

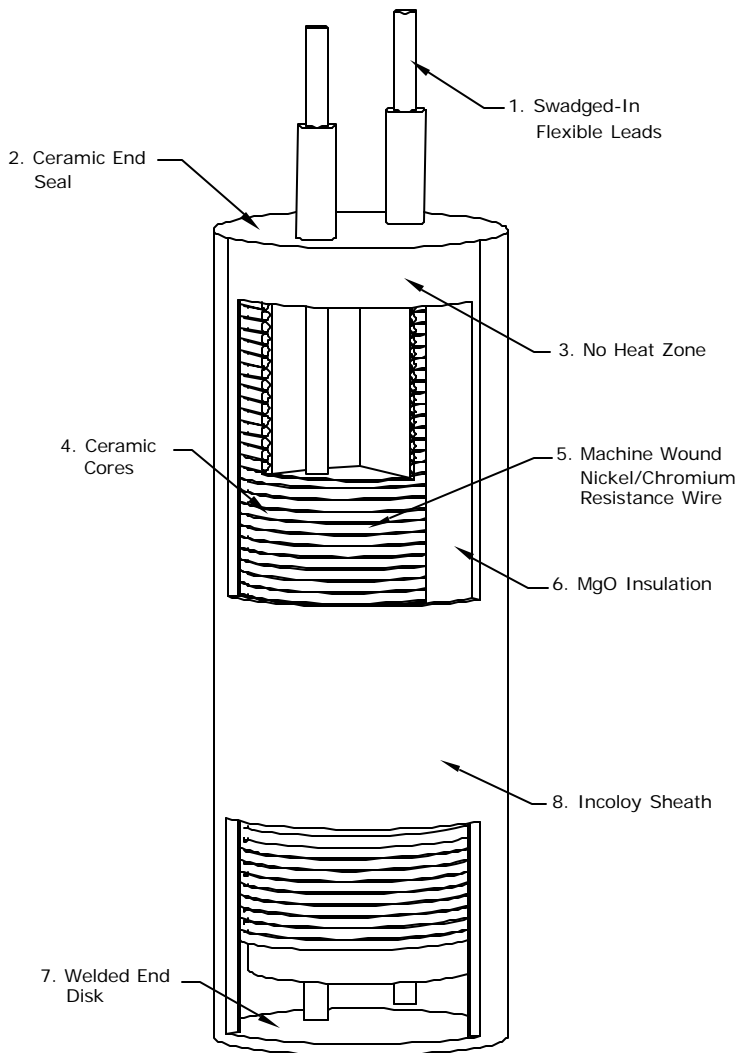


Thermal Manufacturing Solutions

Section I Heating Elements

High Density Cartridge Heaters	I-1
Square Cartridge Heaters	I-7
Mica Insulated and Nozzle Band Heaters	I-9
Mineral Insulated Band Heaters	I-12
Ceramic Insulated Band Heaters	I-14
Mica Insulated Strip Heaters	I-23
Mineral Insulated Strip Heaters	I-25
Ceramic Insulated Strip Heaters	I-27
Tubular Strip Heaters	I-29
Coil Heaters	I-33
Straight Tubular Heaters	I-37
Hairpin Tubular Heaters	I-39
Formed Tubular Heaters	I-40
Screw Plug Immersion Heaters	I-46
Flanged Immersion Heaters	I-48
Air Heaters	I-49
Megadrum & Flexidrum Barrel Heaters	I-51
Silicon Rubber Heaters	I-55
Process Heaters	I-58
Duct Heaters	I-61

HIGH-DENSITY CARTRIDGE HEATERS



Megawat high-density cartridges are round tubular heaters with electrical terminations on one side. These dependable heaters are made to withstand tough industrial usage. With a tolerance of ± 0.002 " on their outside diameter to secure a tight fit inside receptacle holes, and rock hard compaction of MgO insulation through swaging, these heaters can attain 1500°F sheath temperature. Megawat cartridges are available with various termination styles and mounting attachments.

In high-density cartridge heaters the resistance wire loops are positioned as close as possible to the outside shell. Because the MgO powder insulation around these loops is compacted by swaging and transformed into a very hard medium, heat transmission is very efficient. Megawat cartridges can have up to 200 W/in² watt densities. Cartridges are usually supplied usually supplied with lead wires.

The attachment of the leads to the central pins is done internally, in a 3/8" cold section. In excessively hot applications the length of this cold section could be increased.

To facilitate installation and avoid excessive air pockets, cartridges are made 0.004" less than nominal size of the receptacle hole with a tolerance of ± 0.002 ".

Megawat cartridges can be dual-voltage, three-phase, and/or be supplied with a ground terminal. With ten different terminal styles, mounting attachments and various optional features, Megawat high-density cartridges are widely used in numerous high temperature applications.

HIGH-DENSITY CARTRIDGE HEATERS

Operating temperature versus actual temperature of cartridge

Megawatt cartridge heaters are designed to withstand a sheath temperature of up to 1500° F. The recommended maximum operating temperatures for different applications are much less than that. There are many factors that have a direct effect on the lag between the actual sheath temperature of a cartridge heater and the monitored temperature of a material during the heat-up cycle. In some cases, this temperature lag is so significant that the cartridge will reach its elevated critical temperature even when the surrounding material is monitored to have a relatively much lower temperature level. The most common factors that contribute to the degree of temperature difference are the following:

- Thermal conductivity of the material being heated
- The cartridge sheath watt density
- The tightness of the cartridge inside the hole
- The location of the monitoring sensor
- The alloy of the cartridge sheath material
- Contamination around the cartridge heater

These factors should be taken into consideration while selecting a cartridge for a specific application. One common practice is to use stainless steel cartridge sheathes for temperatures up to 1000° F and Incoloy sheathes for temperatures up to 1400° F.

Another design consideration related to the operating temperature is the electrical termination of a cartridge. Teflon and TGGT leads have 480° F rating while MGT wires can withstand up to 840° F. When cartridges are used at relatively high temperatures, the terminals selected should be either different than the common high temperature lead wires or the design should be done such that the temperature around the lead wires (whether the leads are connected internally or externally to the cartridge) is maintained at a temperature level lower than the critical temperature limit of the lead wire.

HIGH-DENSITY CARTRIDGE HEATERS

Optional Features

Built-in thermocouples

One optional feature on **MEGAWAT** cartridges is built-in thermocouples. These could be type "J" or "K", grounded or ungrounded, and attached either at the disc end or the middle of the cartridge.

Graphite coating

To facilitate their installation and removal, cartridges could be coated with a graphite-like substance. This solid lubricant doesn't increase the outside diameter, and is suitable for temperatures up to 750° F.

Moisture and contamination proofing

To protect cartridge heaters against moisture and contamination, Teflon lead wires are used and the lead end is sealed using Epoxy, RTV silicone or Teflon. The temperature limitation is 480° F.

Distributed wattage

In applications such as sealing bars or rubber molds, the two ends of a cartridge heater are usually colder than the middle. To overcome this inconsistency and have a uniformly distributed heat source, cartridges could be made to have higher wattages at the ends. 35/30/35 is a common wattage distribution.

Center-less grinding

In applications where superior heat transfer is required, the tolerance on the outside diameter could be improved to +/-0.001" by center-less grinding.

Zones and cold sections

We can also manufacture cartridges with cold sections and separate zones that can be controlled independently.

HIGH-DENSITY CARTRIDGE HEATERS

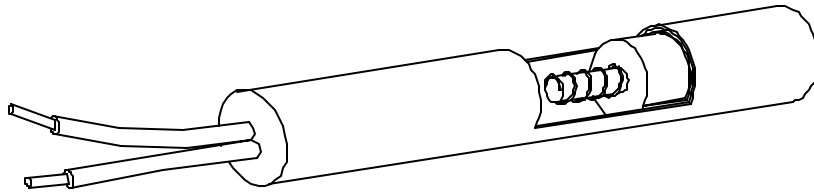
Cartridge Heater Specifications

DIAMETER (NOM)	1/4	5/16	3/8	1/2	5/8	3/4	1
DIAMETER (ACTUAL)	0.246	0.310	0.371	0.496	0.621	0.746	0.996
MAX LENGTH	36"	36"	72"	96"	96"	96"	96"
MAX VOLTAGE (CSA)	240 V	240 V	480 V	480 V	480 V	480 V	480 V
MAX VOLTAGE	250 V	250 V	600 V	600 V	600 V	600 V	600 V
MAX WATTAGE AT 240V	1200 W	1300 W	2000 W	3000 W	5300 W	5300 W	5300 W
WATTAGE TOLERANCE	+5%-10%						
DIAMETER TOLERANCE	+/-0.002"						
LENGTH TOLERANCE	+/-2% of length						
CAMBER TOLERANCE	0.010" per ft up to 12in						
	0.018" per ft above 12in						

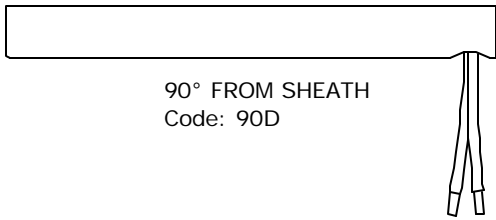
Selection & Installation Tips

- Cartridges should have a tight fit in the receptacle hole. Drilling and reaming to the next standard size and using a larger cartridge could solve the problem of loose or worn-out holes.
- Lead wires should be kept away from abrasion, and should not be exposed to temperatures above 840°F.
- Stocked cartridge heaters, which have been exposed to air and moisture for a long period of time, should be energized on a low voltage prior to usage, in order to eliminate possible moisture contamination. It is always preferable to stock cartridges in sealed bags.
- Cartridges should be immersed completely inside the receptacle hole. Proper mounting attachments can prevent their edging out by vibration. If it is necessary to have an exposed section, that part should be unheated.
- Receptacle holes should be properly cleaned prior to the installation of a cartridge.
- When designing molds, it is recommended to make the receptacle cavities such that they will accommodate cartridge heaters completely and all-the-way-through. This will later facilitate the removal of the heaters.
- Watt densities should be kept within the safe range. This can be done by using either larger cartridges or as many as it is reasonably possible.
- To prevent short cycling, the wattage of a cartridge should be close to the wattage required by that specific application.

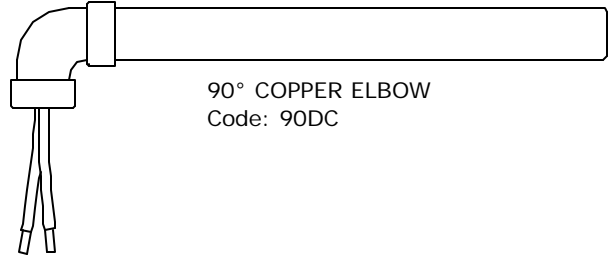
HIGH DENSITY CARTRIDGE HEATERS



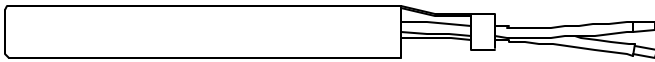
LEAD EXIT OPTIONS



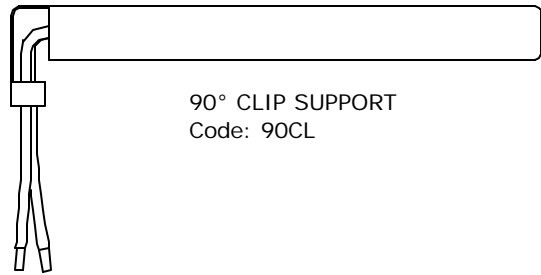
90° FROM SHEATH
Code: 90D



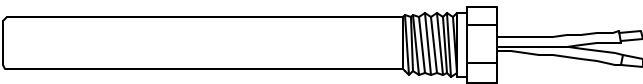
90° COPPER ELBOW
Code: 90DC



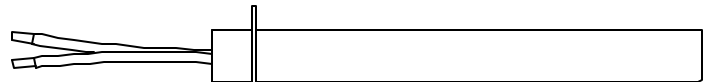
CLIP SUPPORT
Code: CL



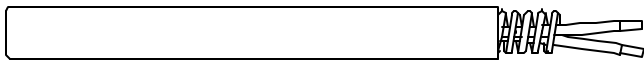
90° CLIP SUPPORT
Code: 90CL



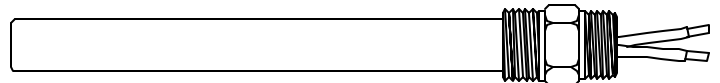
NPT BUSHING
Code: B



FLANGE
Code: FL



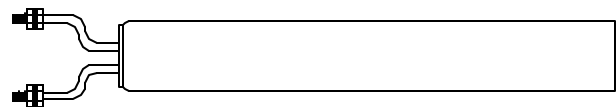
STRAIGHT STRAIN RELIEF SPRING
Code: SR



HEX CENTER BUSHING
Code: HB

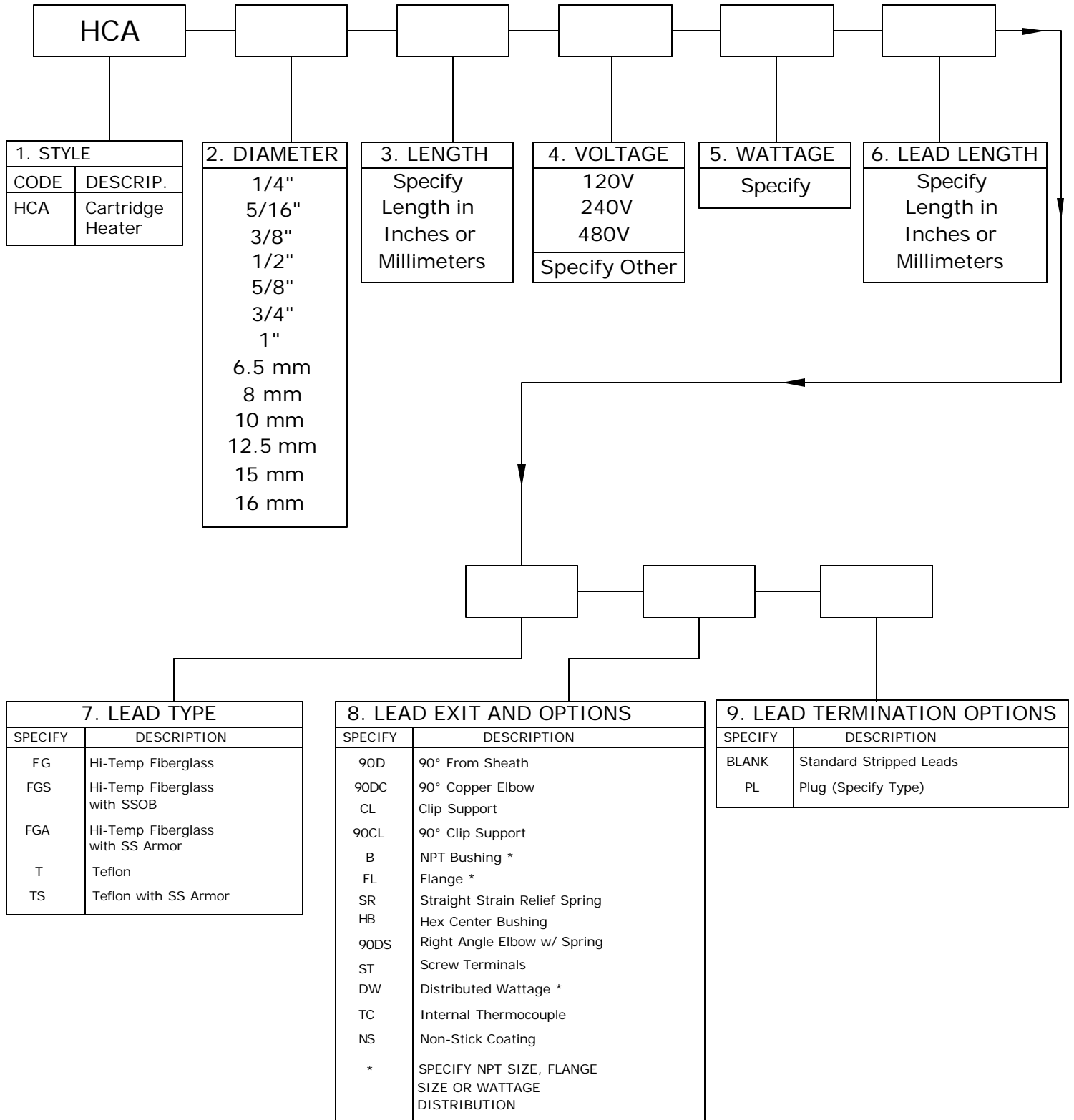


RIGHT ANGLE ELBOW W/ SPRING
Code: 90DS

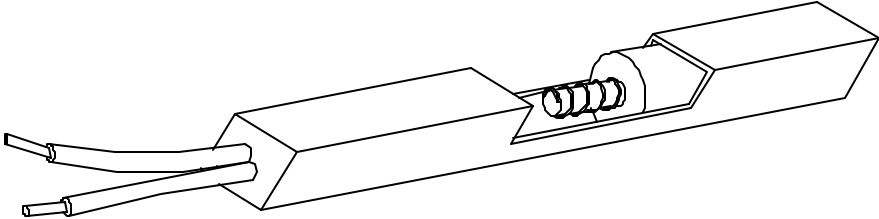


SCREW TERMINALS
Code: ST

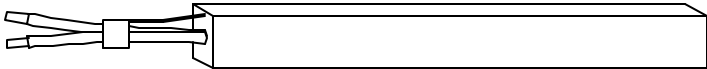
HIGH DENSITY CARTRIDGE HEATERS



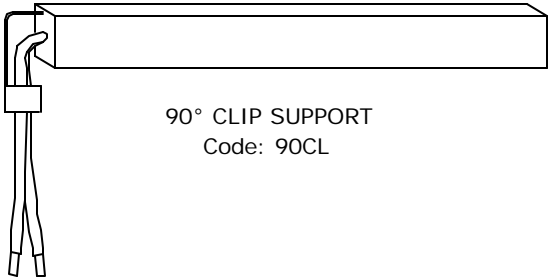
HIGH DENSITY SQUARE CARTRIDGE HEATERS



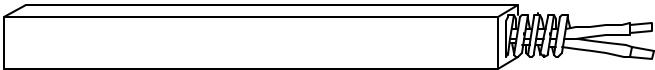
LEAD EXIT OPTIONS (SQUARE)



