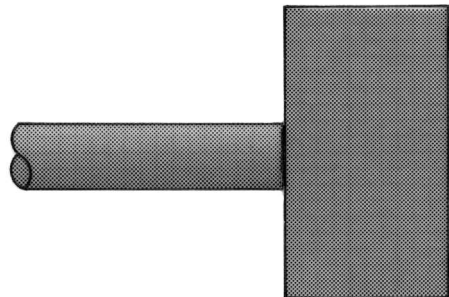


SF12-P5: 3 prong/straight blade/2 pole/3 wire/UL&CSA Listed/NEMA 5-15P/125 volts/20 amps.



SF13: Enclosures for protection of electrical connections.

SF13A: General purpose box. NEMA No. 1. 2 3/4" x 1 1/2" x 1 1/2".



Available on:

- Standard Cartridge: 3/8" to 1" diameter.
- Superwatt Cartridge: 3/8" to 1" diameter.

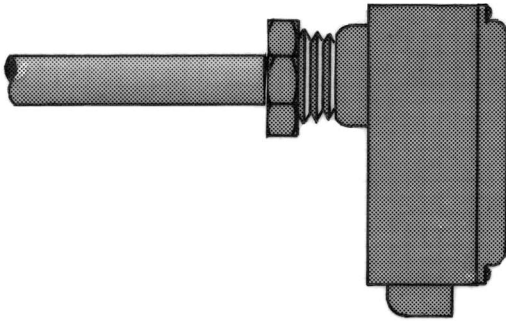


Cartridge Heaters

Special Features

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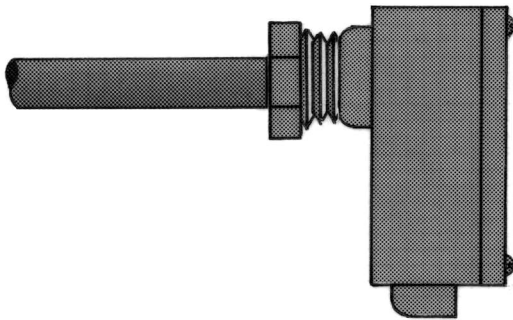
SF13B: Moisture resistant box. Mounted on NPT fitting.



Available on:

- Standard Cartridge: 3/8" to 1 1/4" diameter.
- Superwatt Cartridge: 3/8" to 1" diameter.

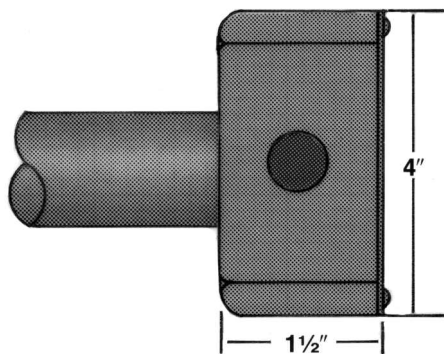
SF13C: Explosion resistant box. Mounted on NPT fitting.



Available on:

- Standard Cartridge: 3/8" to 1 1/4" diameter.
- Superwatt Cartridge: 3/8" to 1" diameter.

SF13D: General purpose box. NEMA No. 1. Rust resistant steel. 4" octagonal.

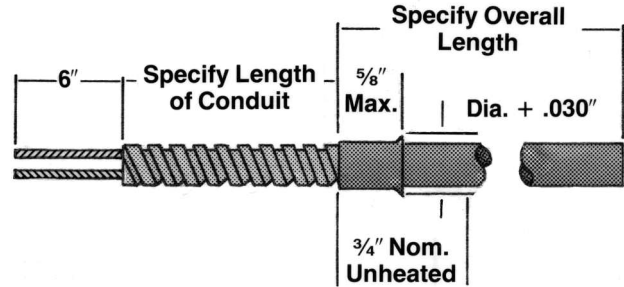


Available on:

- Standard Cartridge: 1 1/4" to 2 3/4" diameter.

Lead Protection

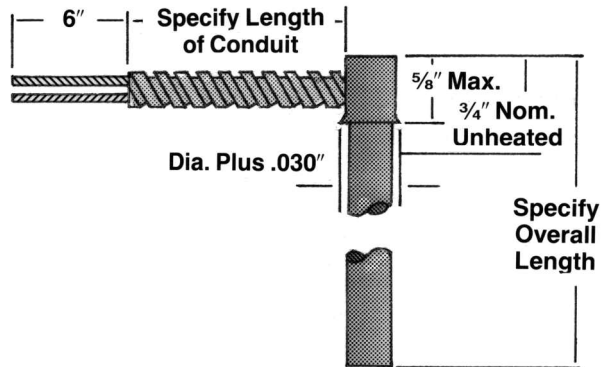
SF14: Flexible, stainless steel conduit for straight leads.



Available on:

- All products with leads: 3/8" to 1 1/4" diameter.

SF15: Flexible, stainless steel conduit for right angle leads.



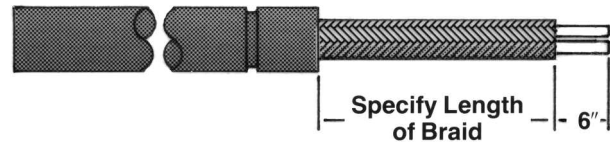
Standard Conduit Sizes

Unit Size	Conduit O.D.	Min. Bend Diam.
3/8" - 1/4"	.244 nominal	1.31" inside
3/8"	.350 nominal	1.93" inside
1/2" - 5/8"	.381 nominal	2.12" inside
3/4" & up	.500 nominal	2.25" inside

Available on:

- Standard Cartridge: 3/8" to 1 1/4" diameter.
- Superwatt Cartridge: 1/4" to 1" diameter.
- Square Cartridge: 1/4" to 1/2" diameter.

SF16: Stainless steel, flexible braid for straight leads. Specify braid length. Leads are supplied 6" longer than braid.



Available on:

- Standard Cartridge: 3/8" to 3/4" diameter.
- Superwatt Cartridge: 3/8" to 3/4" diameter.
- Square and Rectangular: 3/8" and 1/2" square. (1/4" x 5/8" and 1/4" x 1" rectangular).

