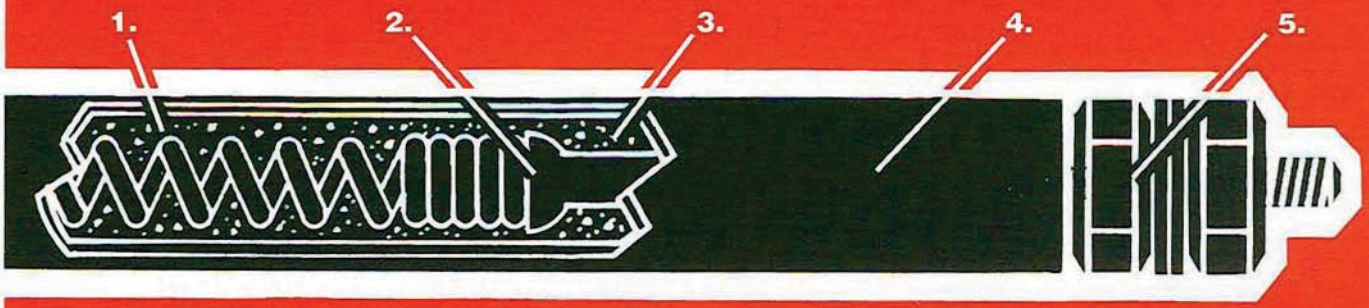
TUBULAR HEATING ELEMENTS



1. **PRECISION WOUND NICKEL-CHROMIUM RESISTANCE WIRE.**
2. **WELDED CONNECTION OF WIRE TO NICKEL PLATED STEEL TERMINAL PIN.**
3. **HIGH QUALITY, DENSITY COMPACTED MAGNESIUM OXIDE POWDER.**
4. **INCOLOY SHEATH STANDARD FULLY ANNEALED FOR FIELD BENDING. COPPER, STEEL, AND STAINLESS STEEL OPTIONAL.**
5. **A VARIETY OF TERMINATIONS AND MOISTURE SEALS TO SUIT SPECIFIC APPLICATION AND CONVENIENCE.**

FEATURES

- INCOLOY TUBING STANDARD
- 80/20 NICKEL-CHROME RESISTANCE WIRES
- HIGH PURITY MAGNESIUM OXIDE FILLER
- PRECISION SWAGED SIZES
- RECOMPACTED BENDS
- ANNEALED, FOR CUSTOMERS FORMING
- LONG LIFE AT ELEVATED TEMPERATURES
- NICKEL OR STAINLESS STEEL TERMINALS

APPLICATIONS

- MOLDS AND DIES
- PLATENS
- LIQUIDS
- GASSES
- SOLIDS
- OVENS
- RADIANT DRYING PROCESS
- CAST – IN PRODUCTS
- SEALING MACHINERY

DELTA MANUFACTURING COMPANY INCORPORATED

SPECIFICATIONS/APPLICATIONS/FEATURES FOR TUBULAR ELEMENTS

Delta **TUBULAR HEATERS** are capable of being formed into almost any type of configuration and are limited only by the minimum radius of a bend and the straight length required by the terminal pins. Tubular heaters are the most versatile and widely used of all the heating elements. Due to the ratings, sizes, materials and terminations available makes the tubular element adaptable to many industries.

Nickel-chromium 80/20 resistance wire is sized by our computer and then helically wound centered in a metal sheath. Surrounding the wire is a high grade magnesium oxide power (MgO) which is vibrated to insure even density throughout the length of the heater. When the sheath assembly is filled with MgO, it is compacted by rolling or swaging. This operation compresses the MgO and wire together so that the coil will not shift during the bending process. Swaging the tubular increases its dielectric strength and improves its thermal conductivity. Bends are then recompacted to eliminate potential insulation breaks. All Delta straight length tubular heaters are supplied fully annealed unless otherwise specified.

