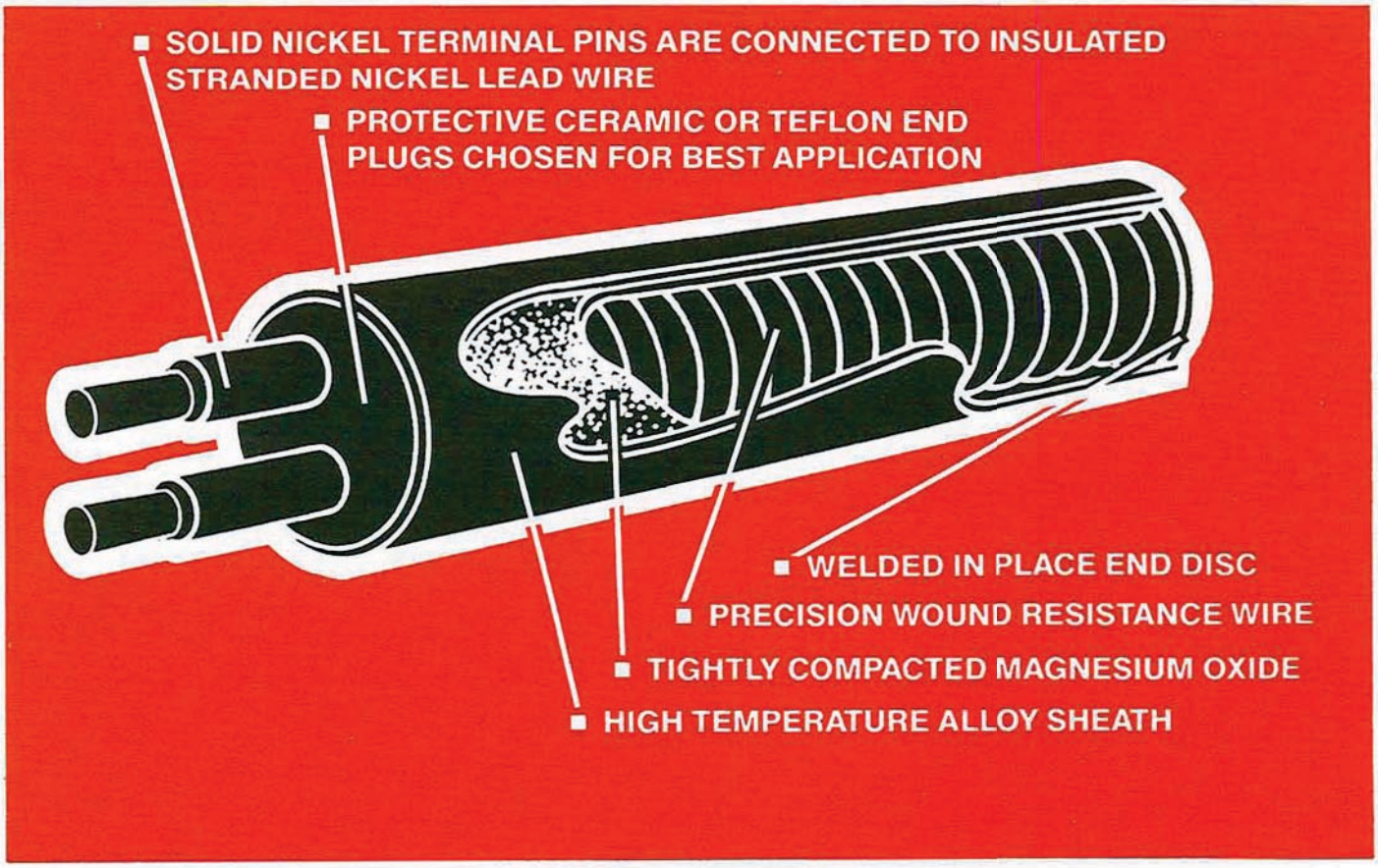
CARTRIDGE HEATERS-HIGH WATT DENSITY



FEATURES

- SWAGED HIGH TEMPERATURE ALLOY SHEATH
- FLEXIBLE NICKEL LEAD WIRES
- NICKEL CHROME RESISTANCE WIRE
- HELI-ARC WELDED END DISC
- AVAILABLE IN METRIC DIMENSIONS
- OPTIONAL LEADS & DESIGNS

APPLICATIONS

- MOLDS & DIES
- HEAT SEALING EQUIPMENT
- BOLT HEATERS
- LABELING EQUIPMENT
- PACKAGING EQUIPMENT
- PLASTIC EXTRUDERS
- FOOD PROCESSING

FULLY SWAGED

Delta High Watt Density cartridge heaters are fully swaged and can be applied wherever high temperature cartridge heaters are used. This heater will deliver temperatures of 1400°F on the high temperature alloy sheath.