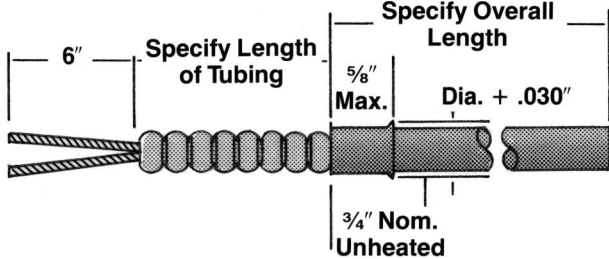


Cartridge Heaters

Special Features

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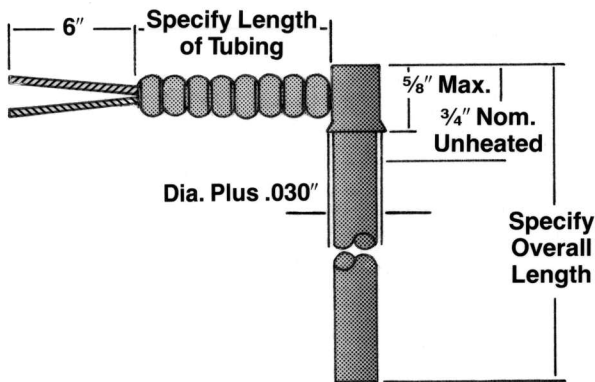
SF17: Convoluted bronze tubing. Flexible sealed tubing for waterproof leads. Specify tubing length.



Available on:

- Standard Cartridge: 3/8" to 1 1/4" diameter.
- Superwatt Cartridge: 3/8" to 1" diameter.
- Square Cartridge: 3/8" and 1/2" square.
- Immersion Heater: 3/8" to 1 1/4" diameter.

SF18: Right angle convoluted bronze tubing.



Available on:

- Standard Cartridge: 3/8" to 3/4" diameter.
- Superwatt Cartridge: 3/8" to 3/4" diameter.
- Square Cartridge: 3/8" and 1/2" square.

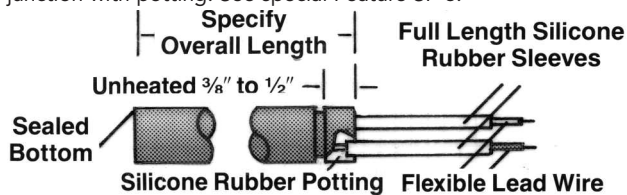
SF19: Straight solid copper extension. Specify length when ordering. Leads are 6" longer than tubing.

Available on:

- Standard Cartridge: 1/4" to 3/4" diameter.
- Superwatt Cartridge: 1/4" and 3/4" diameter.

Sealing and Potting Lead End for Adverse Environmental Conditions

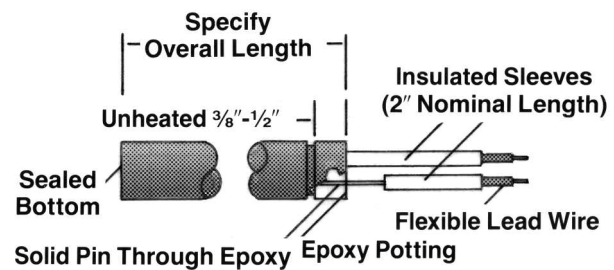
SF20: Silicon rubber potting for moisture proof application to 400°F (204 °C) in potting area. Silicon rubber sleeving must be used in conjunction with potting. See special Feature SF-8.



Available on:

- Standard Cartridge: 3/8" to 2 3/8" diameter.
- Superwatt Cartridge: 1/4" to 1" diameter.
- Square and Rectangular: All sizes except 1/8" square.
- Immersion Heater: All sizes.

SF21: Epoxy potting for moisture proof applications to 265°F (129°C) in potting area.



Available on:

- Standard Cartridge: 1/4" to 2 3/8" diameter.
- Superwatt Cartridge: 1/4" to 1" diameter.
- Square and Rectangular: All sizes except 1/8" square.
- Immersion Heater: All sizes.

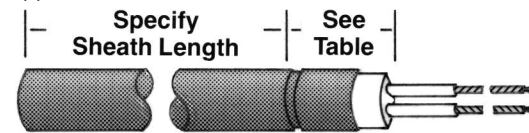
SF22: Teflon end seal for moisture applications to 400°F (204°C).



Available on:

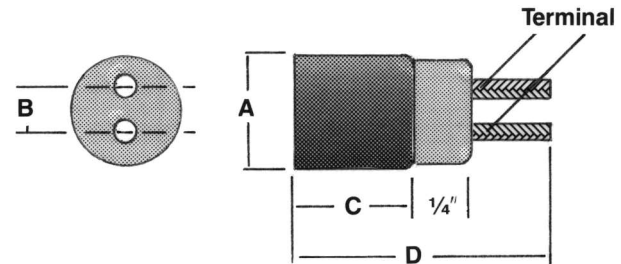
- Standard Cartridge: 1/8" to 3/4" diameter.
- Superwatt Cartridge: 1/4" to 3/4" diameter.

SF23: Ceramic to metal seals for hermetic sealing and vacuum applications to 1000°F (538°C).



Available on:

- Standard Cartridge: 3/8" to 3/4" diameter.
- Superwatt Cartridge: 3/8" to 3/4" diameter.
- Immersion Heater: 3/8" to 3/4" diameter.