The **SCREW PLUG IMMERSION HEATER,** bent in a hair-pin element is either brazed or welded into a pipe plug and provided with a terminal housing for electrical connections. The screw plug immersion heater is mounted through tank walls using standard pipe couplings and is available in various sizes, heat capacities and sheath materials for heating oil, water or corrosive solutions.

FLANGED IMMERSION HEATERS allow high kilowatt ratings without an increase in length or multiple mountings that is required in screw plug heaters. Hair-pin bent tubular elements are brazed or welded into a standard pipe flange. A selection of flange size, wattages, voltages, thermostats, and hi-limit thermocouple attached to sheath along with optional NEMA housing are available for heating oil, water or corrosive solutions.

Delta's **CIRCULATION HEATERS** are compact and efficient. Heater, vessel and controls are all self-contained in an insulated steel tank. Standard incoloy elements as used in screw plug and flanged immersion heaters, cover most applications and temperatures for heating circulating gas or liquids. Various options are available such as NEMA terminal housings, temperature controls, flanged inlet/outlets and various insulating materials.

AIR DUCT HEATERS are made of incoloy elements and mounted in a heavy duty steel frame and are installed in duct work or in ovens for drying operations, heat treating, annealing or temperature boosting. NEMA housings, temperature controls, special ratings and sizes are all optional.

OPEN COIL HEATERS are made of nickel-chromium 80/20 resistance wire and mounted in a heavy duty steel frame. Coil heaters are flexible in design, lightweight and used when a fast response is needed in heat up. Open coil heaters are used in incubators, environmental chambers, ovens or when heating forced air.

SHEATH MATERIAL	MAXIMUM SHEATH TEMPERATURE	MAX. WATTS PER SQ. IN.
Incoloy	1500°F/815°C	40
Stainless	1200°F/650°C	30
Steel	750°F/400°C	22
Copper	350°F/175°C	55

ALL DIMENSIONS ARE IN INCHES

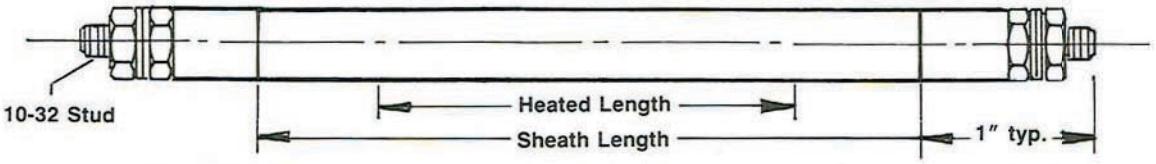
Sheath Diameter ± .005		.260	.315	.375	.430	.475	.490	.625
Sheath Length	Minimum	11	11	11	11	11	11	11
	Maximum	200	200	250	250	275	275	255
Maximum Amperage		15	30	30	40	40	40	40
Maximum Voltage		250	480	480	550	550	550	550
Ohms per Heated Inch	Minimum	.100	.060	.040	.040	.040	.040	.050
	Maximum	17	21	21	21	21	21	17
Resistance tolerance		NEMA standard plus 10% minus 5%						
Wattage tolerance		NEMA standard plus 5% minus 10%						

TOLERANCE FOR SHEATH AND HEATED LENGTHS

Overall Sheath length	11-20	21-50	51-80	81-100	101-140	141-170	171-200	201-UP
Sheath length Tolerance	±3/32	±1/8	±5/32	±3/16	±7/32	±1/4	±1/4	±1/4
Heated length Tolerance	±1/4	±1/2	±7/8	±1-1/8	±1-3/8	±1-5/8	±1-7/8	±2-3/8
Minimum unheated area each end	1	1-1/4	1-1/2	1-5/8	1-3/4	2	2-1/4	2-1/2