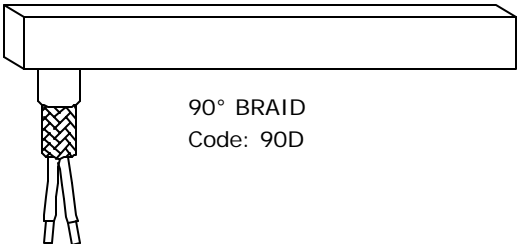
STRAIGHT CLIP SUPPORT
Code: CL



90° CLIP SUPPORT
Code: 90CL

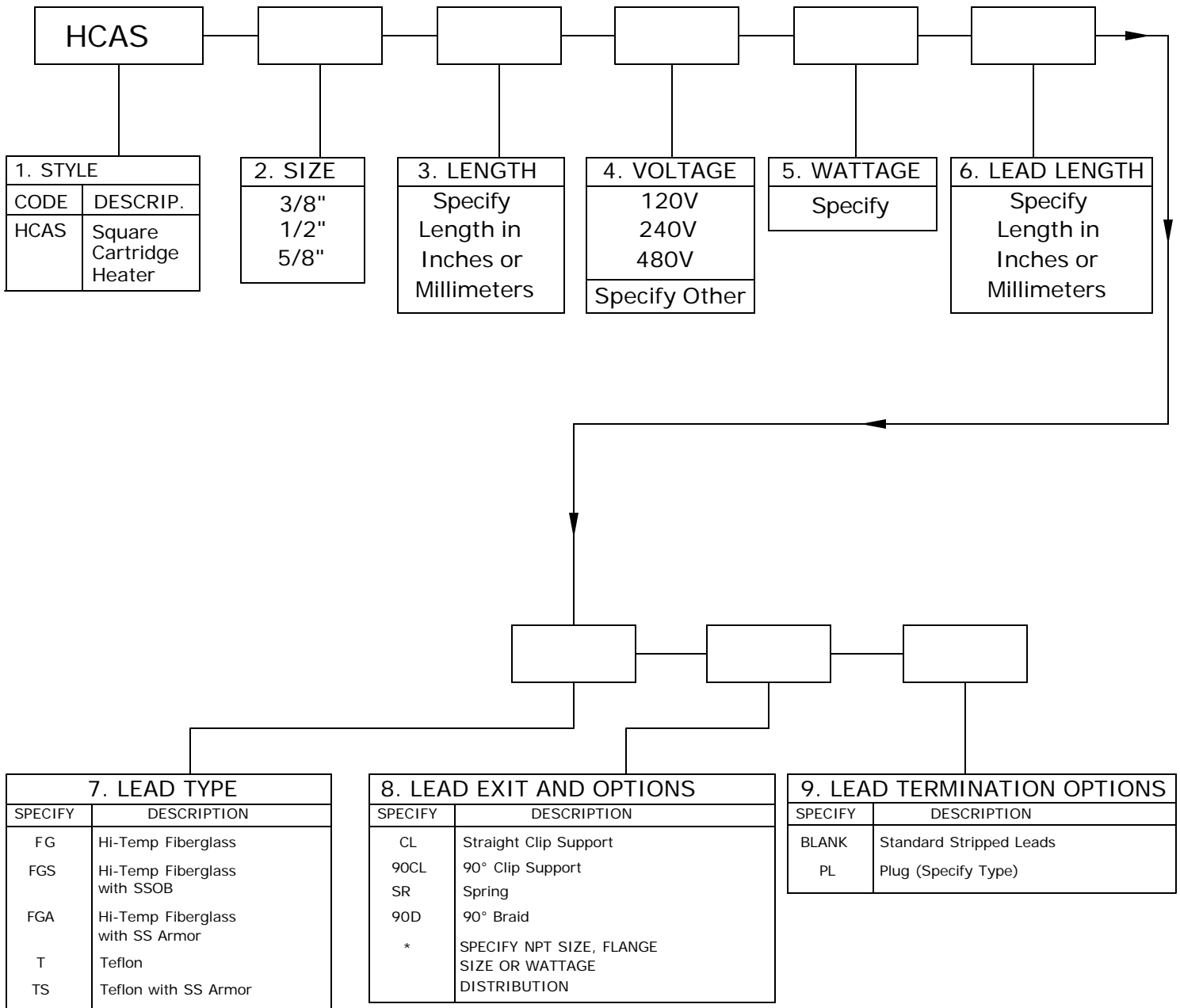


SPRING
Code: SR



90° BRAID
Code: 90D

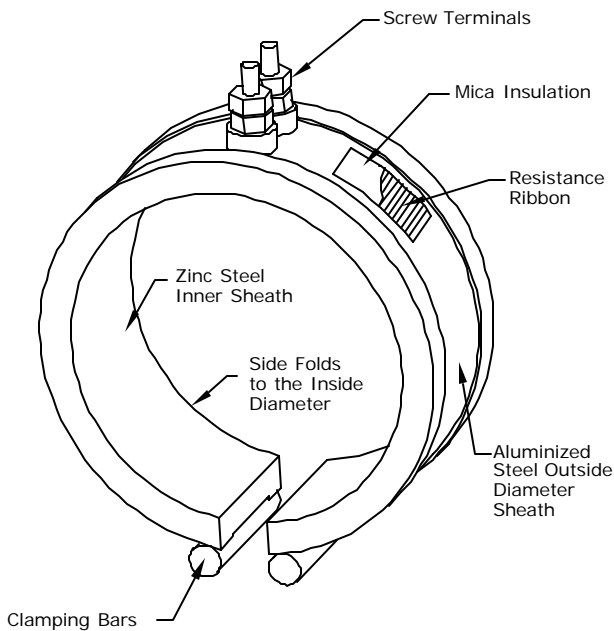
HIGH DENSITY SQUARE CARTRIDGE HEATERS



MICA INSULATED BAND HEATERS

Megaband mica insulated band heaters are efficient and economical solutions to the heating requirements of many applications. Although their maximum sheath temperature is limited to 900° F, with different electrical termination styles, clamping mechanisms, and ability to accommodate holes and cutouts, Megabands are successfully used in many applications, but are mostly sought for in the plastics industry.

Megabands utilize different types of top grade mica. The thickness of each mica layer is carefully selected to balance between the insulating characteristics of Mica and the ease of heat transfer from the resistance ribbon to the machine barrel.



The resistance ribbon used in a Megaband is not restricted to the capabilities of Nichrome wire. Different alloys are considered for different applications. The internal winding is carefully designed to ensure uniform heat distribution throughout the heater.

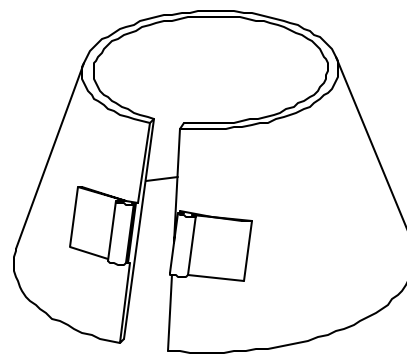
To maximize the surface-to-surface contact, Megabands are carefully rounded and formed to optimize the grip on a machine barrel. The external metallic protective sheath of a Megaband is made of a special alloy, which expands less than the barrel when heated. This difference in thermal expansion makes the heater grip the barrel firmly once it is energized, and this improves heat transfer. Poor heat transfer acts like a throttle and makes the resistance element inside the heater function at elevated temperatures, which eventually leads to the premature failure of the heater.

Megabands are made in different construction styles, clamping mechanisms, and terminal types. Holes, cutouts, slots, thermocouple or mounting brackets can be accommodated in the design.

MICA INSULATED BAND HEATERS

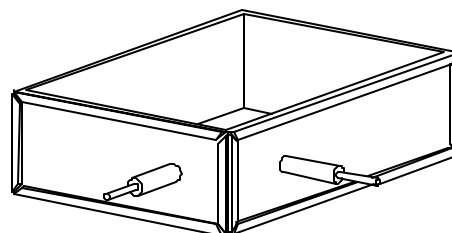
Conical

Conical or irregular shaped heaters are made to fit unconventional forms. Heat transfer considerations impose limitations on the overall design and construction of these heaters. Our engineers are available to discuss the requirements of each application.



Square and rectangular

Mica bands can be made square, rectangular or multi-sided to suit your specific requirements.

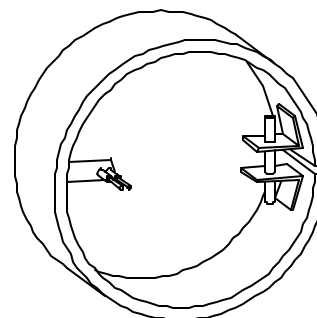


Reverse

Reverse heaters are used in applications where heating from inside the barrel is required. The outside shell of these heaters is the heating surface and all the terminations and clamps are located on the inside of the heater.

Diameter: 3"min; 36" max

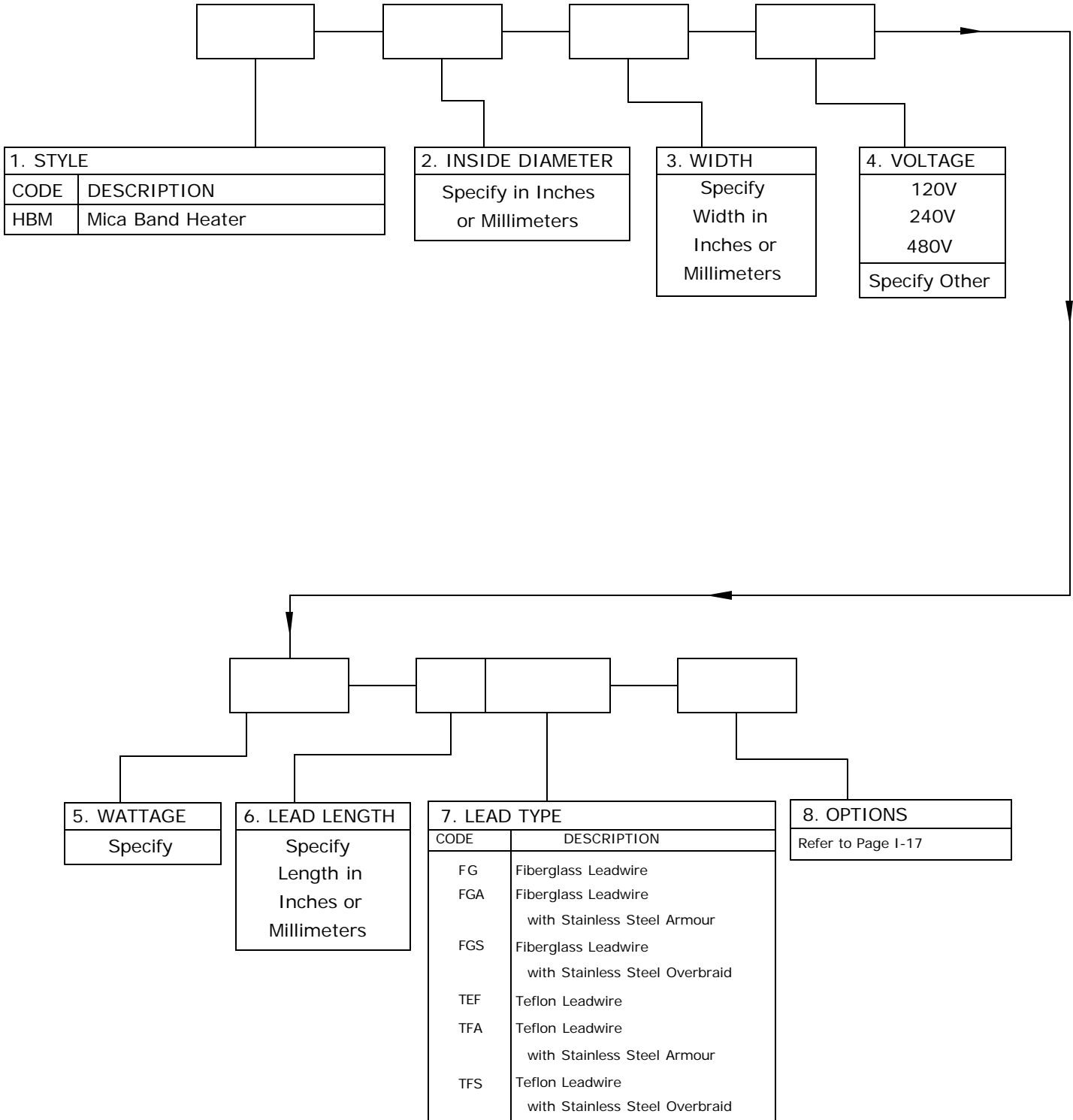
Width: 1"min; 12" max



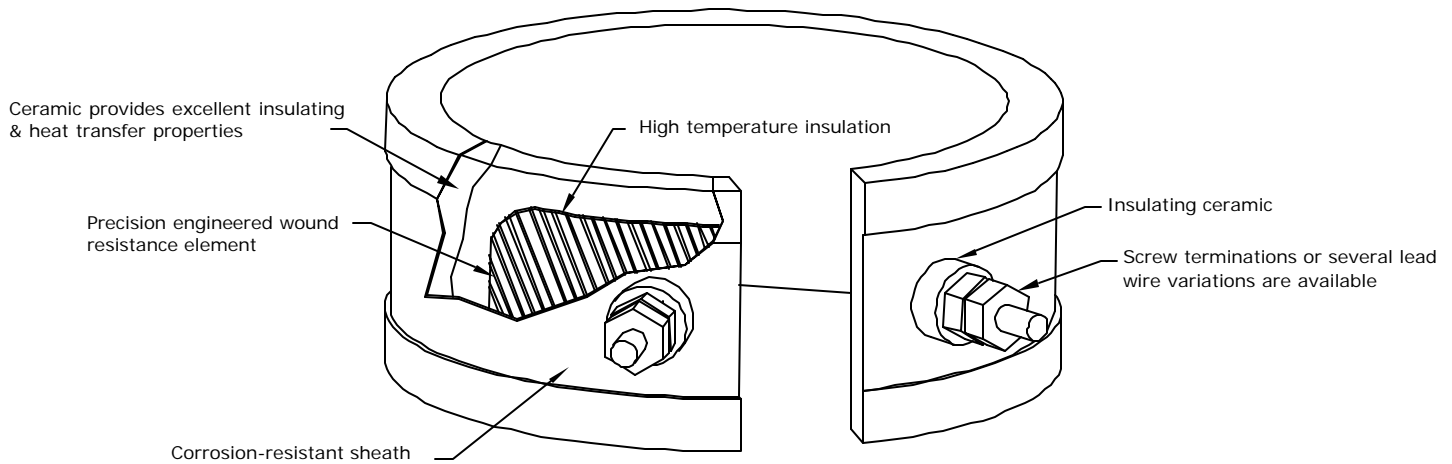
Installation Tips

- The cylinder should be clean from any contaminants and foreign materials.
- The heater should be tightened firmly on the cylinder. The rims should be gently tapped with a plastic mallet and the heater re-tightened.
- Energize the heater for a short period of time and then re-tighten the fasteners.
- To compensate for thermal expansion, large diameter heaters should have spring-loaded fasteners.
- One-piece construction heaters should be opened only slightly, and made to slide on a cylinder. Two-piece construction or flexible heaters should be used when a heater has to be fully opened.

MICA BAND HEATERS



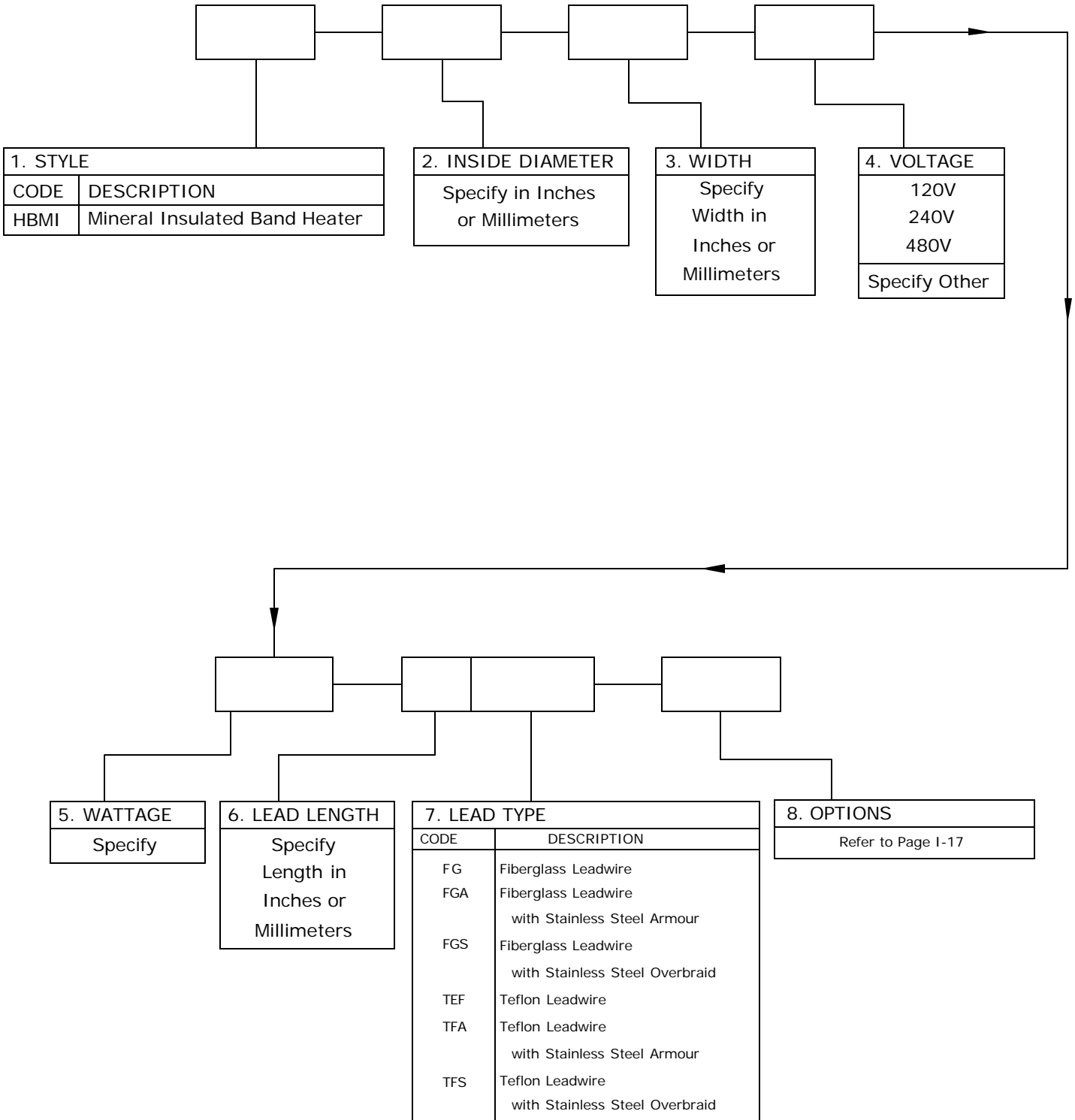
MINERAL BAND HEATERS



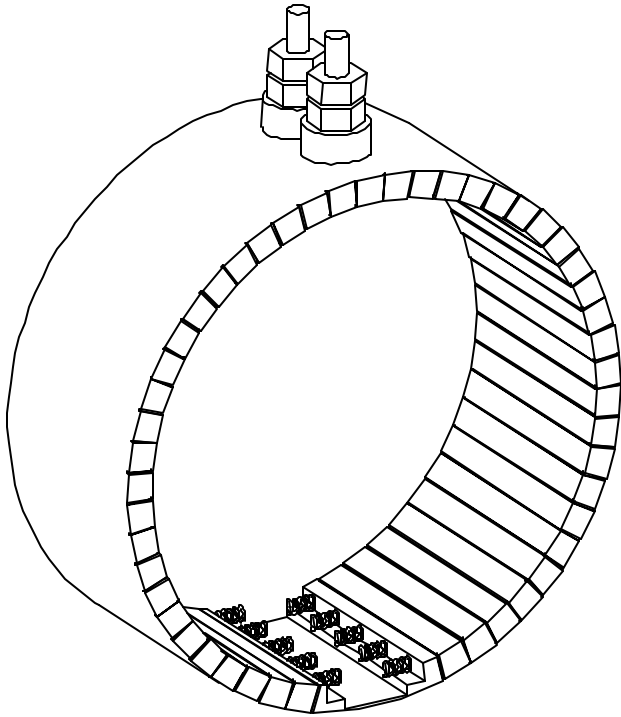
Features & Benefits

- Maximum watt densities; far in excess of any other type of band.
- Highest application temperatures available.
- Best possible clamping resulting in improved efficiency.
- Longest life available for any application and reduction of equipment downtime.
- High heat transfer rates and the resulting fast response.
- Rapid heat-up capabilities and no fear of heater failure.
- Reduced number and physical size of heaters required per application.
- Choose a Better Band when the temperature of the heater will exceed 650°F (343°C).
- Expandable or two-piece construction.