SF23: Table of Dimensions

Cat. No.	Unit Diameter			
	A	B	C	D
SF23-A	3/8"	.148"	1/2"	1"
SF23-B	1/2"	.180"	17/32"	1 1/2"
SF23-C	5/8"	.238"	3/16"	1 3/5"
SF23-D	3/4"	.304"	1 9/32"	1 7/2"



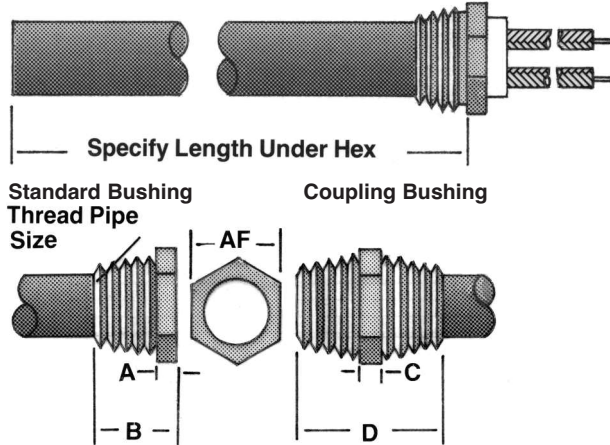
Cartridge Heaters

Special Features

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Attaching Fittings

SF25: Units with pipe bushing.



Heater O.D.	Pipe Thread NPT Size	A	B	C	D	AF
1/4"	1/8"	1/8"	1/2"	3/16"	15/16"	7/16"
3/8"	1/4"	1/8"	9/16"	3/16"	1 1/16"	5/8"
1/2"	3/8"	3/16"	5/8"	1/4"	1 1/8"	1 1/16"
5/8"	1/2"	3/16"	3/4"	1/4"	1 3/8"	7/8"
3/4"	3/4"	1/4"	7/8"	3/8"	1 5/8"	1 1/8"
1 5/16" & 1"	1"	1/4"	1 5/16"	1/2"	1 7/8"	1 3/8"
1 1/4"	1 1/4"	5/16"	1 1/32"	1/2"	1 15/16"	1 3/4"
1.9"	2"	9/16"	1 7/16"	NA	NA	2 1/2"
2 3/8"	2 1/2"	5/8"	1 3/4"	NA	NA	3"

Brass Bushings

SF25A: Single Brass.

SF25B: Coupling Brass.

Stainless Steel Bushings

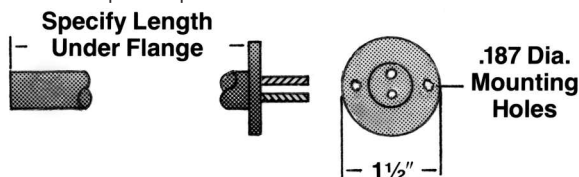
SF25C: Single Stainless Steel.

SF25D: Coupling Stainless Steel.

Available on:

- Standard Cartridge: 1/4" to 2 3/8" diameter.
- Superwatt Cartridge: 1/4" to 1" diameter.

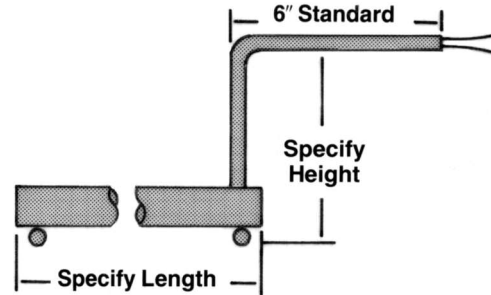
SF26: Units with flanges. Mounting hold centers for 1/4" to 5/8" diameter is 1 1/2" and for 3/4" diameter is 1 3/4". Special flange sizes available upon request.



Available on:

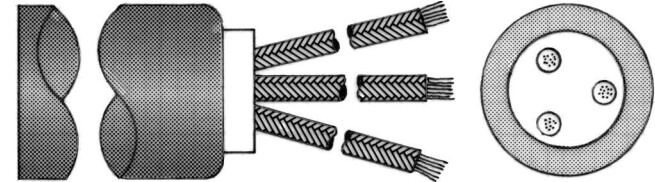
- Standard Cartridge: 1/4" to 3/4" diameter.
- Superwatt Cartridge: 1/4" to 3/4" diameter.

SF27: Stainless steel riser and support feet for over the side immersion heaters.



Special Electrical Features

SF28: Three phase heaters.

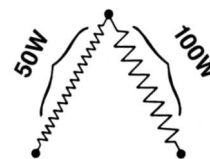


Available on:

- Standard Cartridge: 3/8" to 2 3/8" diameter.
- Superwatt Cartridge: 3/8" to 1" diameter.
- Immersion Heater: 3/8" to 2 3/8" diameter.
- Square Cartridge: 3/8" to 1/2" square.

SF29: Multiple heat; when a single unit with multiple wattages is necessary. Some uses of these units include: quick heat-up with a standby circuit for maintenance of low temperature; providing different wattages when there is a wide variation in thermal loads; and replacing more expensive rheostats or powerstats for wattage control.

Common



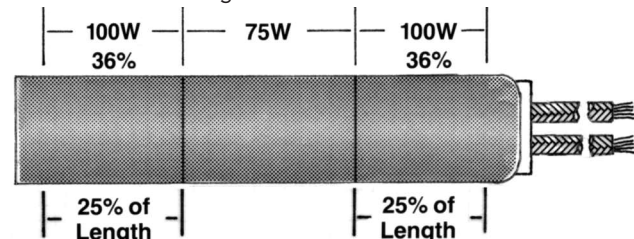
Available on:

- Standard Cartridge: 3/8" to 2 3/8" diameter.
- Superwatt Cartridge: 3/8" to 1" diameter.
- Immersion Heater: 3/8" to 2 3/8" diameter.
- Square Cartridge: 3/8" to 1/2" square.

SF30: Special wattage distribution for units requiring different concentrations of wattage over their heated length. Distribution should be specified as a percentage of wattage over a percentage of length, i.e. 30%.

Available on:

- All units over 3" long.





Cartridge Heaters

Special Features

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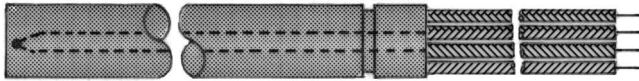
SF31: Built in thermocouple. Junction at bottom of heater.

Ungrounded thermocouple:

- SF31-JU - Iron/Constantan - Type J
- SF31-KU - Chromel/Alumel - Type K

Grounded thermocouple:

- SF31-JG - Iron/Constantan - Type J
- SF31-KG - Chromel/Alumel - Type K



Available on:

- Standard Cartridge: 3/8" to 2 3/8" diameter.
- Superwatt Cartridge: 1/4" to 1" diameter.
- Square Cartridge: 3/8" to 1/2" square.
- Rectangular Cartridge: 1/4" by 1" rectangular.
- Immersion Heater: 3/8" to 2 3/8" diameter.