LEADS & TERMINATIONS

Nickel pins or leads are swaged into the ceramic end cap, at the lead end of the cartridge. Standard 10″ nickel, 450°C fiberglass insulated leads with insulation rated at 300 or 600 volts are supplied. Optional lead types are available – consult catalog for designation.

INTERNAL FEATURES

High purity magnesium oxide cores and filler materials swaged to rock hard condition provide superb dielectric strength while conducting maximum heat from the nickel chrome resistance coil.

OPTIONS

Cartridge heaters can be ordered in a variety of forms. Abrasion resistant leads, threaded bushings, distributed windings, internally connected temperature sensors, terminal boxes, special sizes and voltages. CONSULT FACTORY

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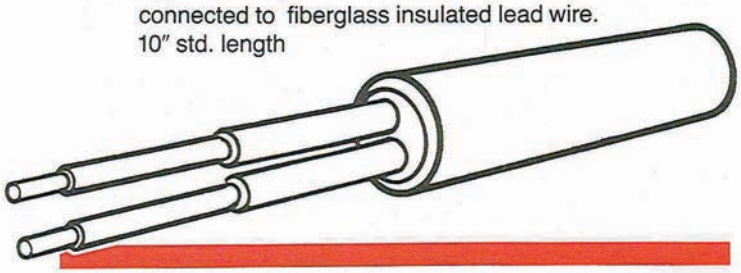
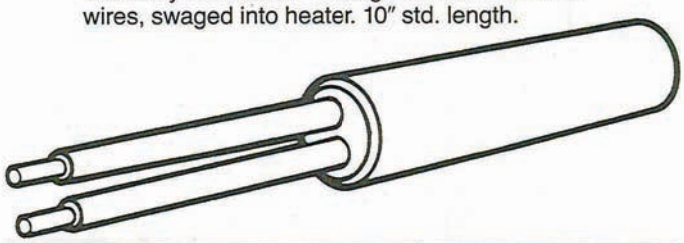
CARTRIDGE HEATERS-HIGH WATT DENSITY

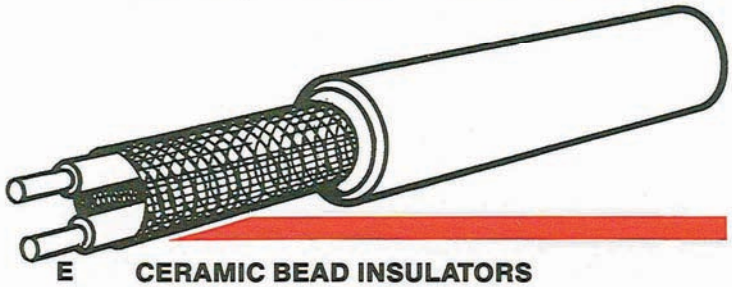
A STANDARD LEADS
Approximately 2″ of solid nickel terminal pins are butt connected to fiberglass insulated lead wire.
10″ std. length



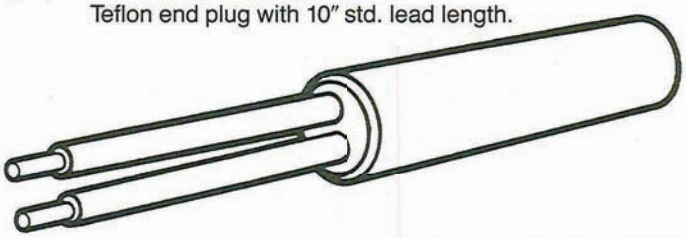
B FLEXIBLE
Internally connected – fiberglass insulated lead wires, swaged into heater. 10″ std. length.