MINERAL INSULATED BAND HEATERS



CERAMIC INSULATED BAND HEATERS



Megaflex ceramic heaters are medium-to-high temperature heaters that have 1200° F as a maximum working temperature. These durable heaters have built-in ceramic fiber jackets that make them energy efficient. Megaflex heaters are available with different terminal styles, are fully flexible, and can accommodate holes and cut-outs.

In a Megaflex heater, nickel-chrome wire is embedded in a flexible outer wall made of special, interlocking ceramic tiles, which are assembled like a brick wall. A ceramic fibre insulating mat and a stainless steel jacket cover

this assembly. This construction prevents heat loss and reduces electrical consumption by 20 %. An energized Megaflex heater will have a temperature of 350° - 450° F on its outside shell when the inside temperature is maintained at 1200° F. To improve the conservation of energy, different thicknesses of ceramic fibre insulation mats are available. Heat is transferred from a ceramic heater to the surface of an application through conduction and radiation. This is why a tight grip on the cylinder is not as critical as in other types of heaters. Moreover, overtightening should be avoided, since the pressure on the insulation mat reduces its insulating efficiency. Megaflex heaters are made by using different combinations of ceramic tiles, which are available only in specific lengths. Consequently, the width of a Megaflex band falls within a certain incremental range. Megaflex ceramic band heaters can be manufactured with different clamping mechanisms, termination styles, holes and cut-outs.

CERAMIC INSULATED BAND HEATERS

Special Construction

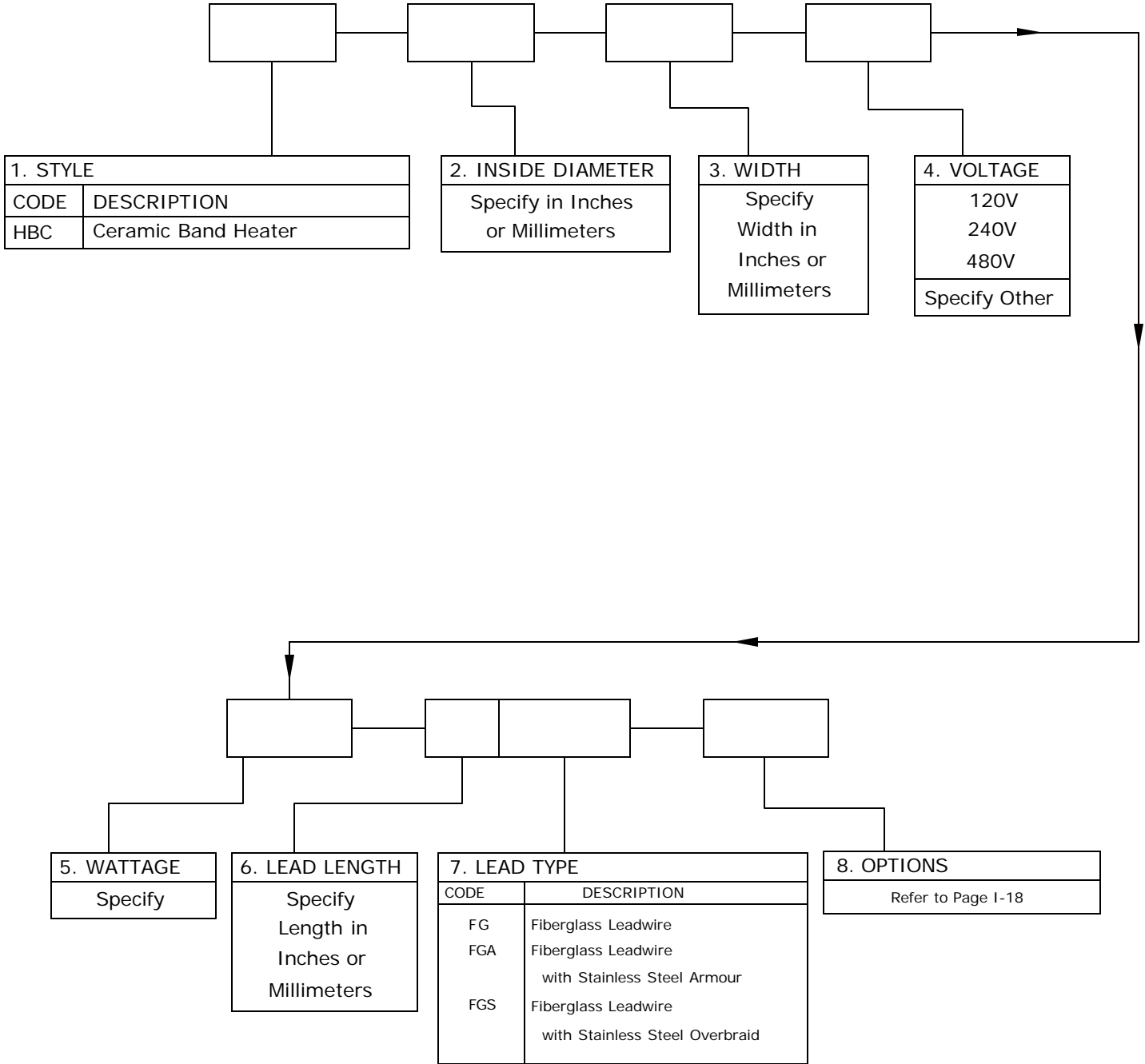
Megaflex ceramic heaters can be combined with high velocity fans to form fast responding heat-cool units in accurate heating applications. These heaters are made with a perforated outside stainless steel sheath, and with no insulating jacket.

Selection Tips

SPECIFICATIONS	
Min Diameter	2"
Min Width	1"
Thickness with 1/4" insulation	5/8"
Standard Gap	3/8"
Max Watt Density	45 W/in ²

- The current amperage limitation for lead wire exiting directly from a heater is 10 amps.
- For higher than 10 amp applications, lead wires should be combined with a terminal box.
- European plugs are adequate for 16 amps.
- to have a balanced internal winding, it is recommended to locate the terminals at 180° with respect to the gap.
- Ceramic covers could be added to provide safety to exposed terminals.

CERAMIC BAND HEATERS



BAND HEATERS (OPTIONS)

TABLE 8 - MICA AND MINERAL BAND HEATER OPTIONS	
CODE	DESCRIPTION
LEADWIRE TERMINATIONS	
C	Exit either side of the gap on thickness
C1	90 Degree exit with cap and tube near gap, exiting towards opening
C2	90 Degree cap with tube near gap, tangential
C3	45 Degree exit with cap and tube near gap, exiting towards opening
C5	90 Degree exit with cap and tube opposite gap, exiting towards opening
C6	90 Degree cap with tube opposite gap, tangential
C7	45 Degree exit with cap and tube opposite gap, exiting towards opening
D	Leads exiting opposite the gap
E	Leads exit near gap
F	Leads exiting either side of the gap
I	Leads exiting opposite gap on thickness
SCREW TERMINAL TERMINATIONS	
A	Seperate on opposite sides of the gap
AV	Seperate on opposite sides of the gap with ceramic protective covers
B1	Along the width side by side
B1G	Along the width side by side with protective terminal box
B1V	Along the width side by side with ceramic protective covers
B2	Along the length side by side
B2G	Along the length side by side with protective terminal box
B2V	Along the length side by side with ceramic protective covers
PLUG TERMINATIONS	
K00	European Plug vertical with box
K3P	European Plug 3 prong with ground
K45	European Plug 45 degree with box
K90	European Plug tangential with box
CLAMPING STYLES	
BN	Barrel Nuts
CP	Clamping Pads
FL	Flange Lock-Up
IS	Independant Strap
LT	Latch and Trunion
LP	Low Profile Barrel Nuts
SB	Spring Loaded Barrel Nuts
SS	Spot Welded Straps
WL	Wedge Lock
CONSTRUCTION OPTIONS	
2P	2 Piece construction (*note: wattage indicated in box 5 will be total wattage)
HL	Hole (indicate inside diameter / location)
TC	Built in Thermocouple (specify calibration)

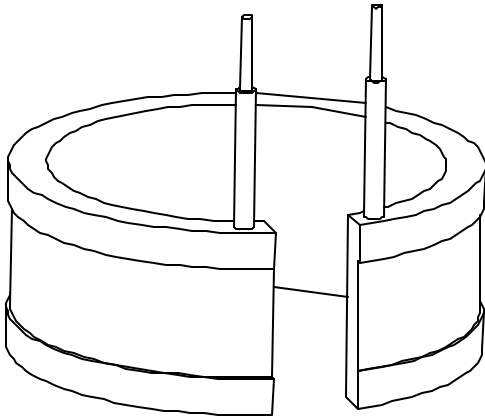
BAND HEATERS (OPTIONS)

TABLE 8 - CERAMIC BAND HEATER OPTIONS	
CODE	DESCRIPTION
LEADWIRE TERMINATIONS	
E	Leads exit near gap
SCREW TERMINAL TERMINATIONS	
A	Seperate on opposite sides of the gap
AV	Seperate on opposite sides of the gap with ceramic protective covers
B1	Along the width side by side
B1G	Along the width side by side with protective terminal box
B1V	Along the width side by side with ceramic protective covers
B2	Along the length side by side
B2G	Along the length side by side with protective terminal box
B2V	Along the length side by side with ceramic protective covers
PLUG TERMINATIONS	
K00	European Plug vertical with box
K90	European Plug tangential with box
CLAMPING STYLES	
BN	Barrel Nuts
FL	Flange Lock-Up
LT	Latch and Trunion
CONSTRUCTION OPTIONS	
2P	2 Piece construction (*note: wattage indicated in box 5 will be total wattage)
HL	Hole (indicate inside diameter / location)
TC	Built in Thermocouple (specify calibration)

BAND HEATERS (OPTIONS)

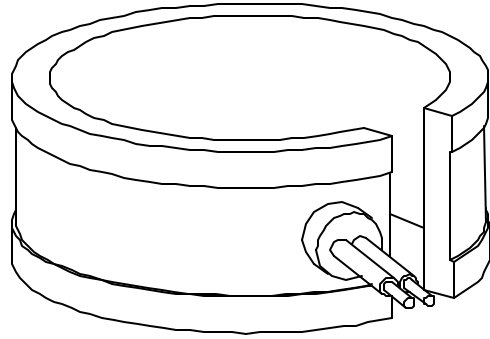
LEADS NEAR GAP

Code: C



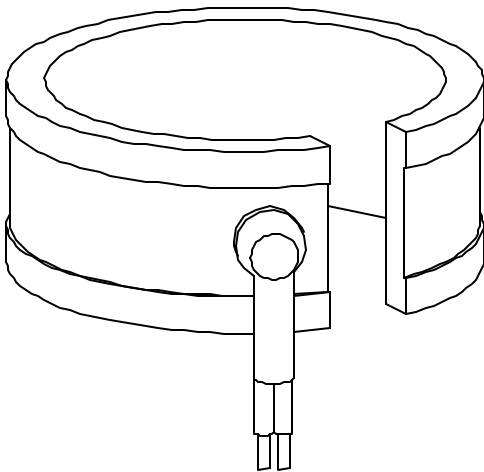
LEADS NEAR GAP (B)

Code: E



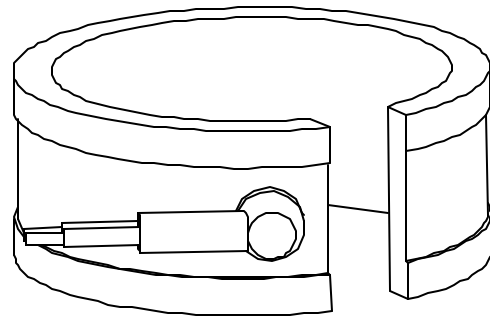
LEADS W/ CAP NEAR GAP

Code: C1



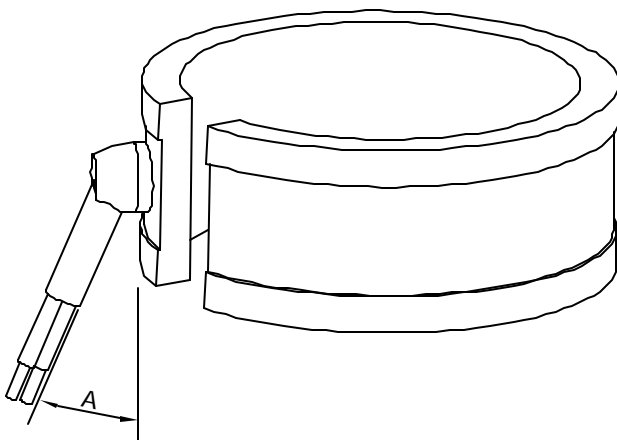
LEADS W/ 90° CAP NEAR GAP

Code: C2



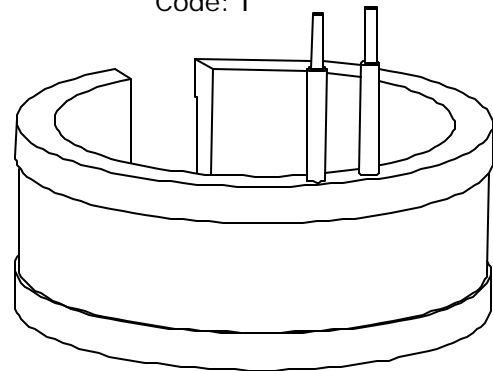
LEADS W/ CAP AT ANGLE

Code: C3



LEADS OPP. GAP

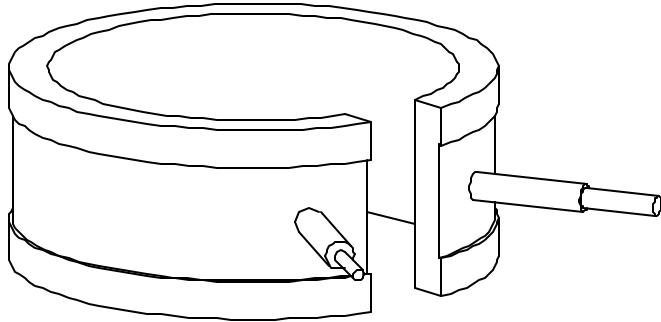
Code: I



BAND HEATERS (OPTIONS)

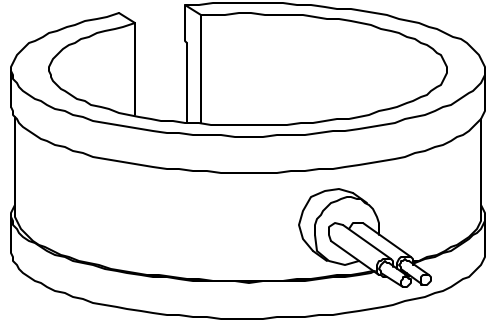
LEADS ON BOTH SIDES OF GAP

Code: F



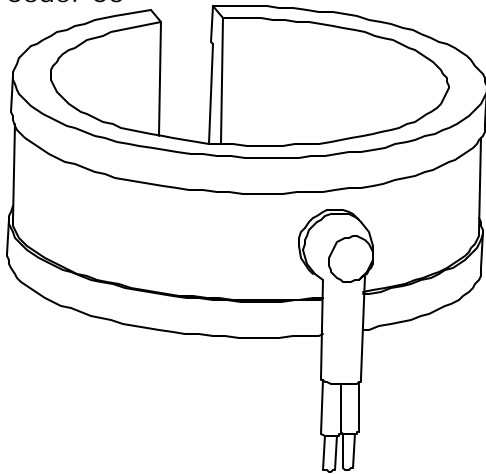
LEADS OPP. GAP

Code: D



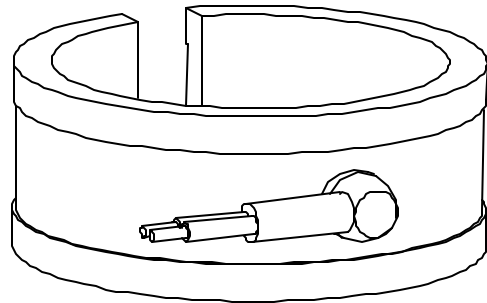
LEADS W/ CAP OPP. GAP

Code: C5



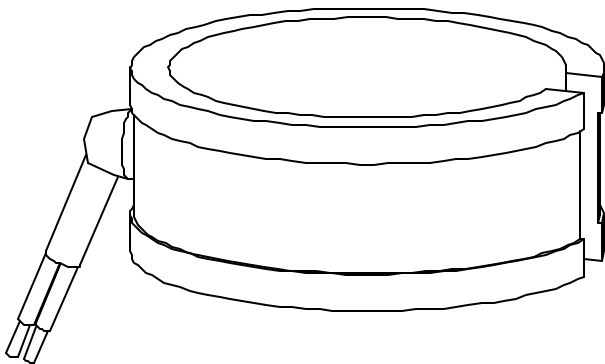
LEADS W/ 90° CAP OPP. GAP

Code: C6



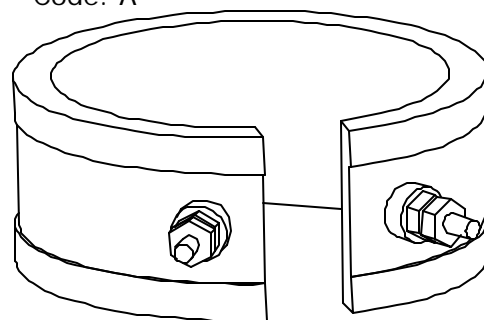
LEADS W/ CAPP OPP. GAP AT ANGLE

Code: C7



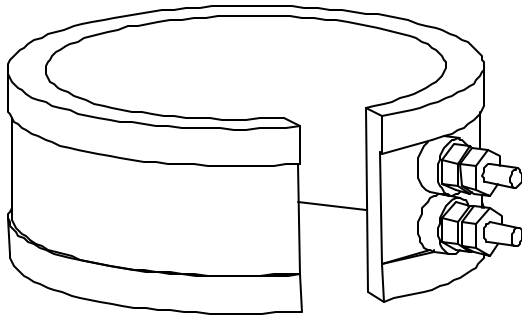
SCREW TERMINALS (A)

Code: A

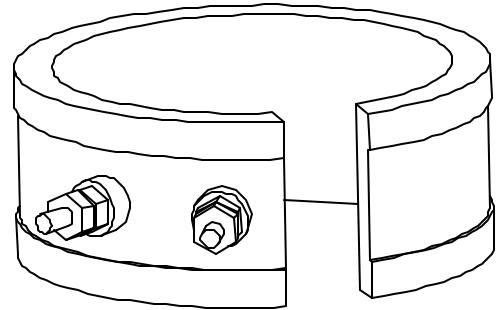


BAND HEATERS (OPTIONS)