SF32: High voltage heaters from 300V to 600V. Consult factory for availability on items.

Maximum Voltage/Unit Size

Diameter	5/8"	3/4"	1"	1 1/4"	1.90"	2 3/8"
Std. Cart.	480V	480V	480V	600V	600V	600V
Superwatt	480V	480V	480V	NA	NA	NA
Immersion	480V	480V	480V	600V	600V	600V

Other Physical Features

SF33: Double end units. One terminal at end. Especially suitable for heating: warming closets, ovens, press heads, drying cabinets, platens and plates. Double end units (post type terminals at each end) can be installed in reamed holes or in machined grooves. The standard sheath material is stainless steel and cannot be bent or formed. Available with SF1 or SF3 terminations.



Available on:

- Standard Cartridge: 3/8" to 3/4" and 1 1/4" diameter.
- Square Cartridge: 1/2" square only.

SF34: Odd sizes: 7/16", 9/16", 1 1/16", 1 3/16", and 7/8" diameter. Stainless steel sheath.

Available on:

- Standard cartridge construction only.

SF36: Centerless ground on diameter for precision fit. Termination must be Type SF2 or SF3. Tolerance on diameter ±.0005.

Available on:

- Standard Cartridge: 1/4" to 1 1/4" diameter.
- Superwatt Cartridge: 1/4" to 1" diameter.

Finished diameters after grinding will be:

1/4" = .2450	3/4" = .7430
3/8" = .3700	1 1/16" = .9300
1/2" = .4950	1" = .9930
5/8" = .6200	1 1/4" = 1.240

SF37: Special alloy sheathing. Consult factory for availability before ordering.

SF37A: 347 Stainless Steel.

SF37B: 321 Stainless Steel.

SF37C: Inconel.

SF37D: Titanium.

Available on:

- Standard Cartridge: 1/4" to 1 1/4" diameter.
- Immersion Heater: All sizes.

SF38: Passivated finish for corrosion resistance.

Available on:

- All Immersion Heaters.

SF39: Teflon coating for corrosive conditions. Termination must be type SF2 or SF3.

Available on:

- Standard Cartridge: 3/8" to 1 1/4" diameter.
- Square or Rectangular: All sizes (except 1/2" square).
- Immersion Heater: All sizes.



Cartridge Heaters

Immersion

U.L. Recognized-E56973
C.S.A. Certified – 016386-0-000

IMMERSION

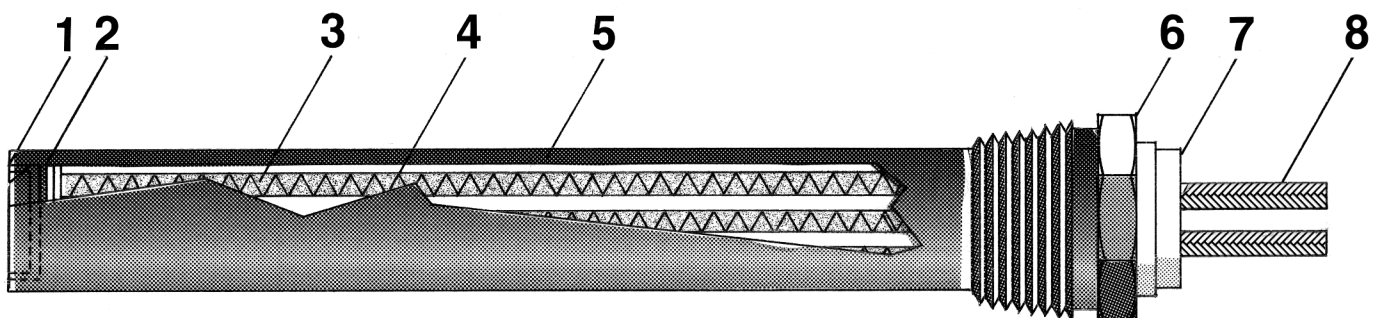


Features:

- The Hotwatt Immersion Heater may be supplied with various junction boxes for additional terminal or lead protection.
- For corrosive environments, units can be supplied in other special alloys best suited to the operating conditions.
- The lead end of the unit may be sealed for extreme environmental conditions.
- Units may be supplied for three phase or three heat operation.
- Made in U.S.A.

Construction:

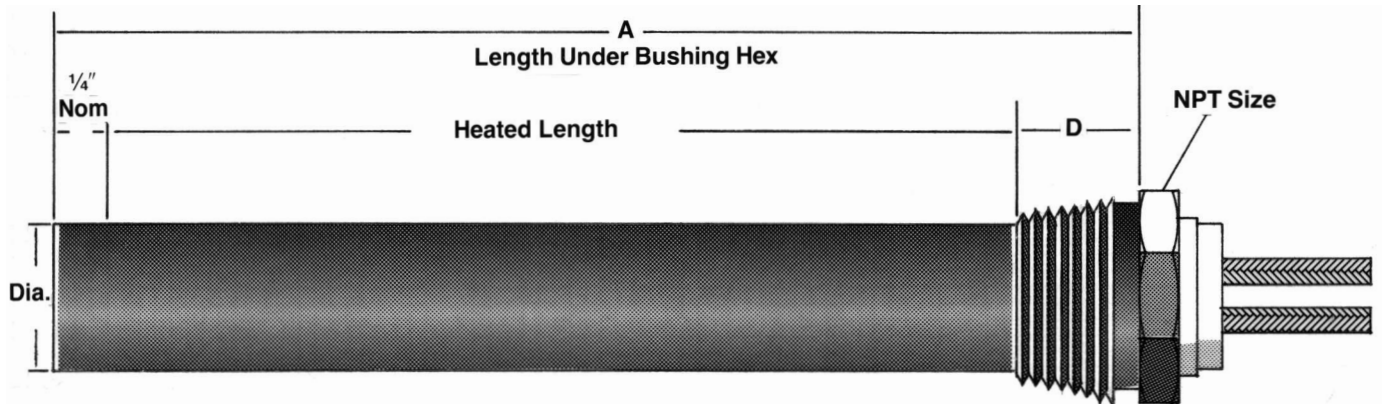
- 1 Welded end.
- 2 Mica.
- 3 Magnesium oxide packing.
- 4 Element wire situated in close proximity to outside surface for maximum heat transfer and minimum internal temperature while preserving good dielectric qualities.
- 5 Series 316 stainless steel sheath.
- 6 Mounting bushing.
- 7 Ceramic cap.
- 8 Flexible stranded nickel alloy insulated leads or rust resistant post terminals.