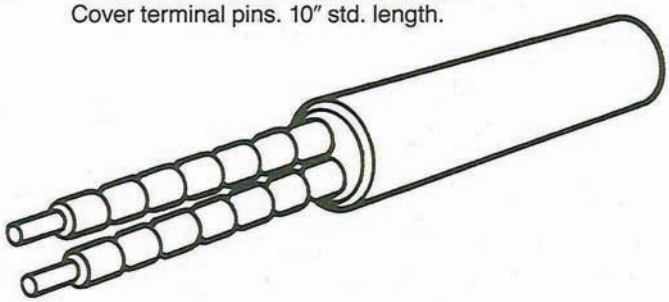
C METAL BRAID
Over fiberglass lead wire 10″ braid with 12″ lead wire.



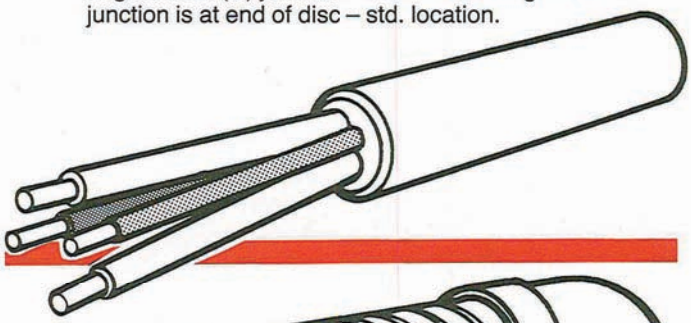
D TEFLON LEADS & SEAL
Teflon end plug with 10″ std. lead length.



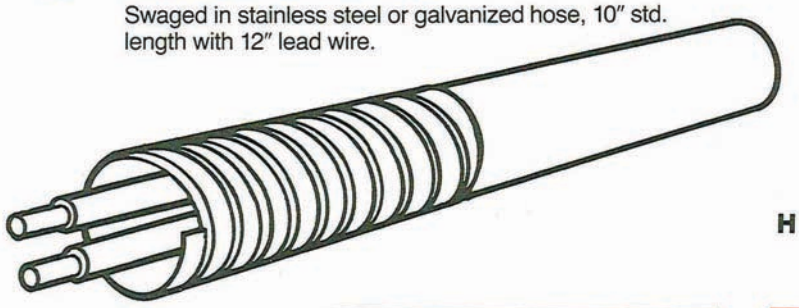
E CERAMIC BEAD INSULATORS
Cover terminal pins. 10″ std. length.

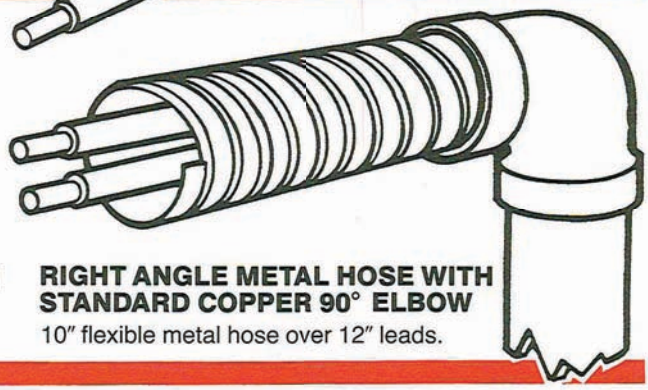


F INTERNAL THERMOCOUPLE
Type (J) iron-constantan standard. Grounded (G) or ungrounded (U) junction. 10″ std. lead length. TC junction is at end of disc – std. location.



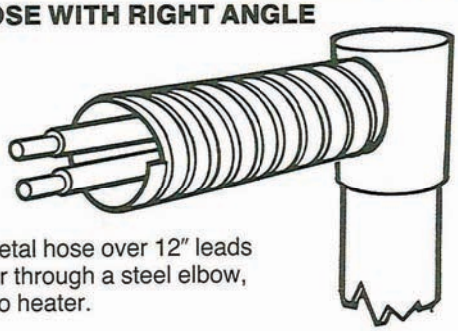
G FLEXIBLE METAL HOSE
Swaged in stainless steel or galvanized hose, 10″ std. length with 12″ lead wire.