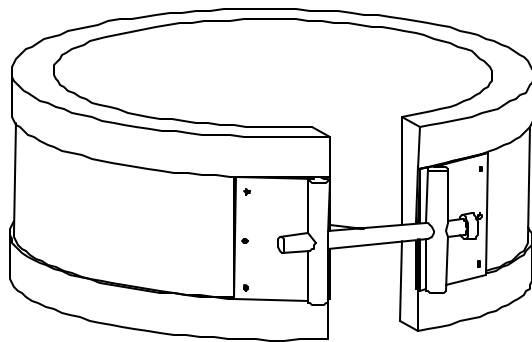
SCREW TERMINALS (C)
Code: B1



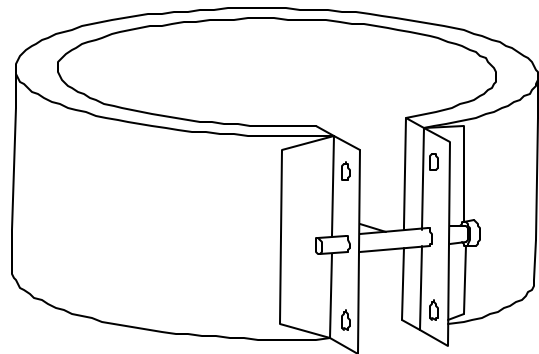
SCREW TERMINALS (B)
Code: B2



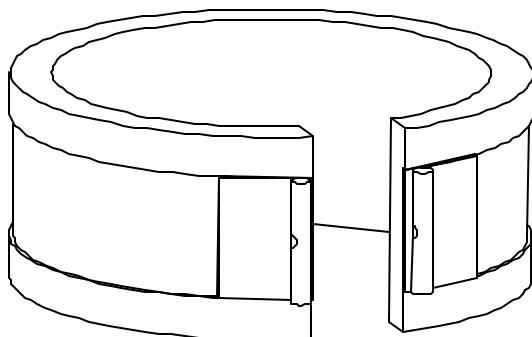
INDEPENDENT STRAP
Code: IS



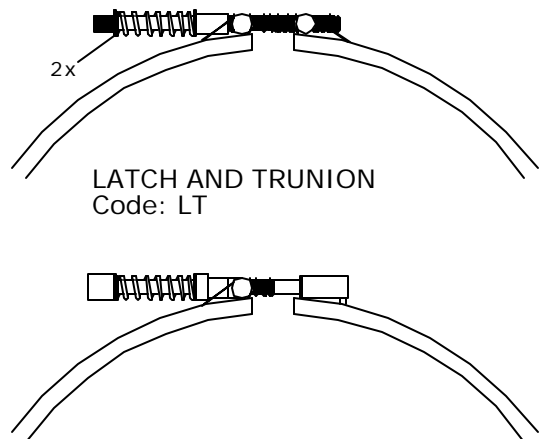
FLANGE
Code: FL



SPOT WELDED STRAPS
Code: SS



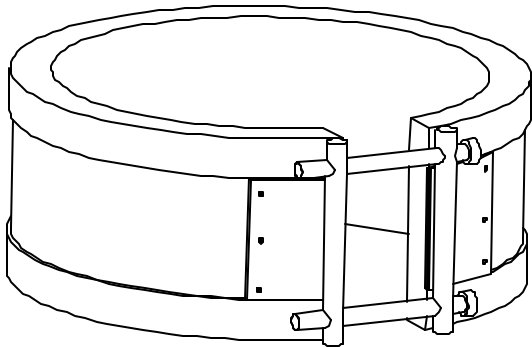
SPRING-LOADED BARREL NUTS
Code: SB



BAND HEATERS (OPTIONS)

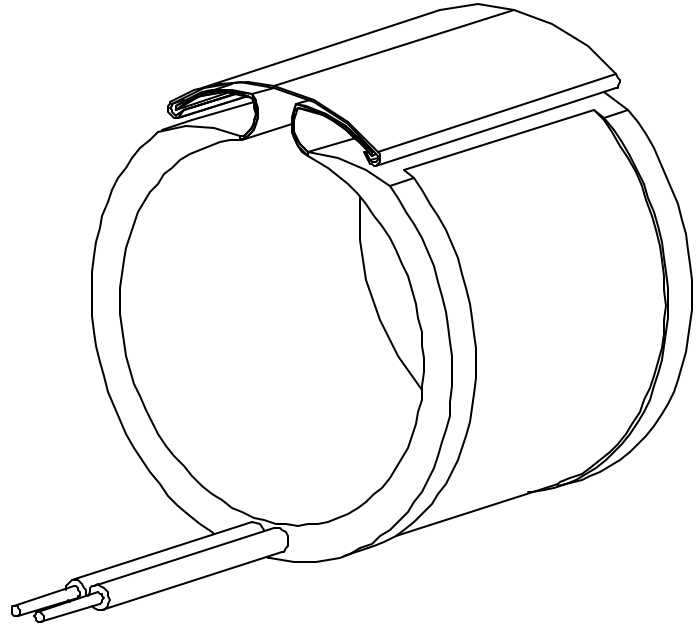
BUILT IN BARREL NUTS

Code: BN



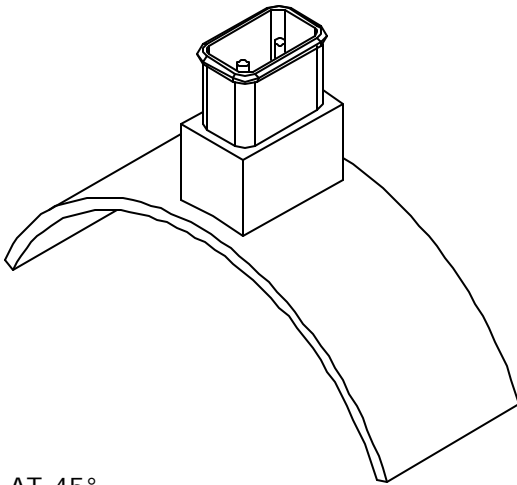
WEDGE-LOCK

Code: WL



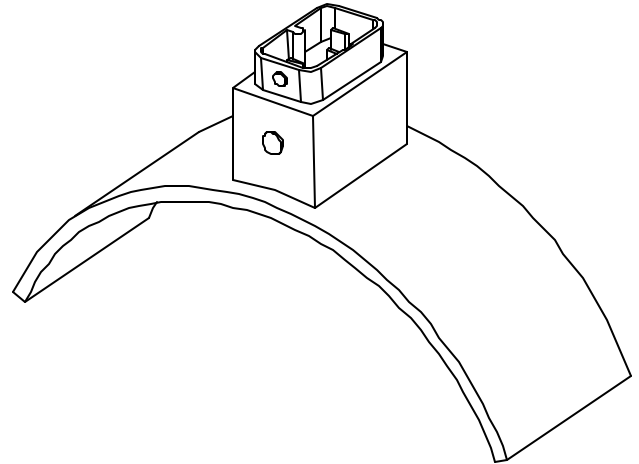
VERTICAL WITH BOX

Code: K00



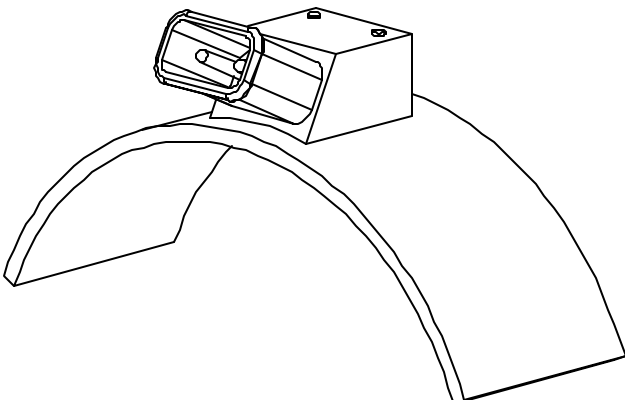
3 PRONG WITH GROUND

Code: K3P



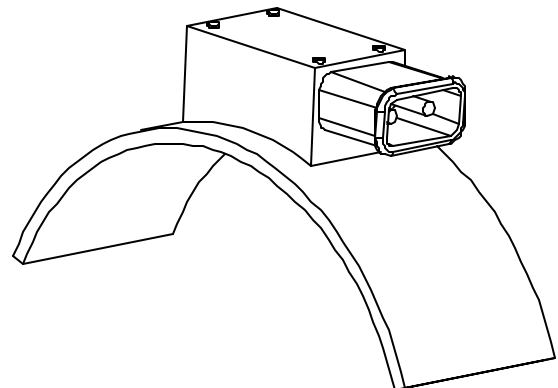
AT 45°

Code: K45



TANGENTIAL WITH BOX

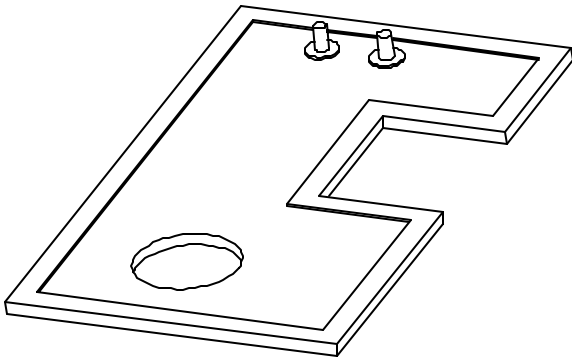
Code: K90



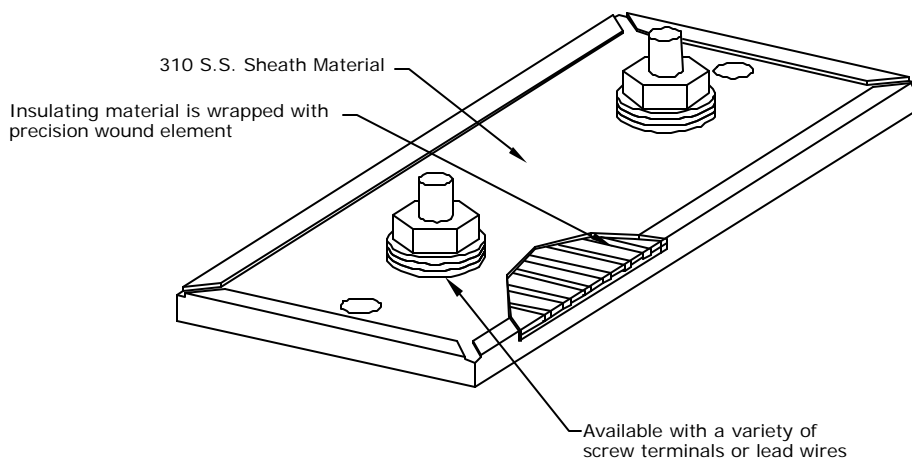
MICA STRIP HEATERS

Megaplate mica insulated strip heaters are economical heat sources, suitable for providing heat to flat surfaces. The sheath temperature limitation is 900° F. These heaters can be made to include pressure plates that improve uniformity and heat transfer. Megaplate heaters are available in many electrical termination styles, and can accommodate holes and cut-outs.

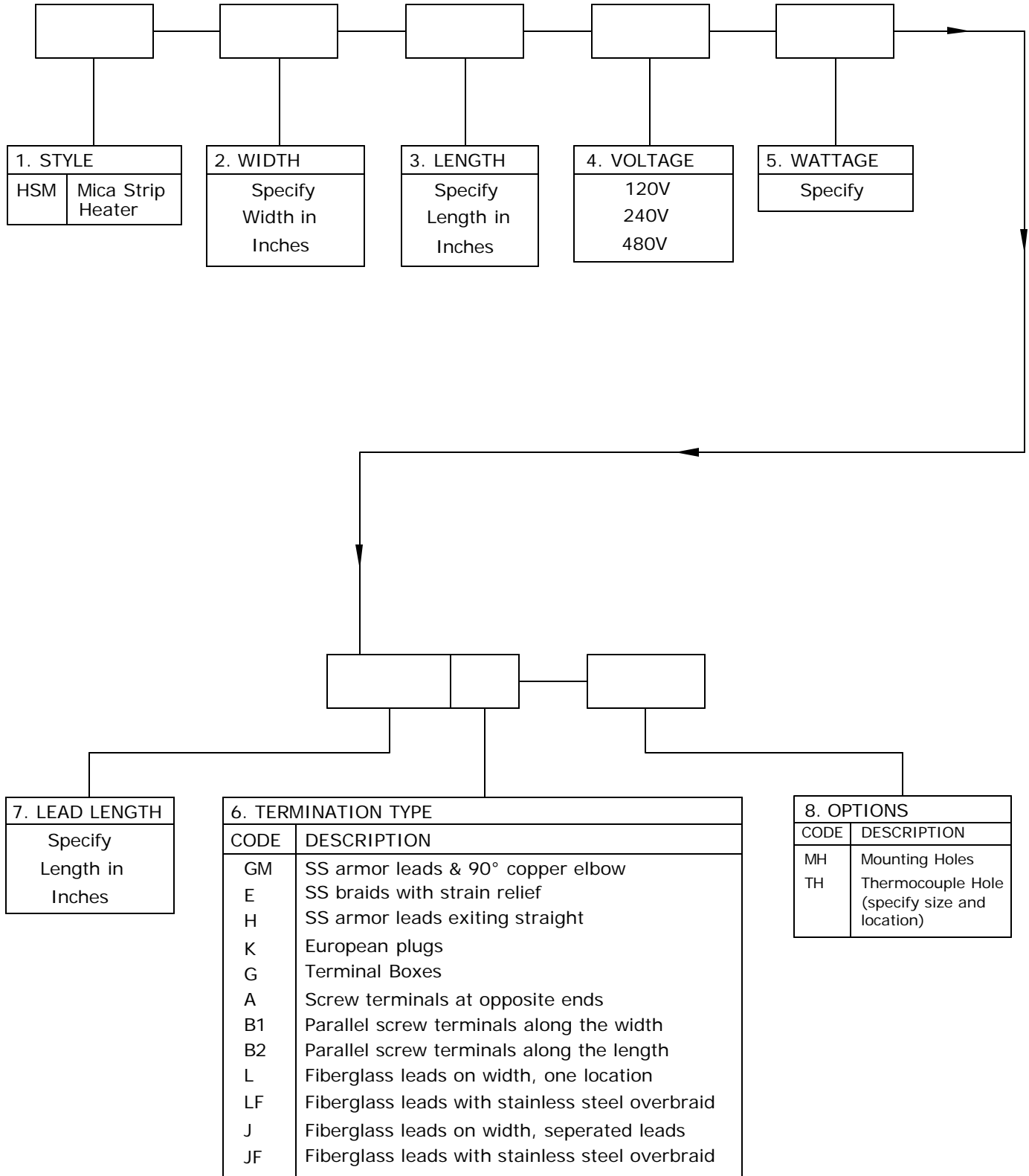
Megaplate mica insulated strip heaters utilize the finest quality muscovite and phlogobite mica, different high-grade alloys of resistance wire, and stainless steel sheathes. The proper components are selected and the heater is designed according to the requirements of each application.



Mounting slots, holes and cutouts can be incorporated into the design of the strip heaters without compromising watt density and heater performance. However, there are design limitations to be considered and the factory should be consulted prior to placing any orders.



MICA STRIP HEATERS



MINERAL STRIP HEATERS

Mineral Insulated Strip Heaters

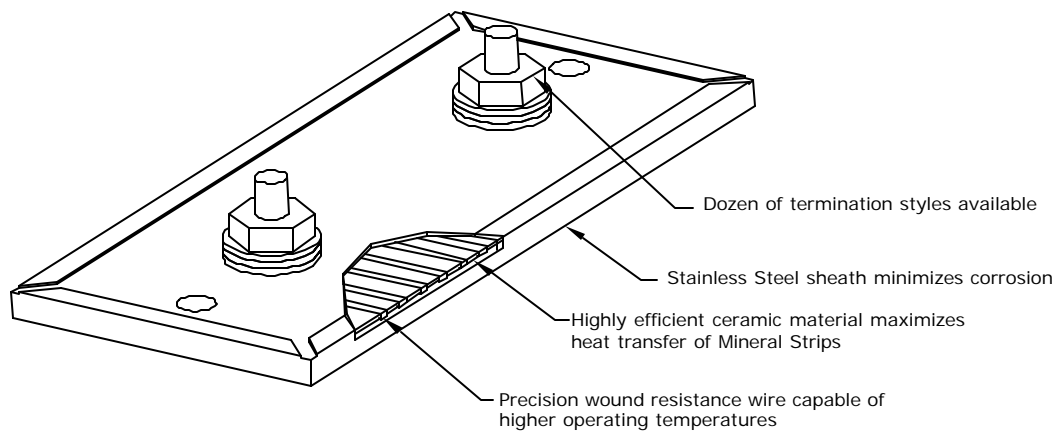
Strips are designed to provide longer life at higher watt densities and operating temperatures than the standard Mica Strip Heater. Its ceramic insulation provides for minimal air gaps and superior heat transfer efficiency. Mineral strips can withstand sheath temperatures of up to 1400°F (760°C). Mineral strips can meet U.L./C.S.A approval.

Applications

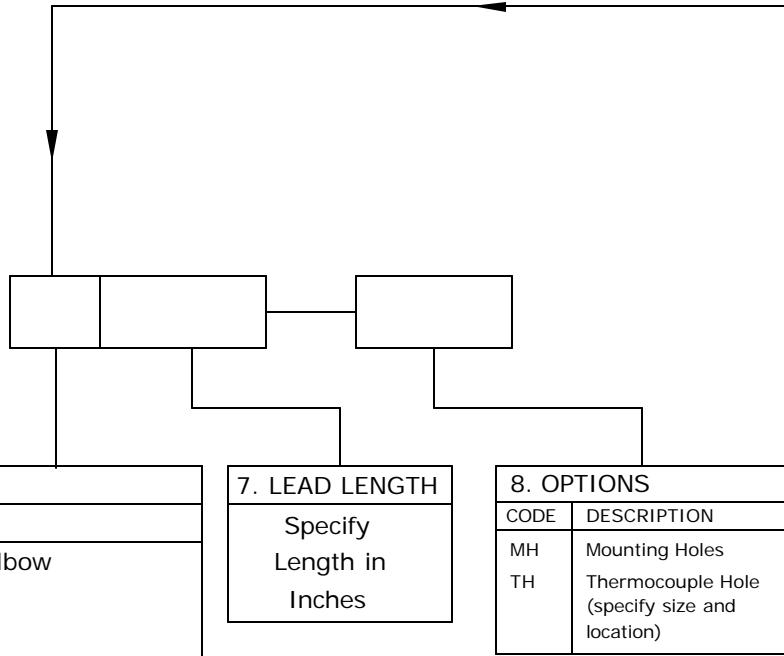
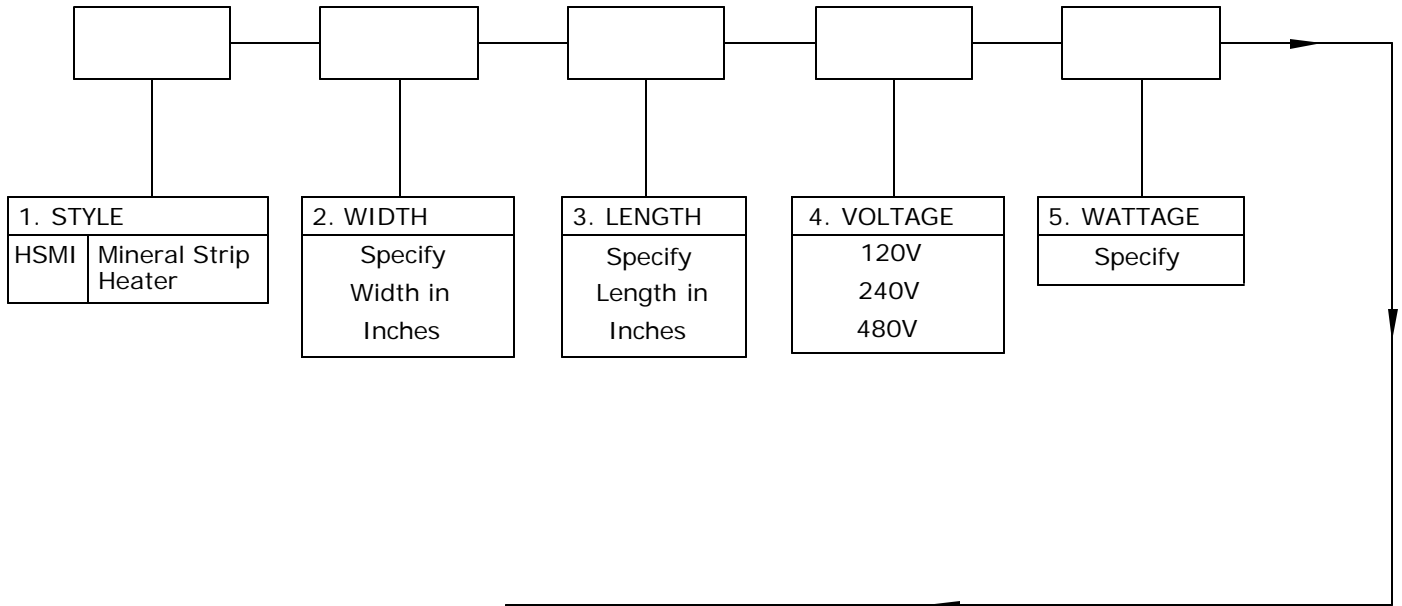
Mineral strip's ability to withstand extremely high temperatures makes it the best choice for many applications, including compression molding, heating of extrusion dies, sealing bars and food processing.