Cartridge Heaters

Immersion

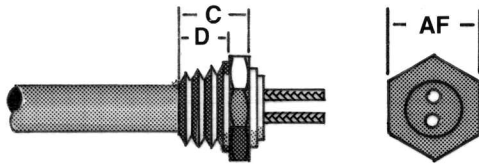


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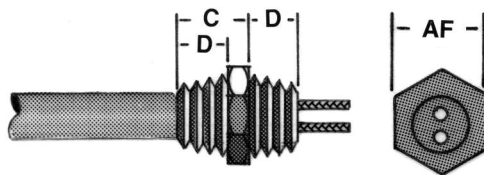
Available Bushings: Must be specified after catalog number.

Brass Bushings

SF25A: Single

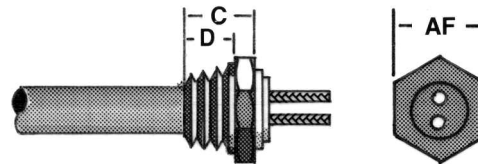


SF25B: Coupling Head

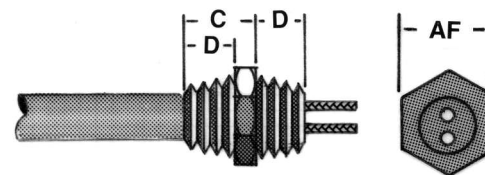


Stainless Steel Bushings

SF25C: Single



SF25D: Coupling Head



▼ Manufactured Items ▼

1/4" Diameter

NPT Size: 1/8"
 Standard Termination: 6" Leads (SF1-6)
 Maximum Amperage: 3.5
 AF: 7/16"
 C: 1/2"
 D: 3/8"

Length A	Catalog Number	Maximum Wattage in Water
2"	EM25-2	115
3"	EM25-3	185
4"	EM25-4	255
5"	EM25-5	325
6"	EM25-6	395
7"	EM25-7	465

3/8" Diameter

NPT Size: 1/4"
 Standard Termination: 6" Leads (SF1-6)
 Maximum Amperage: 6.0
 AF: 5/8"
 C: 5/16"
 D: 7/16"

Length A	Catalog Number	Maximum Wattage in Water
2"	EM37-2	130
3"	EM37-3	240
4"	EM37-4	345
5"	EM37-5	450
6"	EM37-6	555
7"	EM37-7	660



Cartridge Heaters

Immersion

IMMERSION

▼ Manufactured Items ▼

1/2" Diameter

NPT Size: 3/8"
 Standard Termination: 6" Leads (SF1-6)
 Maximum Amperage: 10
 AF: 1/16" C: 5/8" D: 7/16"

Length A	Catalog Number	Maximum Wattage in Water
3"	EM50-3	360
4"	EM50-4	505
5"	EM50-5	635
6"	EM50-6	765
7"	EM50-7	895
8"	EM50-8	1030

5/8" Diameter

NPT Size: 1/2"
 Standard Termination: 6" Leads (SF1-6)
 Maximum Amperage: 10
 AF: 7/16" C: 3/4" D: 7/16"

Length A	Catalog Number	Maximum Wattage in Water
3"	EM62-3	430
4"	EM62-4	605
5"	EM62-5	785
6"	EM62-6	1060
7"	EM62-7	1135
8"	EM62-8	1310

3/4" Diameter

NPT Size: 3/4"
 Standard Termination: 6" Leads (SF1-6)
 Maximum Amperage: 15
 AF: 1/8" C: 7/8" D: 5/8"

Length A	Catalog Number	Maximum Wattage in Water
4"	EM75-4	705
5"	EM75-5	915
6"	EM75-6	1130
7"	EM75-7	1340
8"	EM75-8	1555
9"	EM75-9	1765

1" Diameter

NPT Size: 1"
 Standard Termination: 8-32 Screw and Nut (SF3)
 Maximum Amperage: 25
 AF: 1 3/8" C: 1 5/8" D: 1 1/8"

Length A	Catalog Number	Maximum Wattage in Water
5"	EM1.0-5	1195
6"	EM1.0-6	1495
7"	EM1.0-7	1795
8"	EM1.0-8	2095
9"	EM1.0-9	2395
10"	EM1.0-10	2695

1 1/4" Diameter

NPT Size: 1 1/4"
 Standard Termination: 10-32 Screw and Nut (SF3)
 Maximum Amperage: 30
 AF: 1 3/8" C: 1 1/2" D: 2 3/32"

Length A	Catalog Number	Maximum Wattage in Water
6"	EM1.2-6	1690
7"	EM1.2-7	2145
8"	EM1.2-8	2600
10"	EM1.2-10	3055
12"	EM1.2-12	3505
14"	EM1.2-14	3960

1.9" Diameter

NPT Size: 2"
 Standard Termination: 6" Leads (SF1-6)
 Maximum Amperage: 40
 AF: 2 1/2" C: 1 7/8" D: 1 1/8"

Length A	Catalog Number	Maximum Wattage in Water
10"	EM1.9-10	4200
12"	EM1.9-12	5000
16"	EM1.9-16	6700
20"	EM1.9-20	8400
24"	EM1.9-24	10000
30"	EM1.9-30	12600

2.3" Diameter

NPT Size: 2 1/2"
 Standard Termination: 6" Leads (SF1-6)
 Maximum Amperage: 50
 AF: 3" C: 1 3/4" D: 7/8"