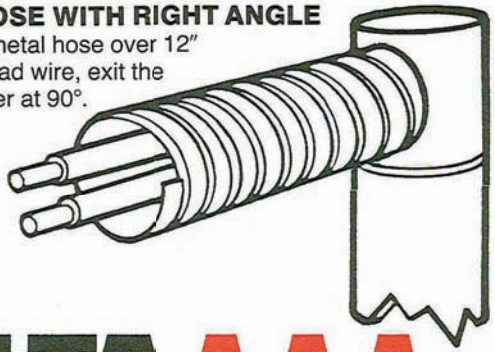
H RIGHT ANGLE METAL HOSE WITH STANDARD COPPER 90° ELBOW
10″ flexible metal hose over 12″ leads.

I METAL HOSE WITH RIGHT ANGLE



10″ flexible metal hose over 12″ leads exit the heater through a steel elbow, tack-welded to heater.

J METAL HOSE WITH RIGHT ANGLE
10″ flexible metal hose over 12″ fiberglass lead wire, exit the side of heater at 90°.

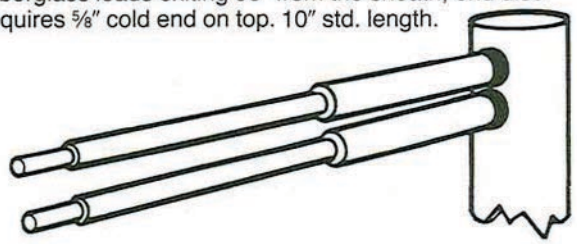


DELTA MANUFACTURING COMPANY INCORPORATED

CARTRIDGE HEATERS - HIGH WATT DENSITY

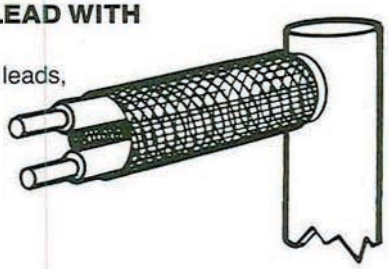
K RIGHT ANGLE LEADS

Fiberglass leads exiting 90° from the sheath, end disc requires ⅝" cold end on top. 10" std. length.



L RIGHT ANGLE LEAD WITH METAL BRAID

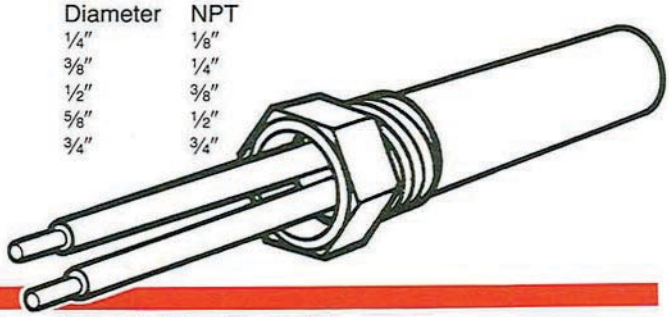
Covering fiberglass leads, exiting 90° std.
10" braid over 12" leads.



M NPT PIPE FITTING

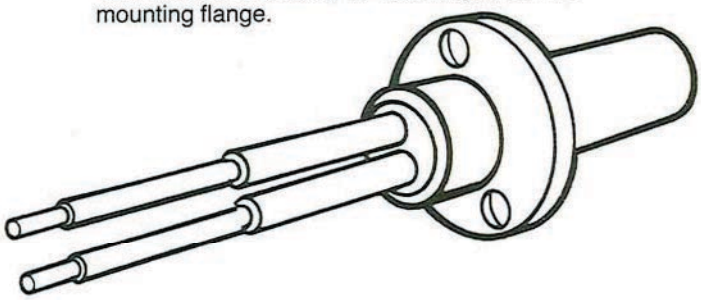
Stainless steel or brass NPT bushings – 10" std. length.

Diameter	NPT
¼"	⅛"
⅜"	¼"
½"	⅜"
⅝"	½"
¾"	¾"



N MOUNTING FLANGE

Tack welded to sheath, 10" std. length, std 1½" mounting flange.

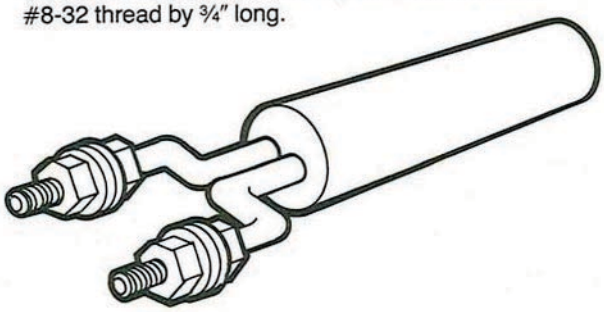


O TERMINALS – OPPOSITE ENDS

Available in lead or pin configuration. Leads can be bent as they exit potted ends. 10" lead wire, standard.