TUBULAR HEATING ELEMENTS

STANDARD TUBULAR STRAIGHT LENGTHS



	SHEATH LENGTH	HEATED LENGTH	WATTS	VOLTS	CATALOG NUMBER
.260" Dia. 30 watts per sq. inch	15"	10"	300	120 240	23T-30-1 23T-30-2
	20"	15"	400	120 240	23T-40-1 23T-40-2
	25"	20"	500	120 240	23T-50-1 23T-50-2
	30"	25"	600	120 240	23T-60-1 23T-60-2
	35"	30"	800	120 240	23T-80-1 23T-80-2
	40"	35"	900	120 240	23T-90-1 23T-90-2
	45"	40"	1000	120 240	23T-100-1 23T-100-2
	50"	45"	1100	120 240	23T-110-1 23T-110-2
	55"	50"	1200	120 240	23T-120-1 23T-120-2
	60"	55"	1400	120 240	23T-140-1 23T-140-2
	65"	60"	1500	120 240	23T-150-1 23T-150-2
	70"	65"	1600	120 240	23T-160-1 23T-160-2
	75"	70"	1800	120 240	23T-180-1 23T-180-2
	80"	75"	2000	120 240	23T-200-1 23T-200-2

	SHEATH LENGTH	HEATED LENGTH	WATTS	VOLTS	CATALOG NUMBER
.315" Dia. 30 watts per sq. inch	15"	10"	300	120 240	33T-30-1 33T-30-2
	20"	15"	400	120 240	33T-40-1 33T-40-2
	25"	20"	600	120 240	33T-60-1 33T-60-2
	30"	25"	800	120 240	33T-80-1 33T-80-2
	35"	30"	900	120 240	33T-90-1 33T-90-2
	40"	35"	1000	120 240	33T-100-1 33T-100-2
	45"	40"	1200	120 240	33T-120-1 33T-120-2
	50"	45"	1400	120 240	33T-140-1 33T-140-2
	55"	50"	1500	120 240	33T-150-1 33T-150-2
	60"	55"	1700	120 240	33T-170-1 33T-170-2
	65"	60"	1800	120 240	33T-180-1 33T-180-2
	70"	65"	2000	120 240	33T-200-1 33T-200-2
	75"	70"	2100	120 240	33T-210-1 33T-210-2
	80"	75"	2300	120 240	33T-230-1 33T-230-2
	90"	85"	2600	120 240	33T-260-1 33T-260-2
	100"	95"	3000	120 240	33T-300-1 33T-300-2

	SHEATH LENGTH	HEATED LENGTH	WATTS	VOLTS	CATALOG NUMBER
.430" Dia. 30 watts per sq. inch	15"	10"	400	240 480	43T-40-2 43T-40-4
	20"	15"	600	240 480	43T-60-2 43T-60-4
	25"	20"	800	240 480	43T-80-2 43T-80-4
	30"	25"	1000	240 480	43T-100-2 43T-100-4
	35"	30"	1200	240 480	43T-120-2 43T-120-4
	40"	35"	1400	240 480	43T-140-2 43T-140-4
	45"	40"	1600	240 480	43T-160-2 43T-160-4
	50"	45"	1800	240 480	43T-180-2 43T-180-4
	55"	50"	2000	240 480	43T-200-2 43T-200-4
	60"	55"	2200	240 480	43T-220-2 43T-220-4
	65"	60"	2400	240 480	43T-240-2 43T-240-4
	70"	65"	2600	240 480	43T-260-2 43T-260-4
	75"	70"	2800	240 480	43T-280-2 43T-280-4
	80"	75"	3000	240 480	43T-300-2 43T-300-4
	90"	85"	3500	240 480	43T-350-2 43T-350-4
	100"	95"	4000	240 480	43T-400-2 43T-400-4
	110"	105"	4500	240 480	43T-450-2 43T-450-4
	120"	115"	5000	240 480	43T-500-2 43T-500-4

Other Information

Net weights per linear foot:
.260 diameter = .05 lbs.
.315 diameter = .10 lbs.
.430 diameter = .18 lbs.
.475 diameter = .25 lbs.

Avg. watt density = 30 watts/sq. inch.
Maximum sheath temperature: 1600°F.
Fully annealed for field bending.

Other sizes, ratings and sheath materials available.