Length A	Catalog Number	Maximum Wattage in Water
12"	EM2.3-12	6000
18"	EM2.3-18	9000
24"	EM2.3-24	12000
30"	EM2.3-30	15000
36"	EM2.3-36	18000
42"	EM2.3-42	21000

- Above wattages are based on a unit operating immersed in water. For heating other materials, see table for recommended maximum watt densities.
- Lengths between and longer than those listed may be ordered.
- See page 148 for Suggested Watt Density and see page 152-155 for Sheath Materials.
- See next page for stock items



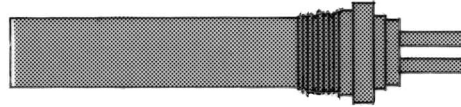
Cartridge Heaters

Immersion

▼ IN STOCK ITEMS ▼

Immersion Heaters

Supplied with: Type SF1 leads, Type SF3S terminals
 U.L. Recognized — E56973 C.S.A. Certified — LR-16386



Length	Cat. No.	Dia.	Wattage	Voltage	Watts/in ²	Weight	Lead Const.	Fittings
6"	EM62-6/SF25C	5/8"	100	120	9	.40	12" w/epoxy seal	1/2" NPT
6"	EM62-6/SF25C	5/8"	400	120	37	.40	12" w/epoxy seal	1/2" NPT
6"	EM62-6/SF25C	5/8"	400	240	37	.40	12" w/epoxy seal	1/2" NPT
6"	EM75-6/SF25C	3/4"	125	120	9	.50	12" w/epoxy seal	3/4" NPT
6"	EM75-6/SF25C	3/4"	500	120	38	.50	12" w/epoxy seal	3/4" NPT
6"	EM75-6/SF25C	3/4"	500	240	38	.50	12" w/epoxy seal	3/4" NPT
11"	EM1.2-11/SF25C	1 1/4"	250	120	6	2.75	S&N w/box & epoxy seal	1 1/4" NPT
11"	EM1.2-11/SF25C	1 1/4"	1000	120	24	2.75	S&N w/box & epoxy seal	1 1/4" NPT
11"	EM1.2-11/SF25C	1 1/4"	1000	240	24	2.75	S&N w/box & epoxy seal	1 1/4" NPT

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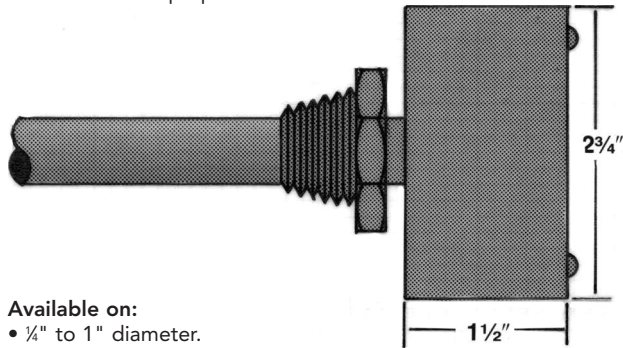
Cartridge Heaters

Immersion

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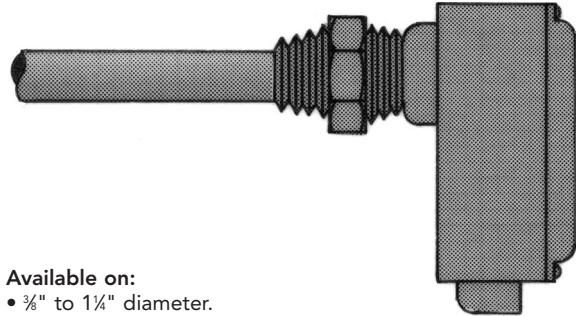
Terminal Enclosure Options

SF13A: General purpose box. NEMA No. 1. 2 $\frac{3}{4}$ " x 1 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ ".



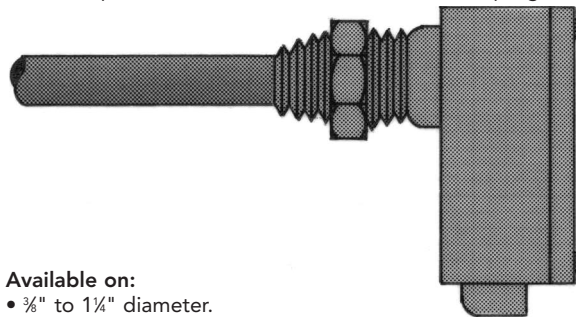
Available on:
• $\frac{1}{4}$ " to 1" diameter.

SF13B: Moisture resistant box. Mounted on NPT coupling head fitting.



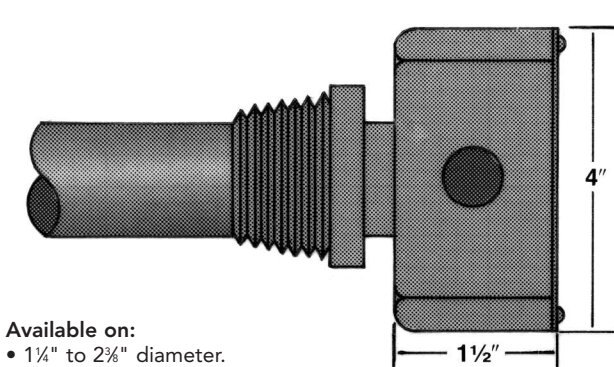
Available on:
• $\frac{3}{8}$ " to 1 $\frac{1}{4}$ " diameter.

SF13C: Explosion resistant box. Mounted on NPT coupling head fitting.



Available on:
• $\frac{3}{8}$ " to 1 $\frac{1}{4}$ " diameter.

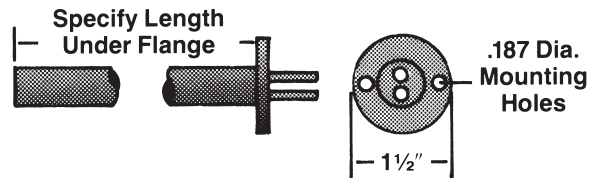
SF13D: General purpose box. NEMA No. 1. Rust resistant steel 4" octagonal.