P POST TERMINALS

Post terminals, available on ½, ⅝ and ¾". All with #8-32 thread by ¾" long.



UNHEATED LENGTHS		
TYPE	LEAD END	DISC END
A, B, G, I, E, F, M, N, O, P	1/4"	1/4"
D, H	5/8"	1/4"
J, K, L, C	1"	1/4"
ON SPECIAL DESIGNS CONSULT FACTORY FOR UNHEATED LENGTHS.		

CARTRIDGE HEATER SPECIFICATIONS

NOMINAL DIAMETER	VOLTS MAX.	AMPS MAX.	MIN. WATT 120V HEATER LENGTH 1	1-1/2	2	MAXIMUM WATTAGE 120V 1ph.	240V 1ph.	480V 1ph.
1/4	240	4.4	100	55	40	525	1050	–
3/8	240	6.7	65	35	25	800	1600	–
1/2	240	9.7	40	25	20	1160	2320	–
5/8	480	16.0	35	20	15	1920	3840	7680
3/4	480	16.0	35	15	10	1920	3840	7680

ELECTRICAL TOLERANCES

Diameter	± .002
Length tolerance	± 2%
Wattage	NEMA standard +5% −10%
Resistance	NEMA standard +10% −5%
Camber tolerance	Up to 12" long: .010 per 12" over 12" long: .020 per 12"

To calculate watt density:

$$\text{Watt Density} = \frac{\text{WATTAGE}}{\text{Heater length MINUS cold section} \times \text{Diameter} \times 3.1416}$$

DELTA MANUFACTURING COMPANY INCORPORATED

CARTRIDGE HEATERS - HIGH WATT DENSITY

WATTAGE CALCULATION

1. Establish required operating temperature.
2. Calculate wattage required to provide maximum temperature.
3. Determine quantity of heaters. (The use of larger heaters, and/or larger quantity of heaters will result in lower watt density).
4. Determine watt density of heaters based upon dimensions and wattage.
5. Refer to watt-density graph. Select heater based upon hole clearance and operating temperature.
6. Watt density, hole clearance, dimension of heater, and wattage affect heater life.

INSTALLATION RECOMMENDATIONS

To extend the life of a cartridge heater, the following recommendations should be taken into consideration:

Use the largest and as many cartridges necessary to keep watt densities down. Higher wattage may be specified if necessary, but should not exceed 200 watts per square inch in optimum environment. (As a general rule, as the watt density is increased, the operating temperature should be decreased.)

Correcting high watt density can be done by 1) using a tighter fit, 2) using larger or more heaters, 3) lowering the wattage. When lowering the wattage, allow for longer heat-up time.

Use the closest practical fit.

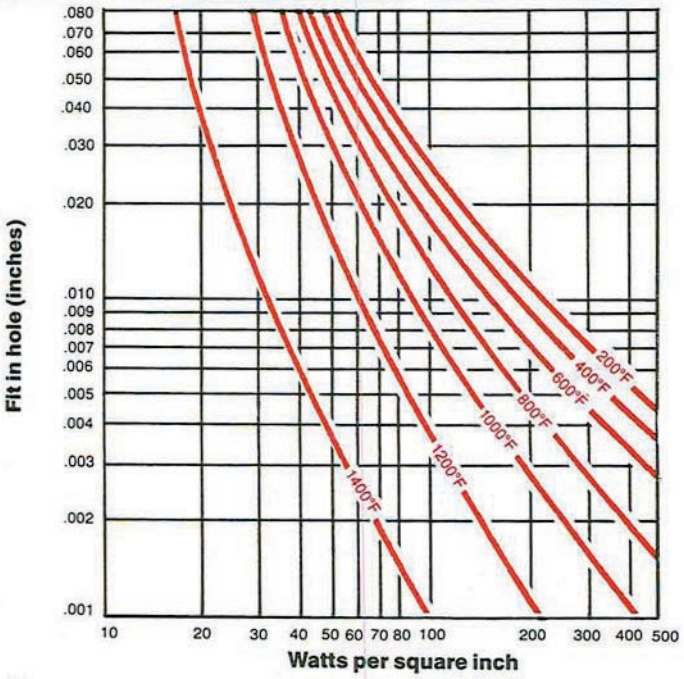
When possible, drill holes all the way through the block for easy removal.