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TUBULAR HEATERS

COMMON BEND FORMATIONS

FIG.1

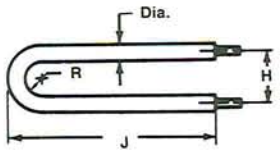


FIG. 2

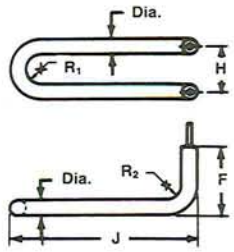


FIG. 3

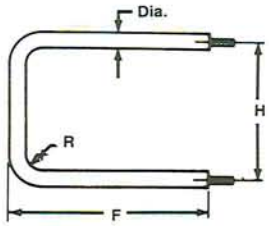


FIG. 4

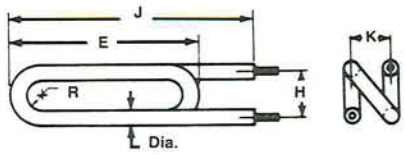


FIG. 5

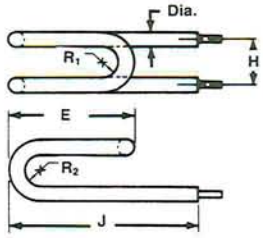


FIG. 6

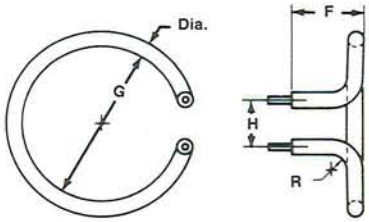


FIG. 7

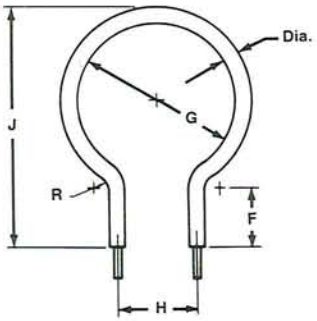


FIG. 8

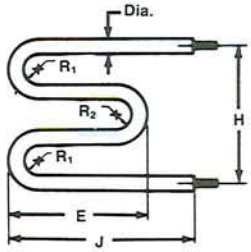


FIG. 9

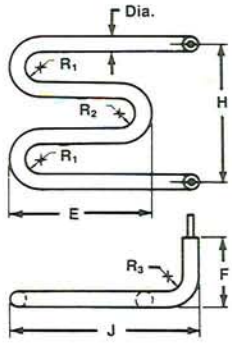


FIG. 10

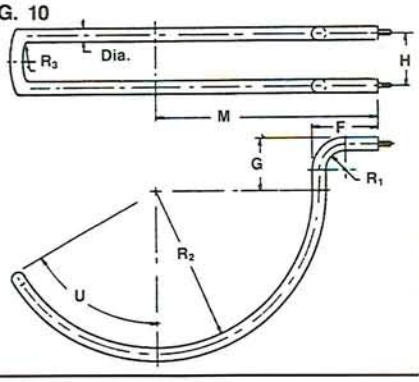


FIG. 11

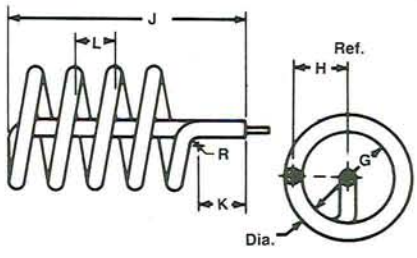
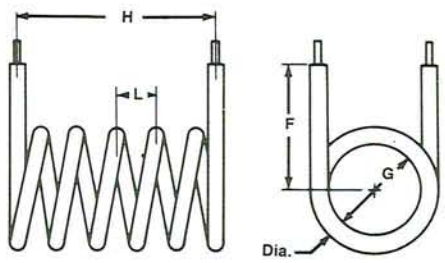