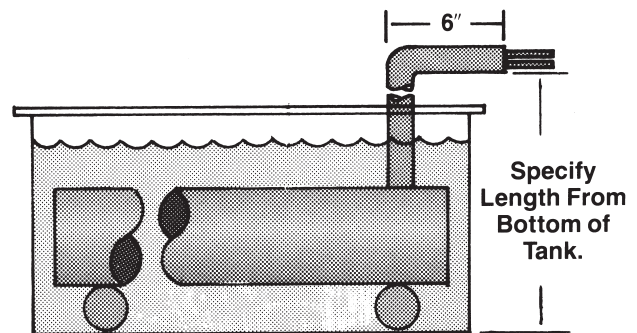
Available on:
• 1 $\frac{1}{4}$ " to 2 $\frac{1}{2}$ " diameter.

Installation Options

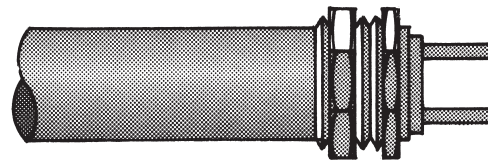
SF26: Stainless steel flange. Mounting hole centers for $\frac{1}{4}$ " to $\frac{5}{8}$ " diameters is 1 $\frac{1}{8}$ " and for $\frac{3}{4}$ " diameter is 1 $\frac{1}{2}$ ". Special flange sizes available upon request.



SF27: Stainless steel riser and support feet for over the side immersion heaters. Consult factory for availability.



XS76: Straight thread with nut. Specify thread size and if bushing is to be standard (hex outside vessel) or inverted (hex inside vessel).



Voltage

Standard voltages are either 120V or 240V. Other voltages are available.

Tolerances

Wattage tolerance is +5%, -10% at rated voltage.

Length tolerances are $\pm 2\%$ with a $\pm \frac{1}{16}$ " minimum.

How to Order

After determining the wattage required and the line voltage available, determine the physical space available for heaters and the numbers of heaters required.

Review page 31 for stock items.

Review other special features, see page 22-27.

Specify: catalog number, wattage, voltage, lead type, bushing type, and special features required.

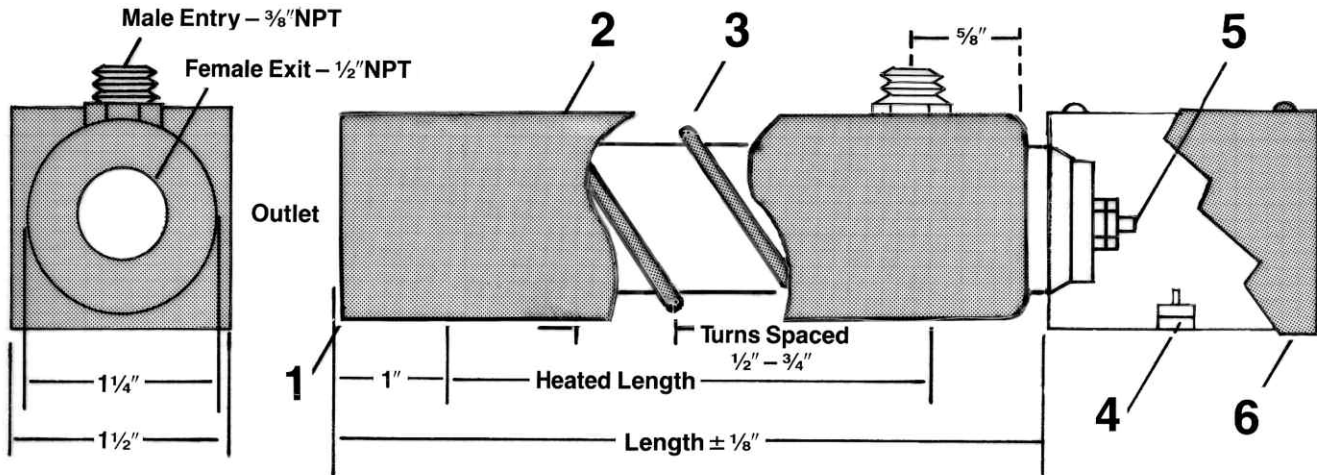
Example: EM62-6/700W240V/SF1-12/SF13A/SF25B.



Cartridge Heaters

Special Immersion

Mini Circulation



IMMERSION

Features:

- The Miniature Circulation Heater is a packaged heater for heating small volumes of liquids as in photographic developer solutions, chemicals, dyes and inks.
- Constructed of 316 series stainless steel.
- Pressures to 100 psig.

Construction:

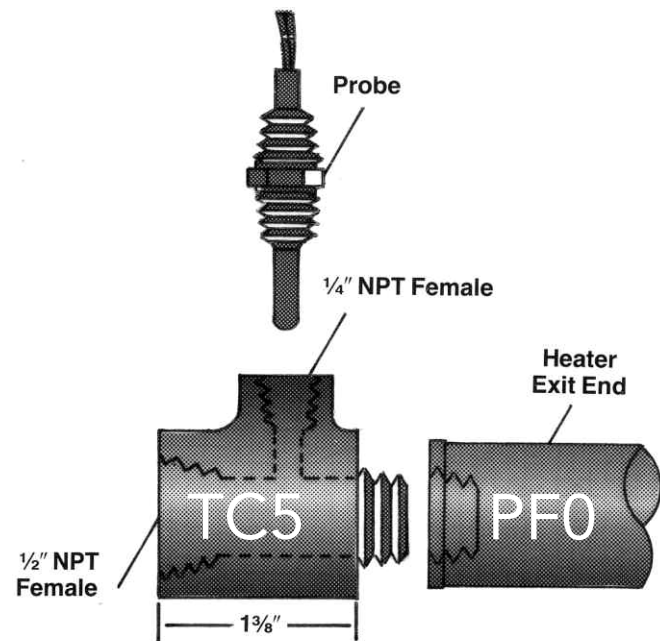
- 1 Heliarc weld.
- 2 Stainless steel sheath.
- 3 Liquid turbulator wire.
- 4 Ground post.
- 5 Post terminals.
- 6 Connection box. 2 3/4" x 1 1/2" x 1 1/2".