When using lubricating materials, keep lubricates away from the lead end, since graphite and lubricates are conductive.

By selecting the proper lead termination for your application, you protect the leads from abrasion, moisture, and contaminants.

Double check all calculations under actual operating conditions, since many variables are difficult to calculate. When standard options will not meet your needs, Delta will help you design a heater that will.

MAXIMUM WATT DENSITY FOR HEATING METALS



CARTRIDGE STOCK LIST

DIA.	SHEATH LENGTH	VOLTS	WATTS	WATT DENSITY	PART NUMBER
¼" (.250)	1"	120	55	135	25-100-1- 55
	1¼"	120	80	195	25-125-1- 80
	1½"	120	100	125	25-150-1-100
	2"	120	150	125	25-200-1-150
	3"	120	200	101	25-300-1-200
	4"	120	300	110	25-400-1-300
	5"	240	350	100	25-500-2-350
	6"	240	400	95	25-600-2-400
⅜" (.375)	1"	120	100	110	375-100-1-100
	1¼"	120	100	115	375-125-1-100
	1¼"	120	150	171	375-125-1-150
	1½"	120	50	43	375-150-1- 50
	1½"	120	100	86	375-150-1-100
	1½"	120	150	128	375-150-1-150
	1½"	240	200	172	375-150-2-200
	2"	120	100	57	375-200-1-100
	2"	120	150	85	375-200-1-150
	2"	240	200	110	375-200-2-200
	2¼"	120	175	86	375-225-1-175
	2½"	240	165	70	375-250-2-165
	2½"	240	185	80	375-250-2-185
	2½"	240	200	85	375-250-2-200
	2½"	240	250	106	375-250-2-250
	3"	240	200	68	375-300-2-200
	3"	240	250	86	375-300-2-250
	3"	240	375	125	375-300-2-375
	3½"	240	300	85	375-350-2-300
	4"	240	250	62	375-400-2-250
	4"	240	350	85	375-400-2-350
	4"	240	500	123	375-400-2-500
	4½"	240	450	95	375-450-2-450
	5"	240	300	57	375-500-2-300
	5"	240	400	76	375-500-2-400
	5"	240	500	96	375-500-2-500
	5½"	240	550	93	375-550-2-550
	6"	240	500	78	375-600-2-500
	6"	240	600	94	375-600-2-600
	7"	240	600	80	375-700-2-600
	7"	240	800	104	375-700-2-800
	8"	240	600	69	375-800-2-600
	8"	240	900	102	375-800-2-900
	9"	240	1000	100	375- 900-2-1000
	10"	240	600	54	375-1000-2- 600
	10"	240	1000	91	375-1000-2-1000
	12"	240	750	55	375-1200-2- 750
	12"	240	1000	75	375-1200-2-1000

The above list is of common sizes and ratings available. Not all items are stocked.