Features and Benefits

- Maximum watt densities; far in excess of other style strips.
- Highest application temperatures available.
- Longest life available and the resulting reduction of equipment downtime.
- High heat transfer rates and fast heat-up.
- Reduced number and physical size of heaters for many applications.



MINERAL STRIP HEATERS



CERAMIC STRIP HEATERS

Ceramic Strip Heaters

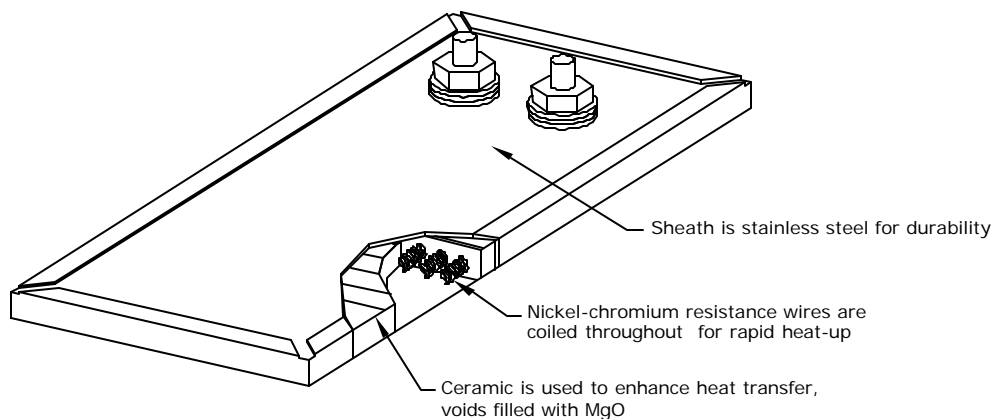
A Ceramic Strip Heater provides the ability to withstand higher temperatures (typically limited to 40 to 45 watts per square inch, depending on the application). The heater consists of a stainless steel sheath containing a high-temperature ceramic insulating a nickel chrome wire coil. Warranty coverage up to 480 Volts. Ceramic Strips can meet U.L./C.S.A. approval.

Applications

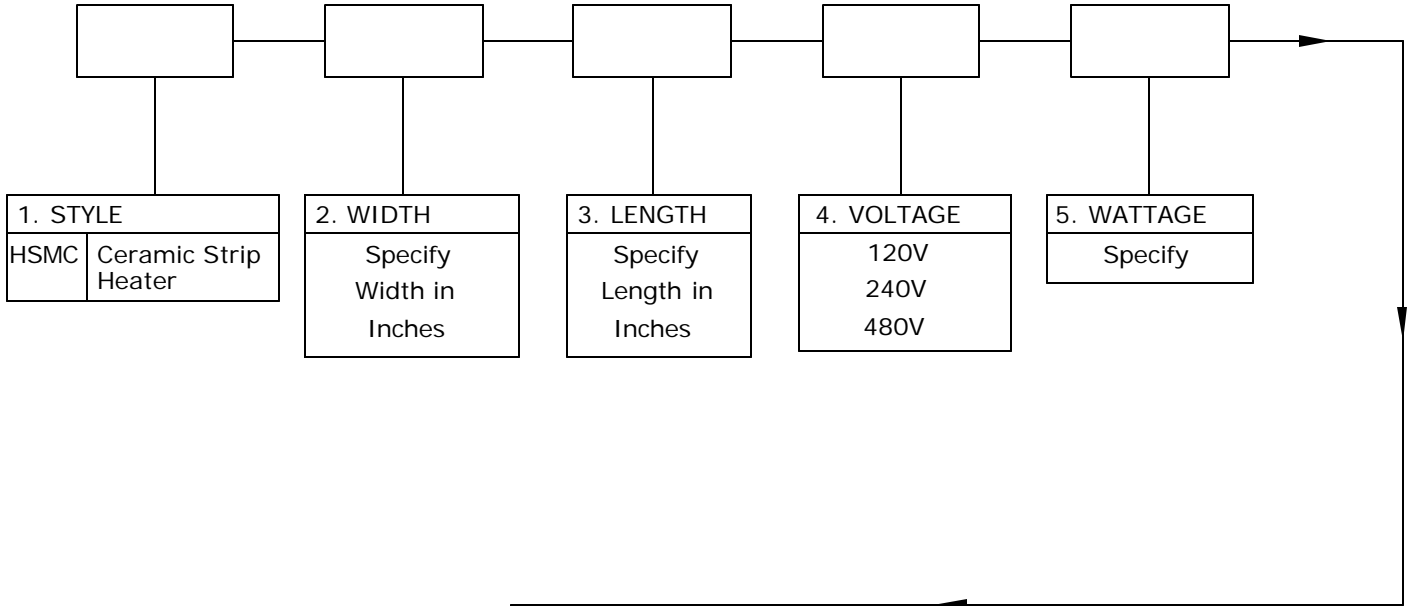
Our Ceramic Strip heaters provide a dependable, versatile and efficient heat source for a wide range of applications, such as heating air, injection and extrusion dies, food tables and platens.

Features and Benefits

- Low expansion characteristics minimize movement away from block on applications not utilizing full clamping plate.
- Long life and the resulting reduction of downtime.
- High heat transfer rates and rapid heat-up.
- Reduces number and physical size of heaters for many applications.
- 3-phase available.
- Distributed wattage available.



CERAMIC STRIP HEATERS



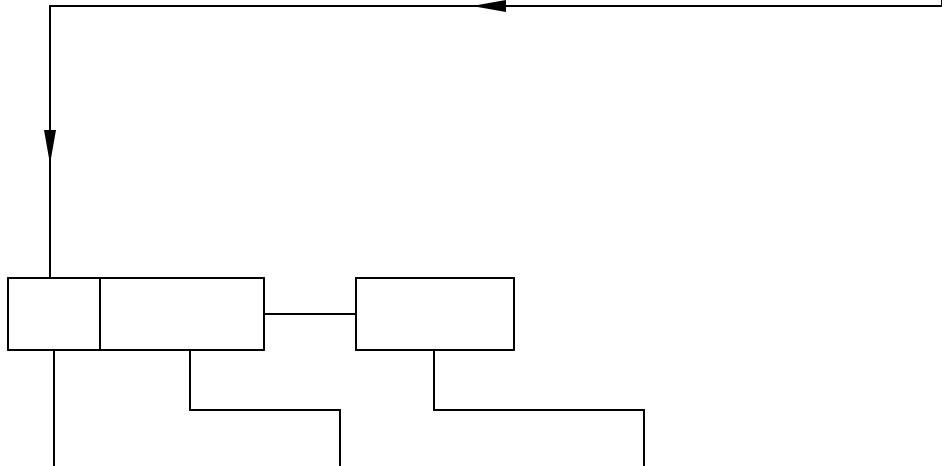
1. STYLE	
HSMC	Ceramic Strip Heater

2. WIDTH
Specify Width in Inches

3. LENGTH
Specify Length in Inches

4. VOLTAGE
120V
240V
480V

5. WATTAGE
Specify



6. TERMINATION TYPE	
CODE	DESCRIPTION
GM	SS armor leads & 90° copper elbow
E	SS braids with strain relief
H	SS armor leads exiting straight
K	European plugs
G	Terminal Boxes
A	Screw terminals at opposite ends
B1	Parallel screw terminals along the width
B2	Parallel screw terminals along the length
L	Fiberglass leads on width, one location
LF	Fiberglass leads with stainless steel overbraid
J	Fiberglass leads on width, seperated leads
JF	Fiberglass leads with stainless steel overbraid

7. LEAD LENGTH
Specify Length in Inches

8. OPTIONS	
CODE	DESCRIPTION
MH	Mounting Holes
TH	Thermocouple Hole (specify size and location)

TUBULAR STRIP HEATERS

Tubular Strip Heaters

Our Tubular Strip Heater uses a reliable tubular heating element encased in a stainless steel sheath. Designed to withstand most corrosive and high temperature environments (up to 1200°F/648°C), the strip's performance is above and beyond the norm.

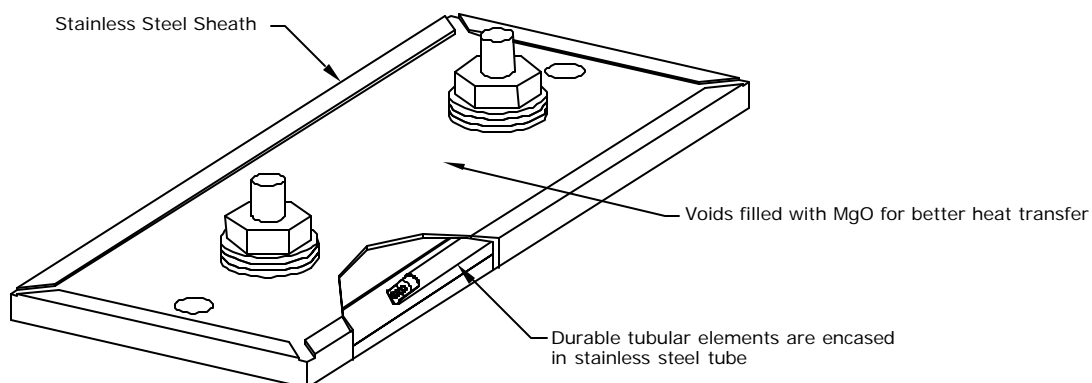
Heavy duty stainless steel sheath and welded stainless steel end caps of the heater eliminate distortion and deformation problems often associated with other strip heaters when operating at higher temperatures.

Applications

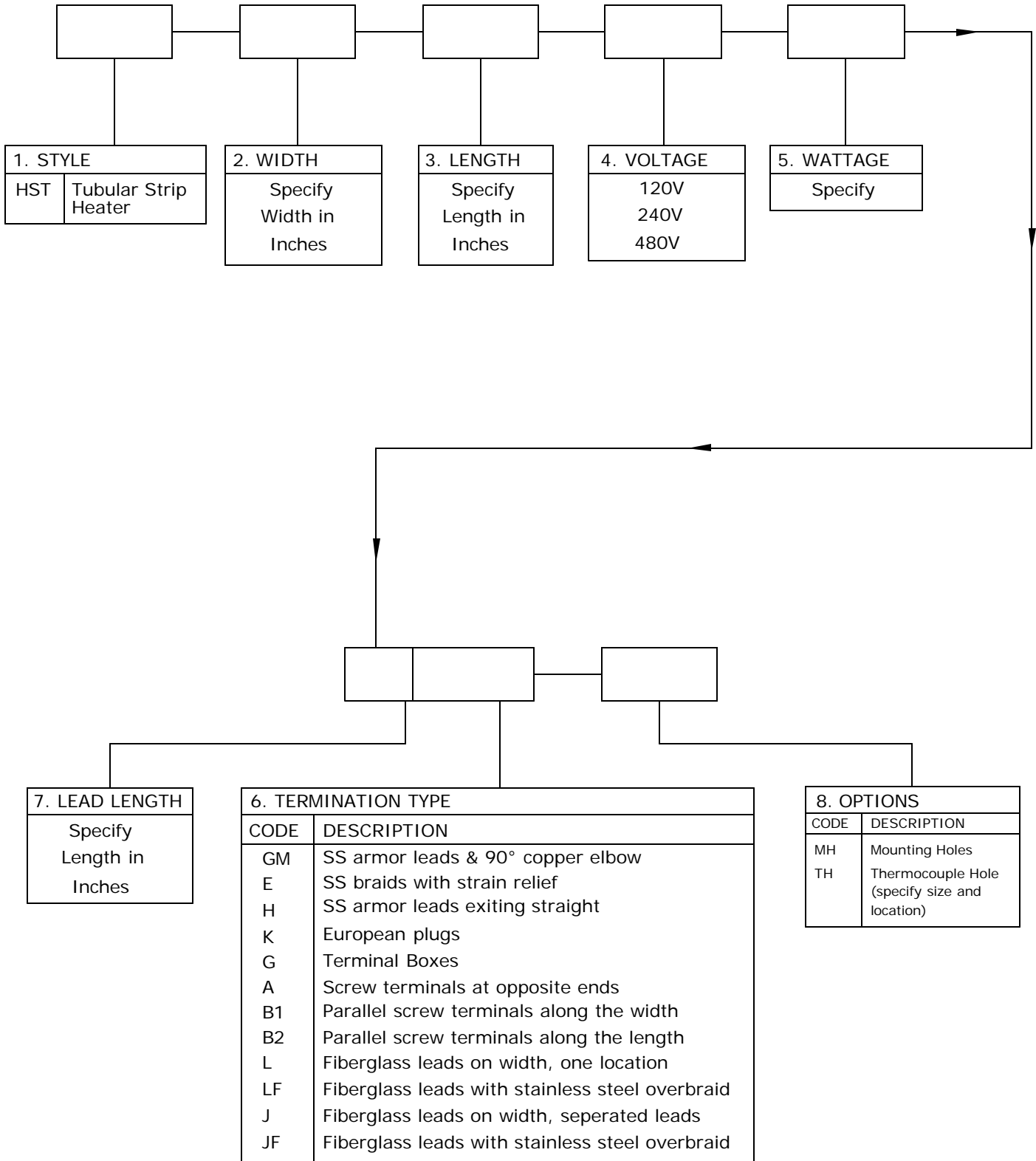
Choose the Tubular Strip Heater for higher temperature applications in which contamination is a problem. Common applications include chemical processing, heating extrusion dies, tin melting and food processing.

Features and Benefits

- Low expansion characteristics minimize movement away from block on applications not utilizing full clamping plate.
- Long life and the resulting reduction of equipment downtime.
- High heat transfer rates and fast heat-up.
- Reduces number and physical size of heaters for many applications.