FIG. 12

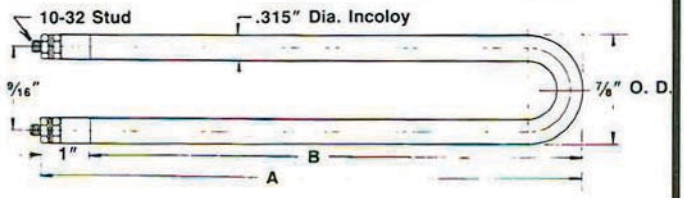


DELTA MANUFACTURING COMPANY INCORPORATED

TUBULAR HEATING ELEMENTS

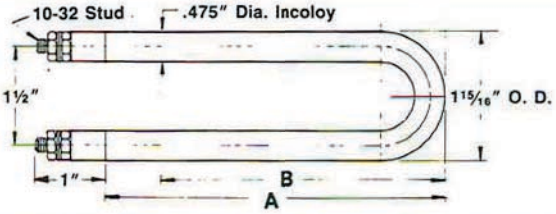
STANDARD HAIRPIN TUBULARS

22 Watts Per Square Inch



HAIRPIN LENGTH "A"	HEATED LENGTH "B"	WATTS	VOLTS	MODEL NUMBER
7¾"	5"	250	120 240	33HT-250-1 33HT-250-2
10¾"	8"	375	120 240	33HT-375-1 33HT-375-2
13¾"	11"	500	120 240	33HT-500-1 33HT-500-2
21¼"	18½"	750	120 240	33HT-750-1 33HT-750-2
27¾"	25"	1000	120 240	33HT-1000-1 33HT-1000-2
40¼"	37½"	1500	120 240	33HT-1500-1 33HT-1500-2

22 Watts Per Square Inch

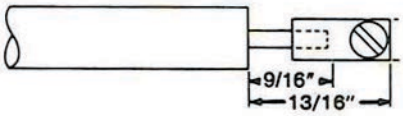


HAIRPIN LENGTH "A"	HEATED LENGTH "B"	WATTS	VOLTS	MODEL NUMBER
14"	10½"	750	240 480	47HT-750-2 47HT-750-4
19"	14"	1000	240 480	47HT-1000-2 47HT-1000-4
21"	17"	1250	240 480	47HT-1250-2 47HT-1250-4
26¼"	21¼"	1500	240 480	47HT-1500-2 47HT-1500-4
34"	29"	2000	240 480	47HT-2000-2 47HT-2000-4
41¾"	36¾"	2500	240 480	47HT-2500-2 47HT-2500-4
49"	44"	3000	240 480	47HT-3000-2 47HT-3000-4
53"	48"	3333	240 480	47HT-3333-2 47HT-3333-4

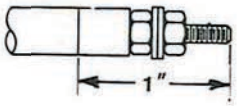
AVAILABLE TERMINATIONS

Plain Pins

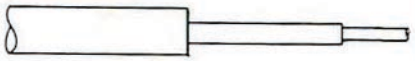
Screw Lug



Threaded Stud

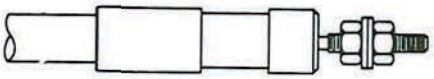


Lead Wires



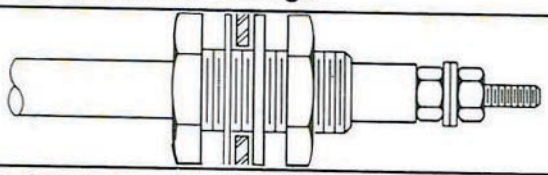
Rubber Overmold

Ceramic-to-Metal

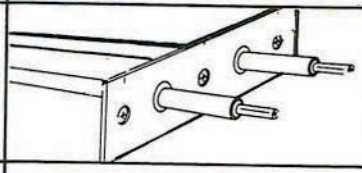


AVAILABLE MOUNTING DEVICES

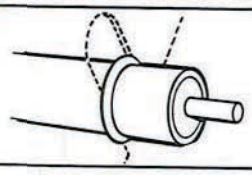
Threaded Bulkhead Fittings



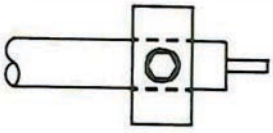
Mounting Brackets



Locator Rings/Washers



Mounting Collars



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