DELTA MANUFACTURING COMPANY INCORPORATED

CARTRIDGE HEATERS-HIGH WATT DENSITY

CARTRIDGE STOCK LIST

DIA.	SHEATH LENGTH	VOLTS	WATTS	WATT DENSITY	PART NUMBER
½" (.500)	1"	120	50	65	50-100-1- 50
	1¼"	120	75	64	50-125-1- 75
	1¼"	120	125	107	50-125-1-125
	1½"	240	150	97	50-150-2-150
	1½"	240	200	128	50-150-2-200
	2"	240	200	86	50-200-2-200
	2"	240	300	128	50-200-2-300
	2"	240	400	172	50-200-2-400
	2¼"	120	150	55	50-225-1-150
	2¼"	240	250	92	50-225-2-250
	2½"	240	200	64	50-250-2-200
	2½"	240	250	80	50-250-2-250
	2½"	240	300	95	50-250-2-300
	2½"	240	400	128	50-250-2-400
	3"	240	250	64	50-300-2-250
	3"	240	300	77	50-300-2-300
	3"	240	500	128	50-300-2-500
	3½"	240	500	107	50-350-2-500
	4"	240	300	55	50-400-2-300
	4"	240	500	92	50-400-2-500
	4½"	240	650	103	50-450-2-650
	5"	240	500	72	50-500-2-500
	5"	240	750	108	50-500-2-750
	5½"	240	750	95	50-550-2-750
	6"	240	500	58	50-600-2-500
	6"	240	850	98	50-600-2-850
	6½"	240	900	96	50-650-2-900
	7"	240	1000	98	50-700-2-1000
	8"	240	750	64	50-800-2-750
	8"	240	1000	86	50- 800-2-1000
	8½"	240	1000	80	50- 850-2-1000
	9"	120	1000	75	50- 900-1-1000
	9½"	240	1250	88	50- 950-2-1250
	10"	120	1000	72	50-1000-1-1000
	10"	240	1500	100	50-1000-2-1500
	10½"	240	1500	96	50-1050-2-1500
	11"	240	1750	106	50-1100-2-1750
	12"	120	1000	56	50-1200-1-1000
	12"	240	1500	84	50-1200-2-1500
	12"	240	2000	112	50-1200-2-2000

DIA.	SHEATH LENGTH	VOLTS	WATTS	WATT DENSITY	PART NUMBER
⅝" (.625)	1¼"	120	200	137	625-125-1-200
	2"	240	200	68	625-200-2-200
	2"	240	250	85	625-200-2-250
	2"	240	250	73	625-200-2-250
	2½"	240	275	70	625-250-2-275
	2½"	240	400	102	625-250-2-400
	3"	240	250	52	625-300-2-250
	3"	240	500	104	625-300-2-500
	4"	240	500	73	625-400-2-500
	4"	240	750	110	625-400-2-750
	4½"	240	750	96	625-450-2-750
	5"	240	500	57	625-500-2-500
	5"	240	750	86	625-500-2-750
	5"	240	1000	114	625-500-2-1000
	5½"	240	800	82	625-550-2-800
	6"	240	850	79	625-600-2-850
	6"	240	1000	93	625-600-2-1000
	7"	240	1000	78	625-700-2-1000
	7"	240	1200	94	625-700-2-1200
	7½"	240	1000	73	625-750-2-1000
	8"	240	1000	68	625-800-2-1000
	8"	240	1200	82	625-800-2-1200
	8"	240	1500	102	625-800-2-1500
	9"	240	1250	75	625-900-2-1250
	10"	240	1000	54	625-1000-2-1000
	10"	240	1500	81	625-1000-2-1500
	12"	240	1500	66	625-1200-2-1500
	12"	240	2000	89	625-1200-2-2000
¾" (.750)	2"	120	200	57	75-200-1- 200
	2½"	240	350	74	75-250-2- 350
	3"	240	400	68	75-300-2- 400
	3"	240	500	85	75-300-2- 500
	3"	240	600	121	75-300-2- 600
	3½"	240	550	79	75-350-2- 550
	4"	240	500	61	75-400-2- 500
	4"	240	750	91	75-400-2- 750
	4"	240	1000	122	75-400-2-1000
	4½"	240	875	94	75-450-2- 875
	5"	240	850	80	75-500-2- 850
	5"	240	1000	95	75-500-2-1000
	5½"	240	900	77	75-550-2- 900
	6"	240	1000	77	75-600-2-1000
	6"	240	1250	96	75-600-2-1250
	6½"	240	1250	88	75-650-2-1250
	7"	240	1000	66	75- 700-2-1000
	7"	240	1500	98	75- 700-2-1500
	8"	240	1750	100	75- 800-2-1750
	8"	240	2000	114	75- 800-2-2000
	9"	240	1800	90	75- 900-2-1800
	9"	240	2000	100	75- 900-2-2000
	10"	240	2000	90	75-1000-2-2000
	10"	240	2250	112	75-1000-2-2250
	12"	240	1500	55	75-1200-2-1500
	12"	240	2000	74	75-1200-2-2000
	12"	240	2500	92	75-1200-2-2500

The above list is of common sizes and ratings available.
Not all items are stocked.

HOW TO ORDER CARTRIDGE HEATERS

1. Order by part number, if known
2. Diameter
3. Length
4. Watts/Volts (Wattage must not exceed maximum watt density)
5. Termination
6. Length of termination
7. **Fax drawing** for special specifications

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