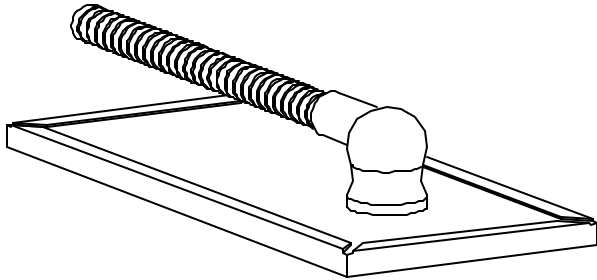


TUBULAR STRIP HEATERS

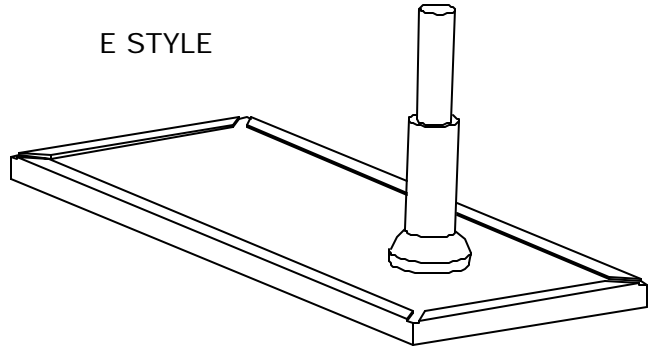


STRIP HEATERS OPTIONS

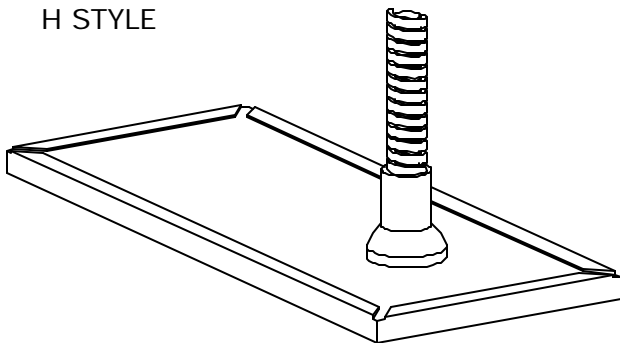
GM STYLE



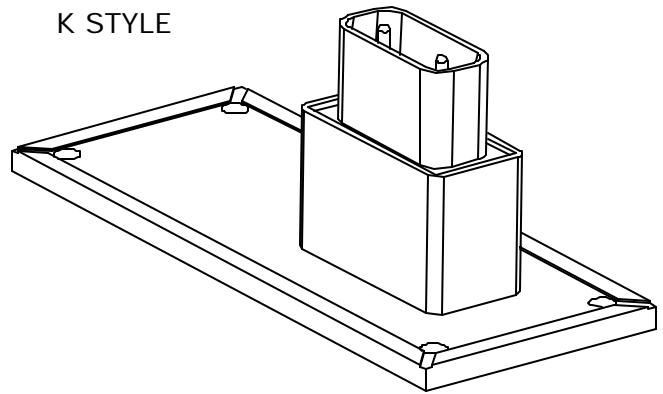
E STYLE



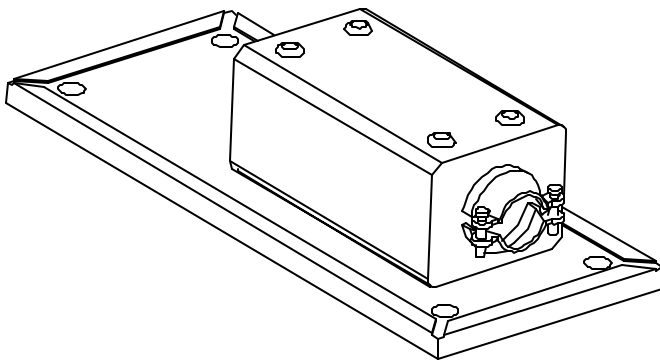
H STYLE



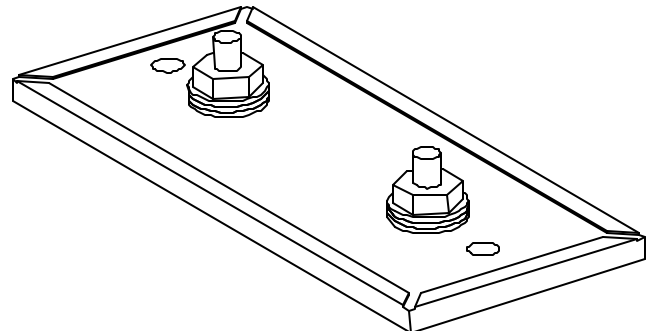
K STYLE



G STYLE

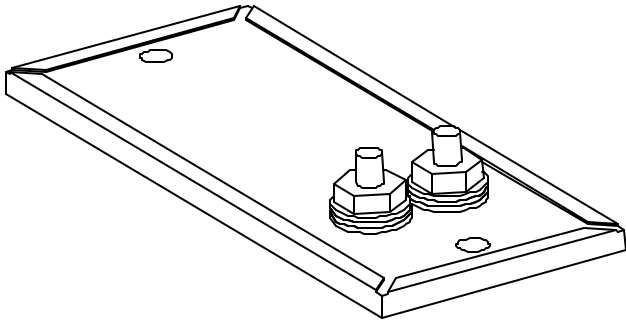


A STYLE

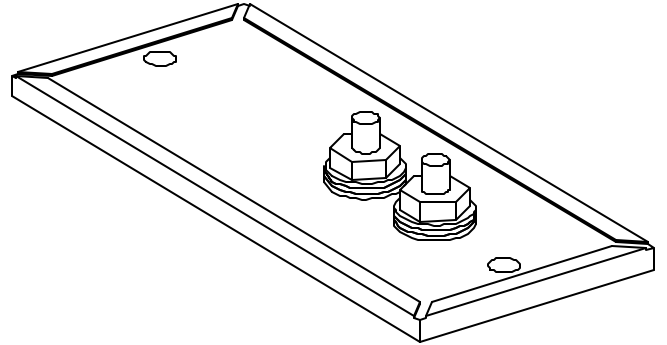


STRIP HEATERS OPTIONS

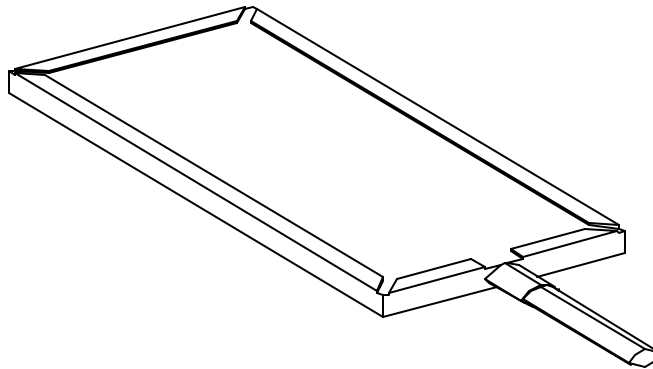
B1 STYLE



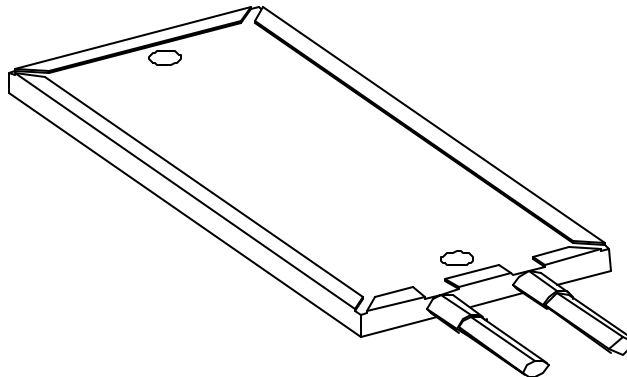
B2 STYLE



L & LF STYLES



J & JF STYLES



COIL & CABLE HIGH PERFORMANCE HEATERS

Highwat coil and cable heaters are reliable, high performance small diameter heaters used whenever a large amount of heat is required in a confined space. These heaters are fully annealed and can be formed into various shapes and forms. Coil and cable heaters can accommodate thermocouple sensors, and their cross-section could be made square or rectangular to improve heat transfer. Highwat coil heaters are successfully used as powerful heating cells in plastic injection molding hot-runner nozzles.

Coil and cable heaters are made by placing a pair of tiny coils or two lines of straight resistance wire inside a very dense MgO medium. This core is then inserted into a stainless steel shell. These high-performance heating cells can acquire temperatures of up to 1500° F. A coil heater in its unformed straight stage can have a maximum length of 6ft and its cross-section can be square or rectangular, while a cable heater can be 300ft long and is available in round cross sections. Thermocouple sensors could be installed internally at the tip or the middle of a heater. Power terminals, as well as ground and thermocouple wires are attached to the internal wires inside a transition adapter, which has a larger diameter than the actual heater's cross-sectional diameter. Although Highwat coil and cable heaters are fully annealed and can acquire any shape, they should be formed to a final shape in a single attempt. Forming and bending operations harden the outside stainless shell of a heater, and re-annealing might become necessary if changing the form is required. The wattage in a coiled heater could be distributed, with higher wattage at the two ends, simply by stretching and distancing apart the middle loops.

COIL & CABLE HIGH PERFORMANCE HEATERS

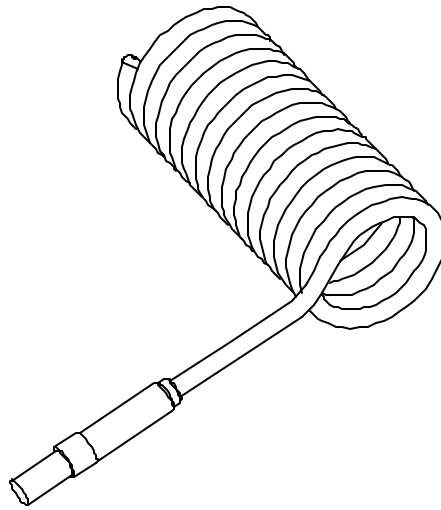
Installation Tips

- The inside diameter of a coil heater is 0.020" smaller than the nominal diameter of a nozzle. This is done intentionally to secure a positive grip at all times. During installation, a coil heater should be screwed to its proper position. Pushing forcefully or slightly opening the coil to facilitate installation could permanently damage the heater.
- During installation, only the straight cold section could be slightly bent. This should be done in a single attempt. The bending radius shouldn't be less than 0.5". It is always recommended to contact our factory when modifications of form are required.
- The straight cold section can withstand temperatures of up to 1500° F. However, to protect the lead wires, the temperature of the section beyond the transition adapter should be maintained below 480° F.
- Usually the sensing tip of a thermocouple is located at the end of the last loop of a coil heater. Care should be taken to insure that the last loop is properly gripping the nozzle.

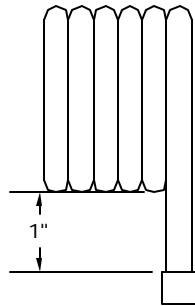
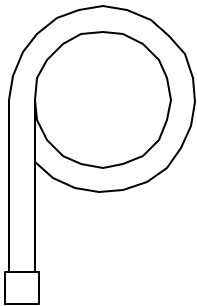
Available Coil Heaters

PART NUMBER	OEM EQ #	ID (IN)	LENGTH (IN)	WATTS	VOLTS	LEAD LENGTH AND TYPE	GROUND (IN)	COLD LEAD	TYPE J T/C	PROFILED HEAT
BK51492	SSTC-62.90	0.5	1.45	250	240	36" FLEX HOSE	Y	2	Y	Y
BK51992	SSTC-72-90	0.5	1.95	250	240	36" FLEX HOSE	Y	2	Y	Y
BK52502	SSTC-42	0.5	2.5	450	240	48" FLEX HOSE	Y	1/1	N	N
BK52592	SSTC-42-90	0.5	2.5	450	240	48" FLEX HOSE	Y	2	N	N
BK54601	SSTC-31	0.5	4.62	300	120	48" FLEX HOSE	Y	1/1	Y	Y
BK54691	SSTC-31-90	0.5	4.62	300	120	48" FLEX HOSE	Y	2	Y	Y
BK54602	SSTC-32	0.5	4.62	300	240	48" FLEX HOSE	Y	1/1	Y	Y
BK54692	SSTC-32-90	0.5	4.62	300	240	48" FLEX HOSE	Y	2	Y	Y
BK60902	SCH0003	0.5	2.5	450	240	42" SS BRAID	Y	2	Y	Y
BK62002	SCH0081	0.5	2.5	450	240	48" SS BRAID	Y	2	Y	Y
BK62502	SCH0082	0.5	4.62	300	120	48" SS BRAID	Y	2	Y	Y
BK63002	SCH0083	0.5	4.62	300	120	48" SS BRAID	Y	2	Y	Y
BK63502	SCH0084	0.5	2.5	450	240	48" SS BRAID	Y	2	Y	Y
BK64002	SCH0085	0.5	2.5	450	240	48" SS BRAID	Y	2	Y	Y
BK65002	SCH0086	0.5	4.62	300	120	48" SS BRAID	Y	2	Y	Y
BK66002	SCH0087	0.5	4.62	300	120	48" SS BRAID	Y	2	Y	Y
BK71402	SCH0060	0.5	1.45	250	240	48" SS BRAID	Y	2	Y	Y
BK71702	SCH3142	0.5	1.95	250	240	48" SS BRAID	Y	2	Y	Y
BK71902	SCH0061	0.5	2.5	450	240	48" SS BRAID	Y	2	Y	Y
BK72402	SCH3242	0.5	2.5	450	240	48" SS BRAID	Y	2	Y	Y
BK72432	SCH0062	0.5	4.62	300	120	48" SS BRAID	Y	2	Y	Y
BK72902	SCH0063	0.5	4.62	300	120	48" SS BRAID	Y	2	Y	Y
BK73402	SCH0064	0.5	4.62	300	120	48" SS BRAID	Y	2	Y	Y
BK74402	SCH0065	0.5	2.5	450	240	48" SS BRAID	Y	2	Y	Y
BK75402	SCH0066	0.5	2.5	450	240	48" SS BRAID	Y	2	Y	Y
BK82102	SCH0088	0.5	4.62	300	120	48" SS BRAID	Y	2	Y	Y
BK82602	SCH0089	0.5	4.62	300	120	48" SS BRAID	Y	2	Y	Y
BK83102	SCH0090	0.5	1.45	250	240	48" SS BRAID	Y	2	Y	Y
BK83602	SCH0091	0.5	1.95	250	240	48" SS BRAID	Y	2	Y	Y
BK86102	SCH0094	0.5	2.5	450	240	48" SS BRAID	Y	2	Y	Y
BK84102	SCH0092	0.5	2.5	450	240	48" SS BRAID	Y	2	Y	Y
BK85102	SCH0093	0.5	4.62	300	120	48" SS BRAID	Y	2	Y	Y

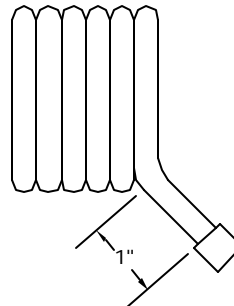
COIL HEATERS



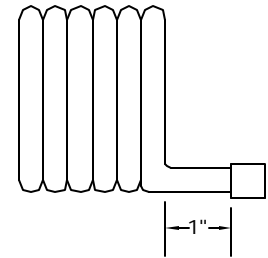
Tangential
Code: ST



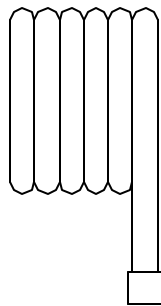
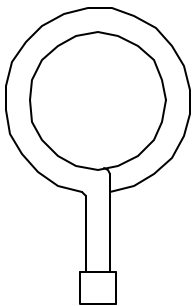
Tangential, 45° Bend
Code: 45ST



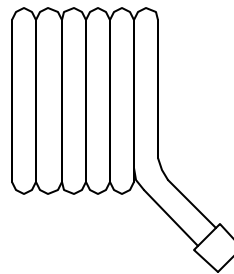
Tangential, 90° Bend
Code: 90ST



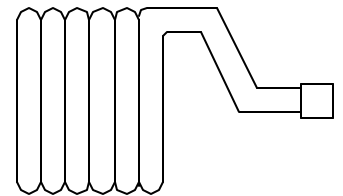
Radial
Code: LT



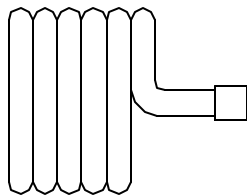
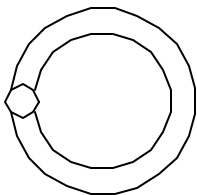
Radial, 45° Bend
Code: 45LT



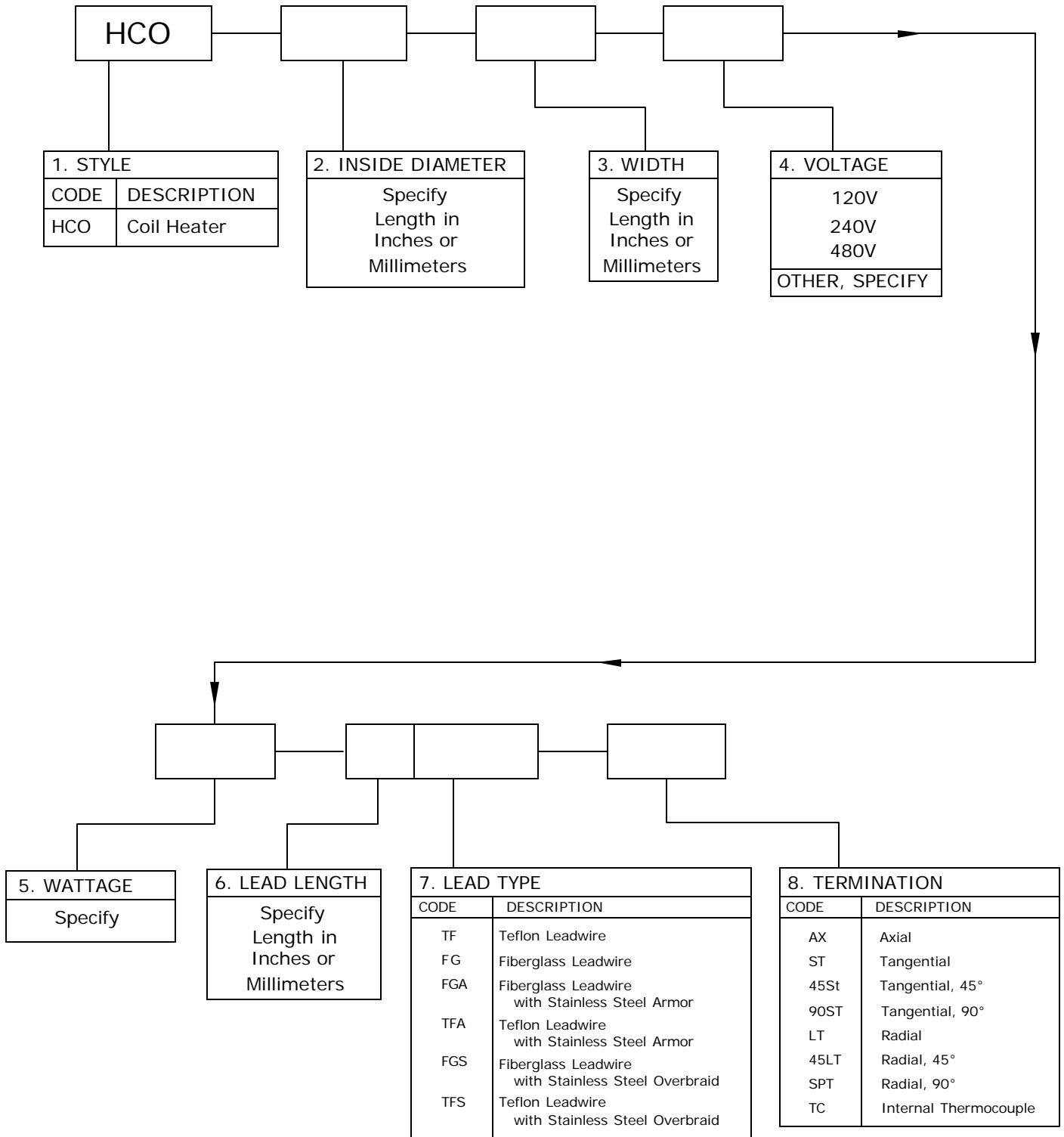
Radial 90° Bend
Code: SPT



Axial
Code: AX



COIL HEATERS



TUBULAR HEATERS

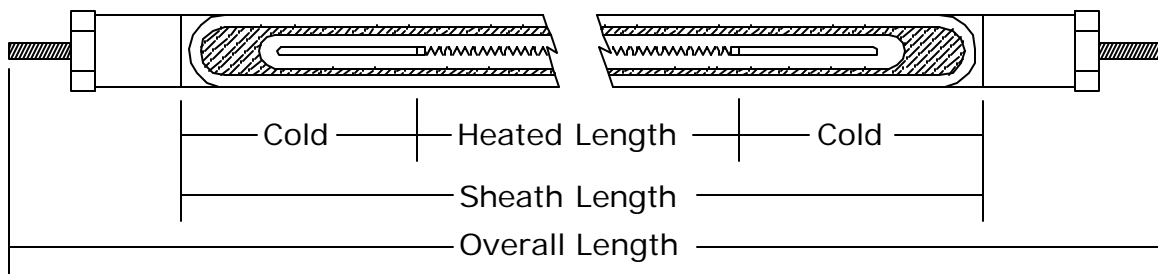
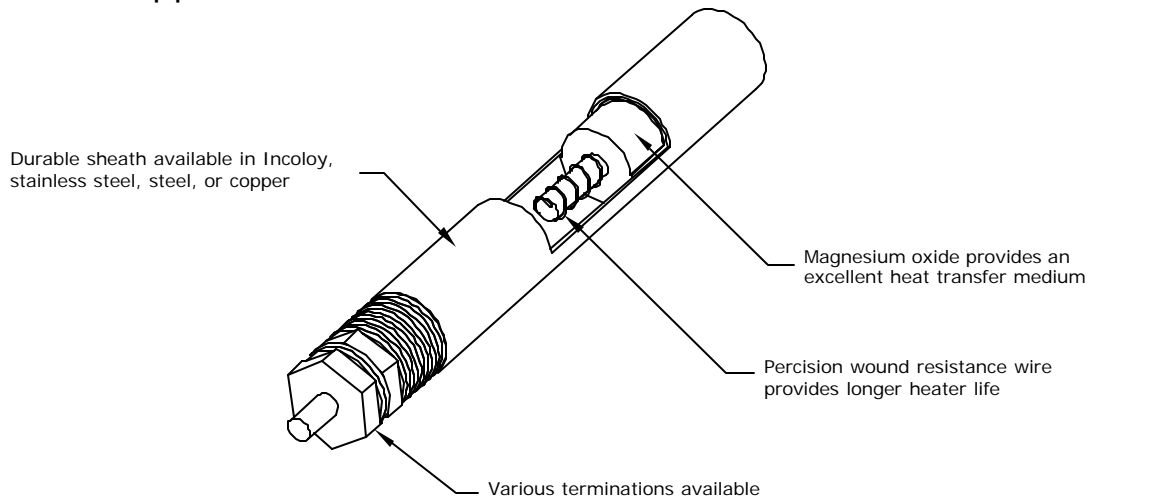
Tubular Heaters are highly adaptable to most applications where electrical heating is required. They can be used in their straight form or bent into various shapes. Tubular heaters can be used in free air, clamped to a surface, placed inside a groove or cast into metal. These versatile heating elements are available in steel, copper, stainless steel or incoloy outside sheath and can utilized in application temperatures of up to 1400°F.