Specifications

▼ Manufactured Items ▼			
Maximum Amperage: 20			
Cross Sectional Flow Area: .152 Sq. In.			
Sizes:			
Length	Heated Length	Catalog No.	Maximum Wattage
6"	4"	PFO-6	600
8"	6"	PFO-8	900
10"	8"	PFO-10	1200
12"	10"	PFO-12	1500
18"	16"	PFO-18	2400

Temperature Control

Thermocouple mounting fitting is available for use with the standard miniature circulation heater. The fitting is threaded into the exit end as shown below. Specify TC-5 fitting. See pages 131-134 for details on temperature controllers and probes.



Above wattages area based on 50 watts per square inch for use with water at low flow. Higher flow rates and/or different liquids will effect allowable watt densities. Consult factory.

Sizes between those listed and larger in diameter are available. Consult factory.

* Thermistor adapter and catalog number TH-1 must be used for thermistor probe mounting in the TC5 fitting.



Cartridge Heaters

Special Immersion

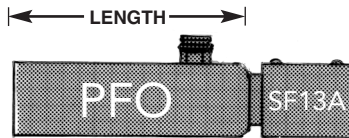
▼ IN STOCK ITEMS ▼

Pure Flow Air Heaters

Supplied with: Type SF3S terminals Type SF13A enclosure

IMMERSION

Length	Cat. No.	Dia.	Wattage	Voltage	Watts/ Linear Inch	Weight	Terminals
6"	PFO-6	1¼"	100	120	23	1.00	S&N w/enclosure
6"	PFO-6	1¼"	400	120	91	1.00	S&N w/enclosure
6"	PFO-6	1¼"	400	240	91	1.00	S&N w/enclosure
8"	PFO-8	1¼"	150	120	23	1.18	S&N w/enclosure
8"	PFO-8	1¼"	600	120	94	1.18	S&N w/enclosure
8"	PFO-8	1¼"	600	240	94	1.18	S&N w/enclosure
10"	PFO-10	1¼"	250	120	30	1.37	S&N w/enclosure
10"	PFO-10	1¼"	1000	120	120	1.37	S&N w/enclosure
10"	PFO-10	1¼"	1000	240	120	1.37	S&N w/enclosure
12"	PFO-12	1¼"	300	120	29	1.55	S&N w/enclosure
12"	PFO-12	1¼"	1200	120	115	1.55	S&N w/enclosure
12"	PFO-12	1¼"	1200	240	115	1.55	S&N w/enclosure



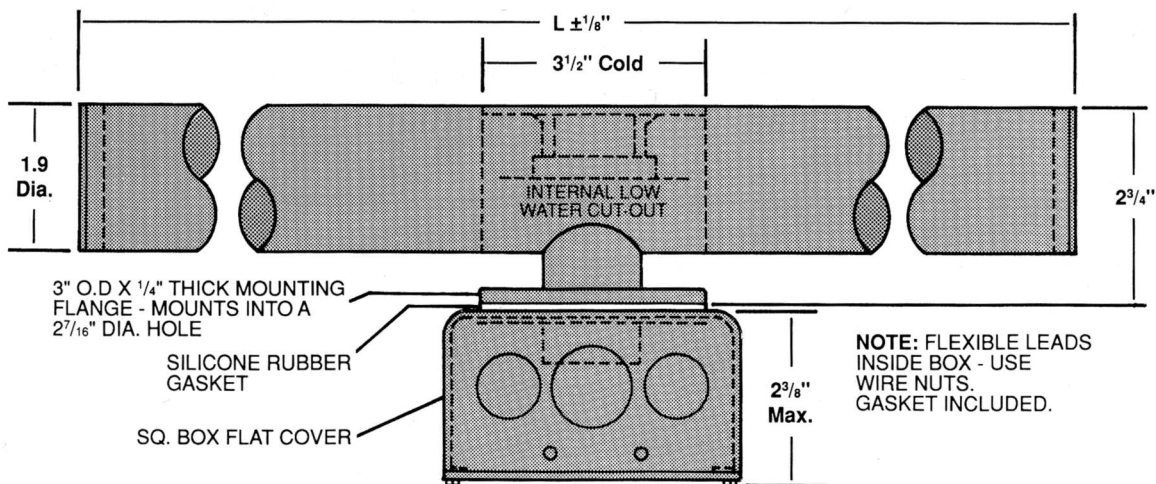


Cartridge Heaters

Special Immersion

U.L. Recognized-E56973

IMMERSION



Applications:

- Restaurant Steam Tables
- Humidifiers
- Water Tanks
- UL Recognized component. - E56973
- Food Cookers
- Process Water Heaters

Features:

- All stainless steel with heliarc welds — No copper or braze material in contact with water.
- Patented—Low water protected—Automatic internal high limit—Shuts off heater, then resets itself.
- Flexible hook-up leads for wire nuts.
- Easy to clean.
- Easy mounting through a 2 7/16" diameter (2" knockout) hole in bottom or side of tank — No need for mounting fittings.
- Other sizes and ratings available — Consult factory.

▼ Manufactured Items ▼					
L Dim	Catalog Number	K.W.	Volts	Line Amps	Phase
8	WB1511	1.5	120	12.5	1
8	WB1521	1.5	208	7.2	1
8	WB1541	1.5	240	6.3	1
12	WB3011	3	120	25.0	1
12	WB3021	3	208	14.4	1
12	WB3041	3	240	12.5	1
14	WB4021	4	208	19.2	1
14	WB4041	4	240	16.7	1
14	WB4051	4	480	8.3	1
18	WB5021	5	208	24.0	1
18	WB5041	5	240	20.8	1
18	WB5051	5	480	10.4	1
18	WB5023	5	208	13.9	3
18	WB5043	5	240	12.0	3
18	WB5053	5	480	6.0	3
22	WB7023	7	208	19.4	3
22	WB7043	7	240	16.8	3
22	WB7053	7	480	8.4	3

How To Order

- Specify Catalog Number from table above.