Copper Sheath: Water heating, water solutions non-corrosive to copper.

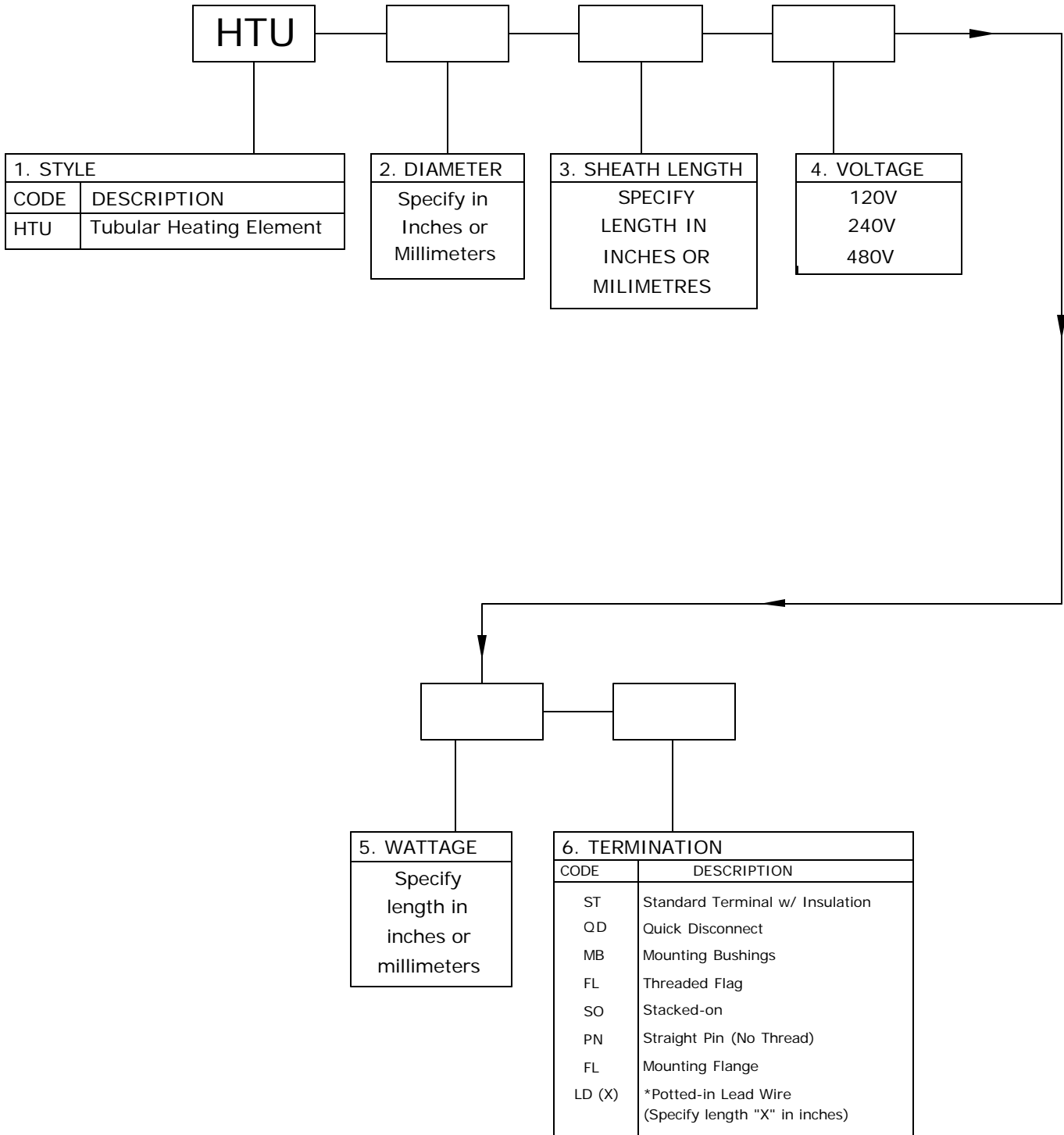
Steel Sheath: Immersion in oils, alkaline cleaning solutions, tars and asphalt. Also suitable for clamping to metal surfaces and casting into aluminum.

Stainless Steel Sheath: Corrosive liquids, food processing equipment.

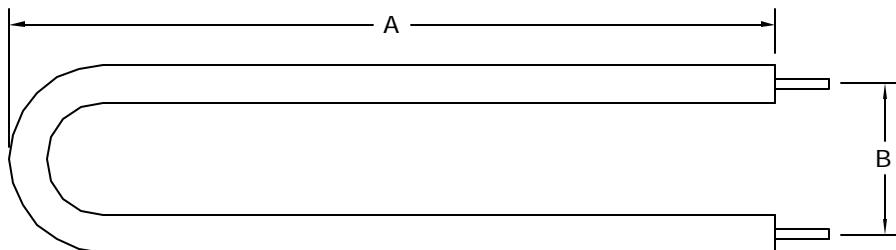
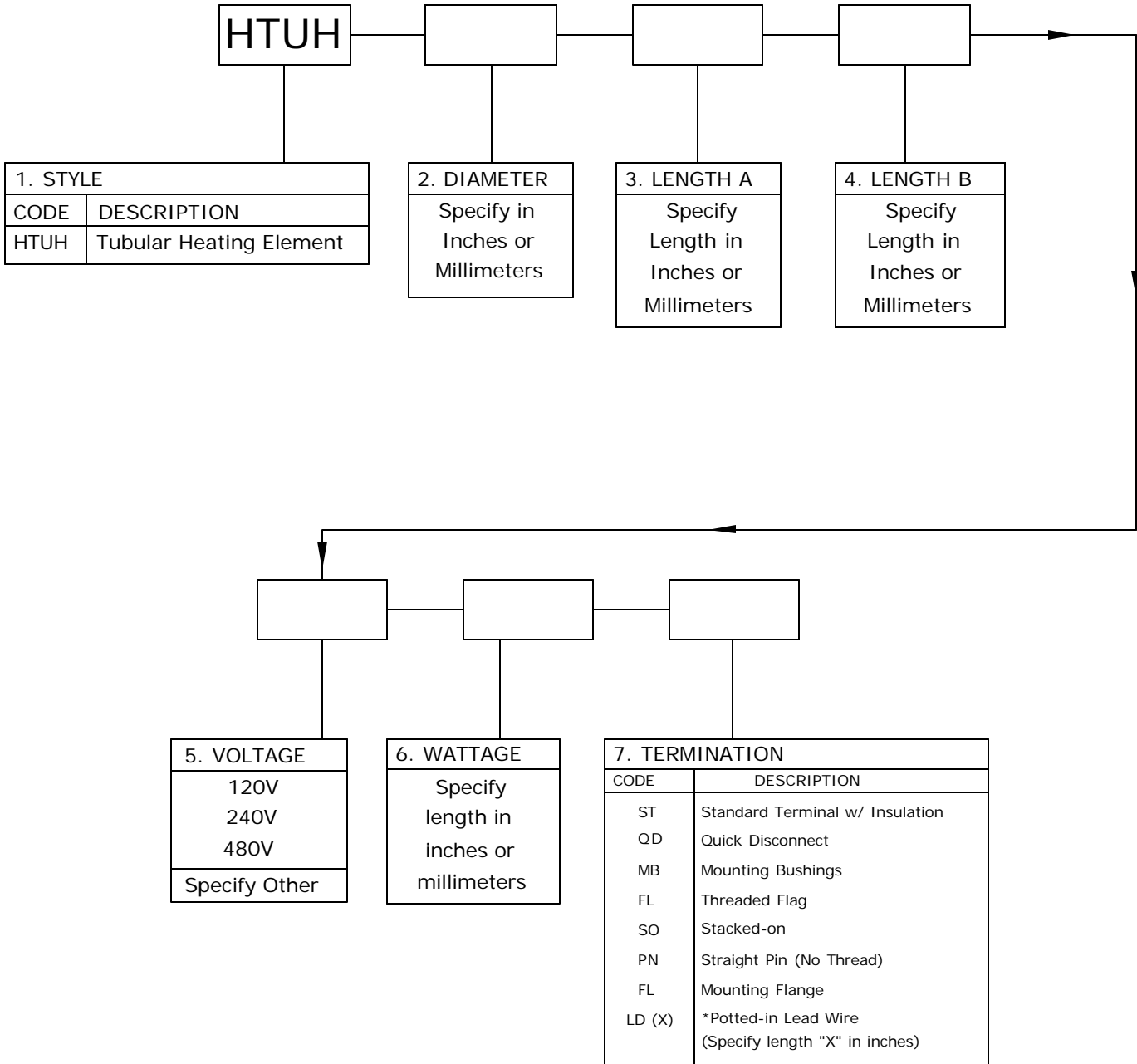
Incoloy Sheath: Air heating, radiant heating, cleaning and degreasing solutions, plating and pickling solutions, corrosive liquids. temperature applications.



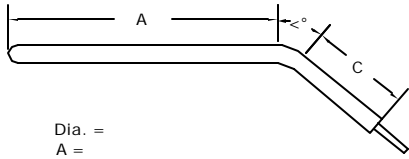
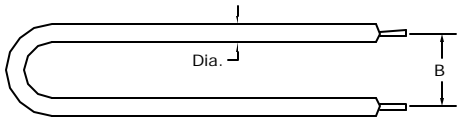
STRAIGHT TUBULAR HEATERS



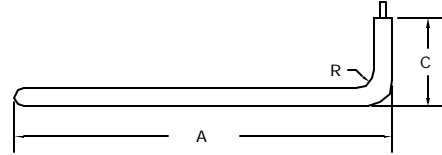
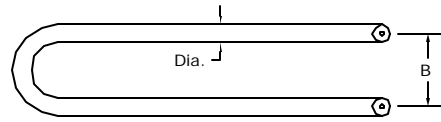
HAIRPIN TUBULAR HEATERS



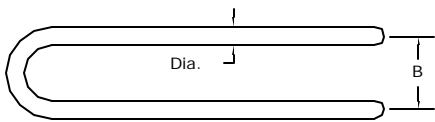
FORMED TUBULAR HEATERS



Dia. =
A =
B =
C =
 α° =

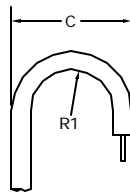
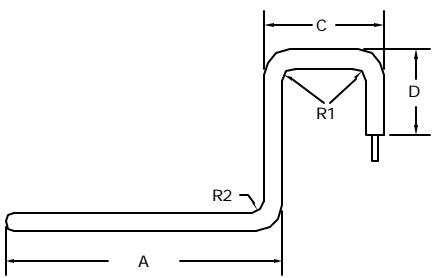


Dia. =
A =
B =
C =
R =

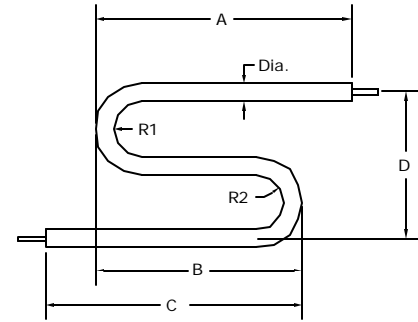


STYLE 1

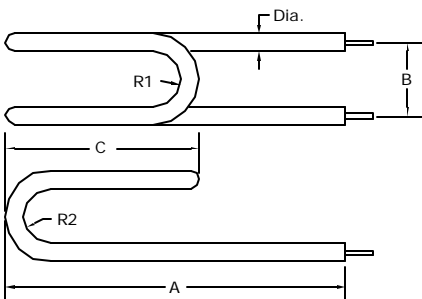
STYLE 2



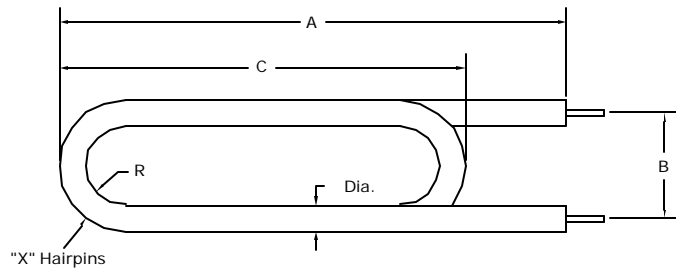
STYLE # =
Dia. =
A =
B =
C =
D =
R1 =
R2 =



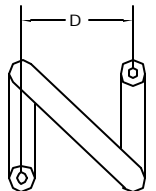
Dia. =
A =
B =
C =
D =
R1 =
R2 =



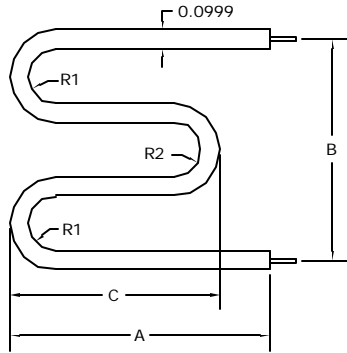
Dia. =
A =
B =
C =
R1 =
R2 =



Dia. =
A =
B =
C =
D =
R =
X =

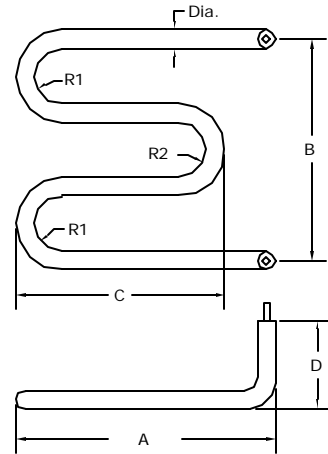


FORMED TUBULAR HEATERS



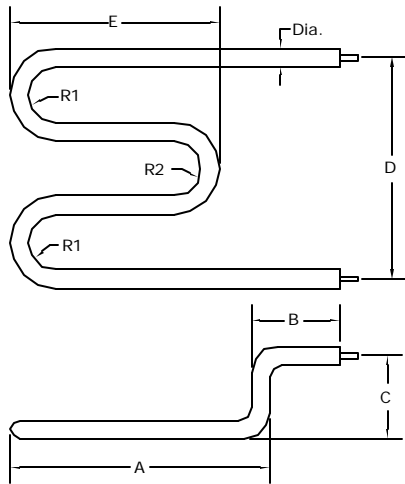
Dia. =
A =
B =
C =

R1 =
R2 =



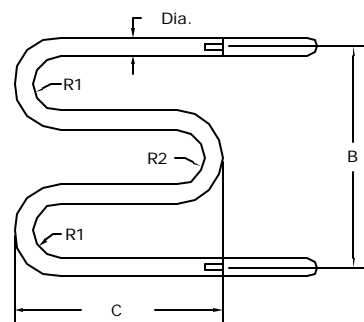
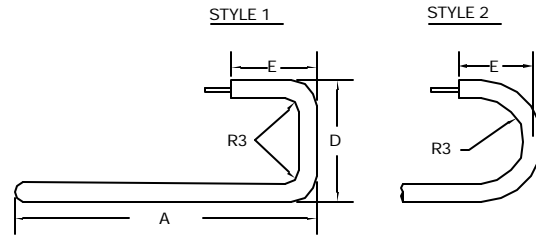
Dia. =
A =
B =
C =

R1 =
R2 =



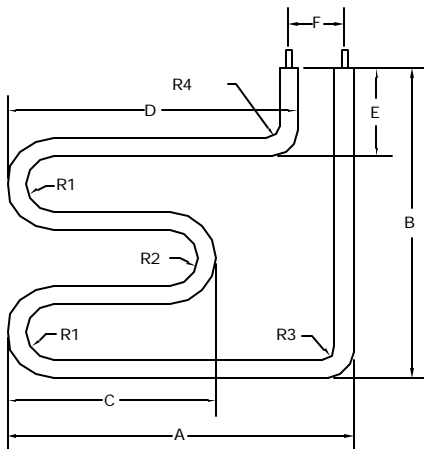
Dia. =
A =
B =
C =

D =
R1 =
R2 =



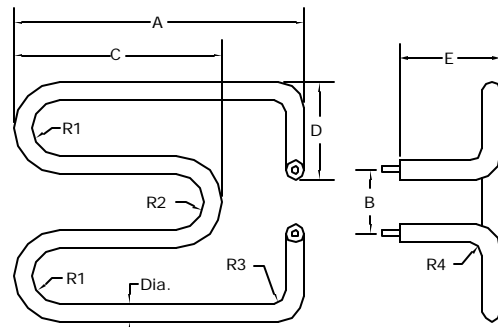
STYLE # =
Dia. =
A =
B =
C =

D =
E =
R1 =
R2 =
R3 =



Dia. =
A =
B =
C =
D =
E =

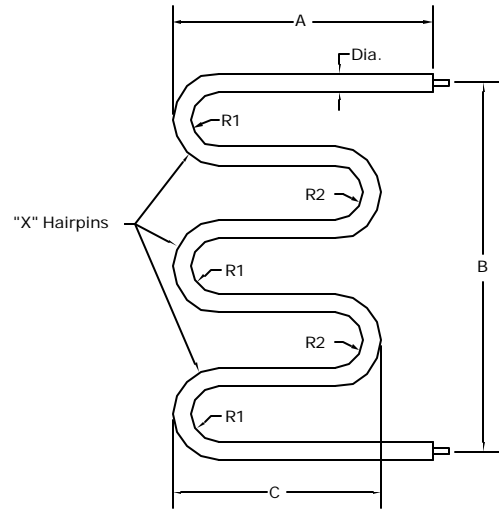
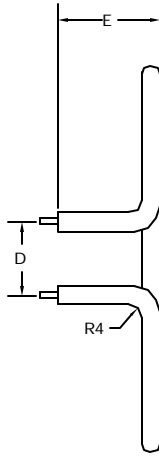
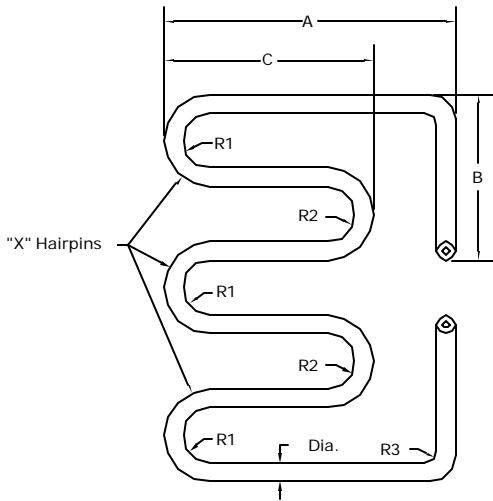
F =
R1 =
R2 =
R3 =
R4 =



Dia. =
A =
B =
C =
D =

E =
R1 =
R2 =
R3 =
R4 =

FORMED TUBULAR HEATERS

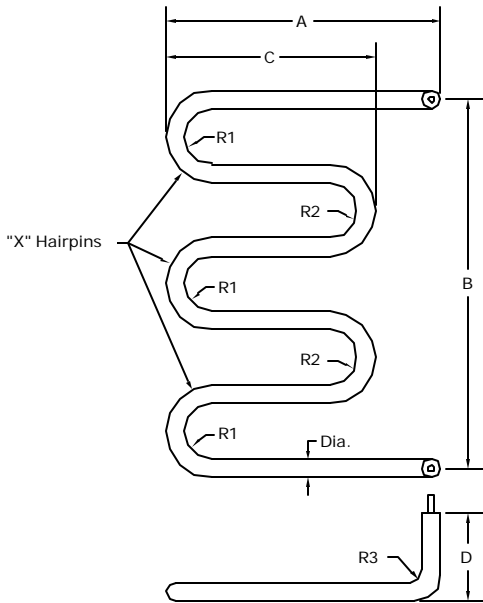


Dia. =
 A =
 B =
 C =
 D =
 E =

R1 =
 R2 =
 R3 =
 R4 =
 X =

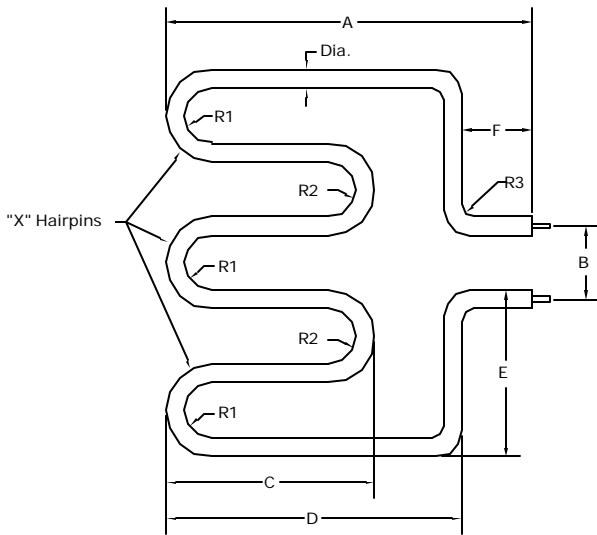
Dia. =
 A =
 B =
 C =

R1 =
 R2 =



Dia. =
 A =
 B =
 C =
 D =

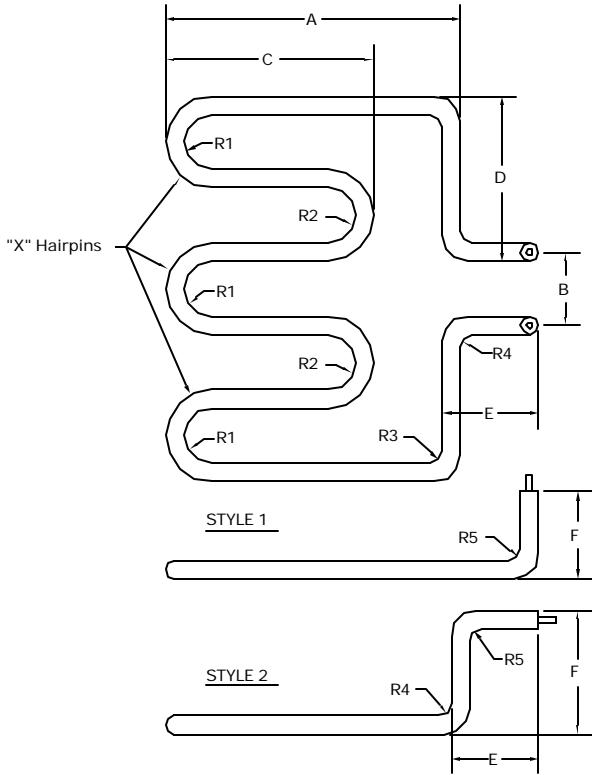
R1 =
 R2 =
 R3 =
 X =



Dia. =
 A =
 B =
 C =
 D =

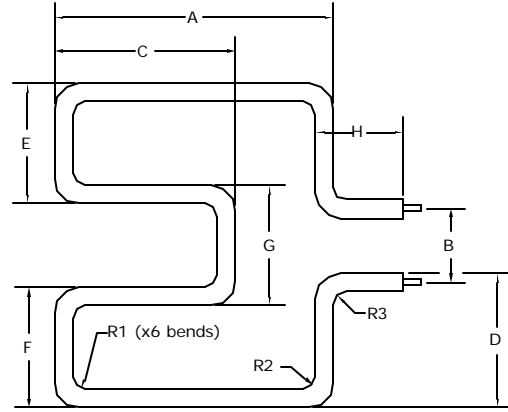
E =
 F =
 R1 =
 R2 =
 X =

FORMED TUBULAR HEATERS



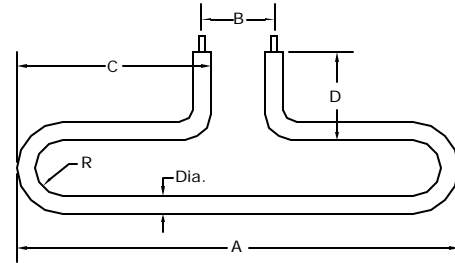
STYLE # =
 Dia. =
 A =
 B =
 C =
 D =
 E =

F =
 R1 =
 R2 =
 R3 =
 R4 =
 R5 =
 X =



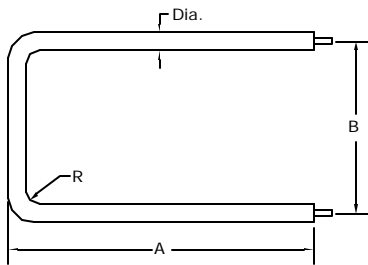
Dia. =
 A =
 B =
 C =
 D =
 E =

F =
 G =
 H =
 R1 =
 R2 =
 R3 =

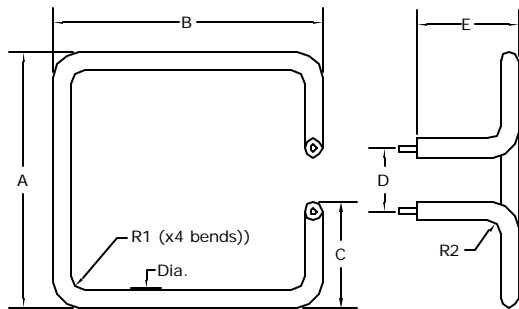
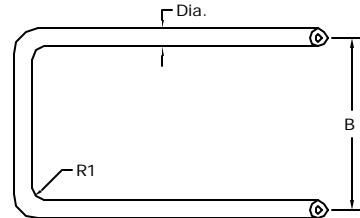


Dia. =
 A =
 B =
 C =

D =
 R1 =
 R2 =

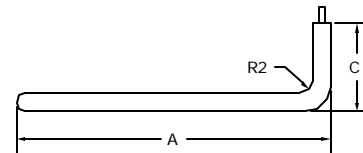


Dia. =
 A =
 B =
 R =



Dia. =
 A =
 B =
 C =

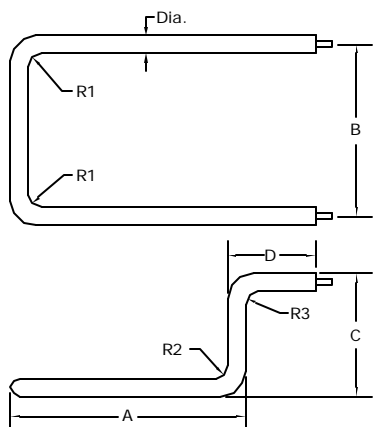
D =
 E =
 R1 =
 R2 =



Dia. =
 A =
 B =

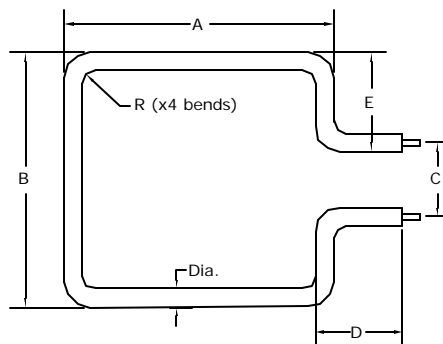
C =
 R1 =
 R2 =

FORMED TUBULAR HEATERS



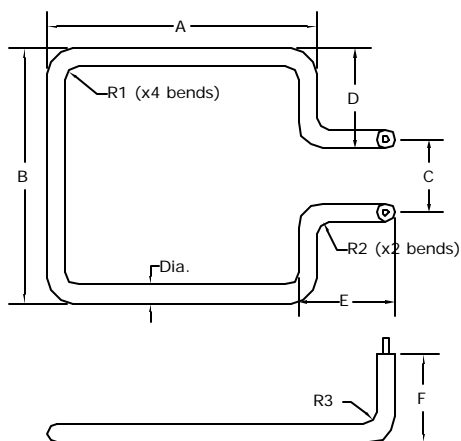
Dia. =
A =
B =
C =

D =
R1 =
R2 =
R3 =



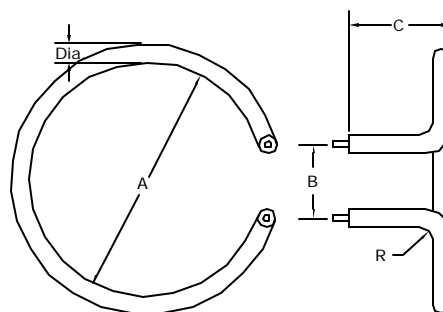
Dia. =
A =
B =
C =

D =
E =
R =



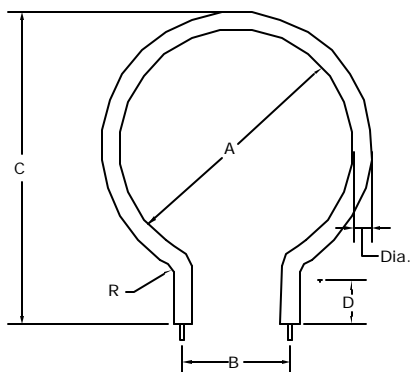
Dia. =
A =
B =
C =
D =

E =
F =
R1 =
R2 =
R3 =



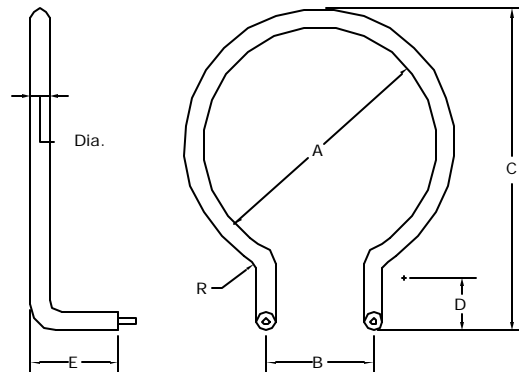
Dia. =
A =
B =

C =
R =



Dia. =
A =
B =

C =
D =
R =

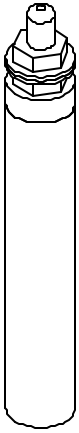


Dia. =
A =
B =
C =

D =
E =
R =

TUBULAR HEATER TERMINATIONS

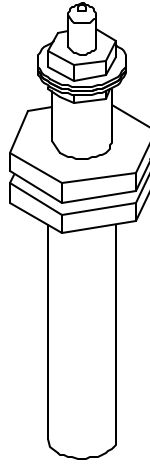
ST
Standard Terminal
w/ Insulation



QD
Quick Disconnect



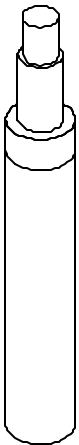
MB
Mounting Bushings



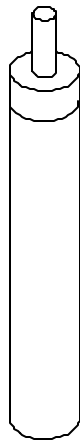
FL
Threaded Flag



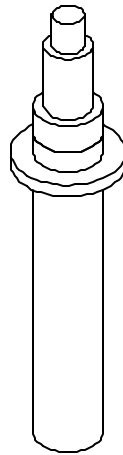
SO
Stacked-on



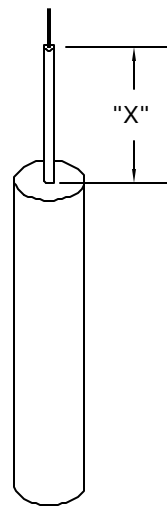
PN
Straight Pin
(No Thread)



FL
Mounting Flange



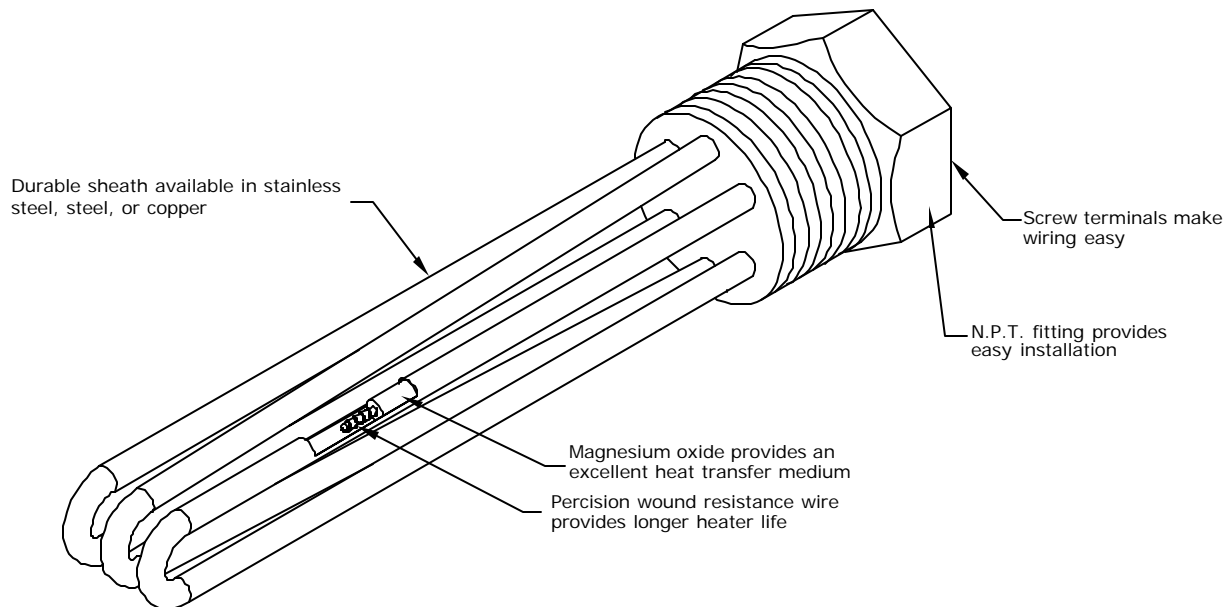
LD (X)
Potted-in Lead Wire



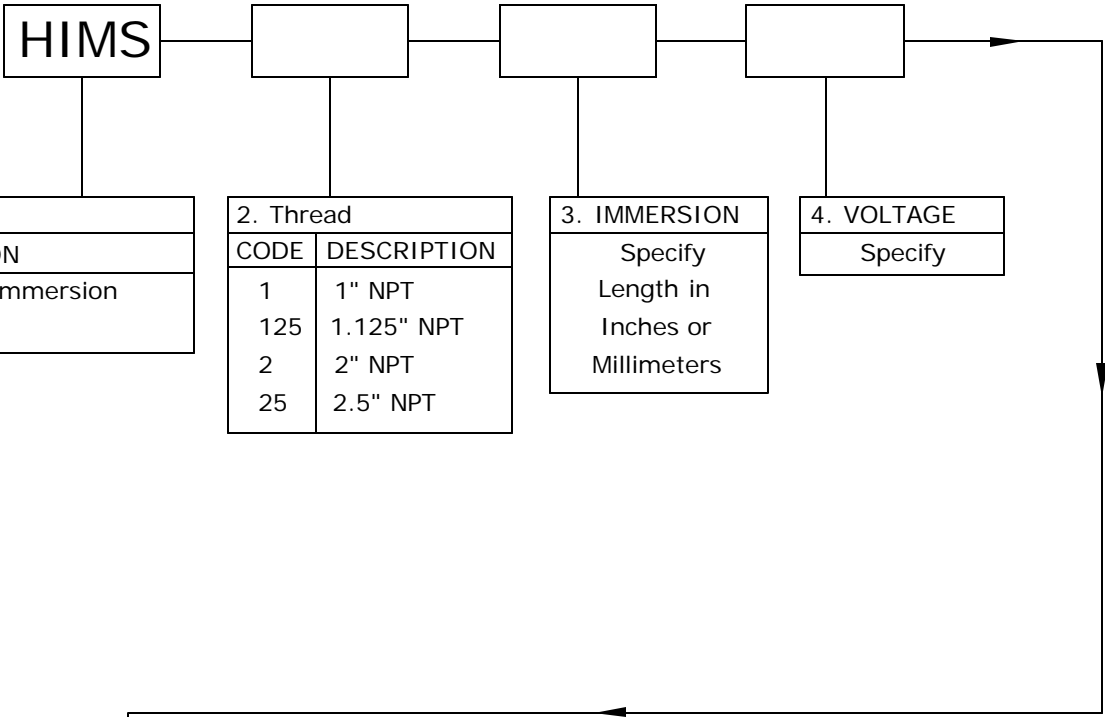
TUBULAR IMMERSION HEATERS

Applications

Immersion heating elements are intended to be used for applications in which the heat must be applied directly in the fluid. Attention must be given to the different characteristics of the material to be heated. Typical contributing factors are the amount of heat required for the application, compatibility of all materials, watt density of the heater, and particular installation or mounting requirements.



SCREW PLUG IMMERSION HEATERS

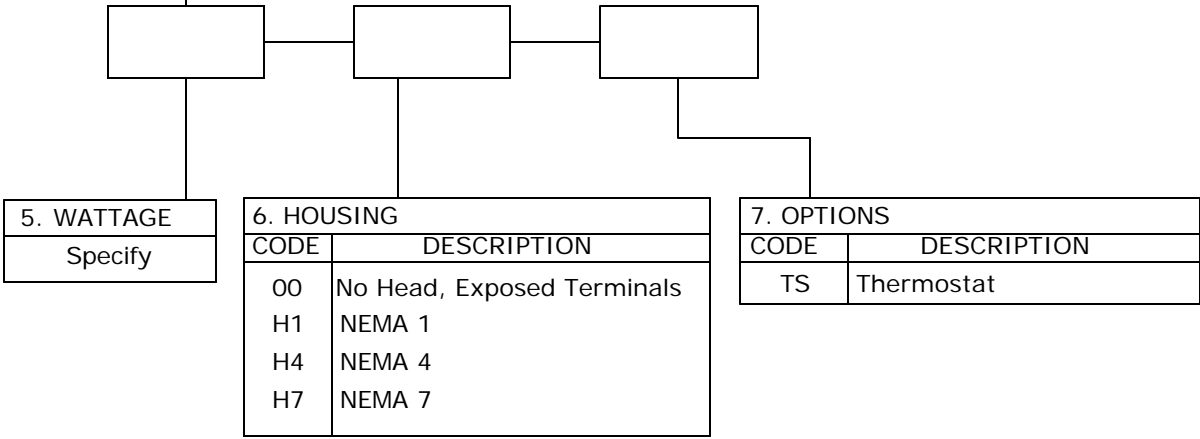


1. STYLE	
CODE	DESCRIPTION
HIMS	Screw Plug Immersion Heater

2. Thread	
CODE	DESCRIPTION
1	1" NPT
125	1.125" NPT
2	2" NPT
25	2.5" NPT

3. IMMERSION
Specify Length in Inches or Millimeters

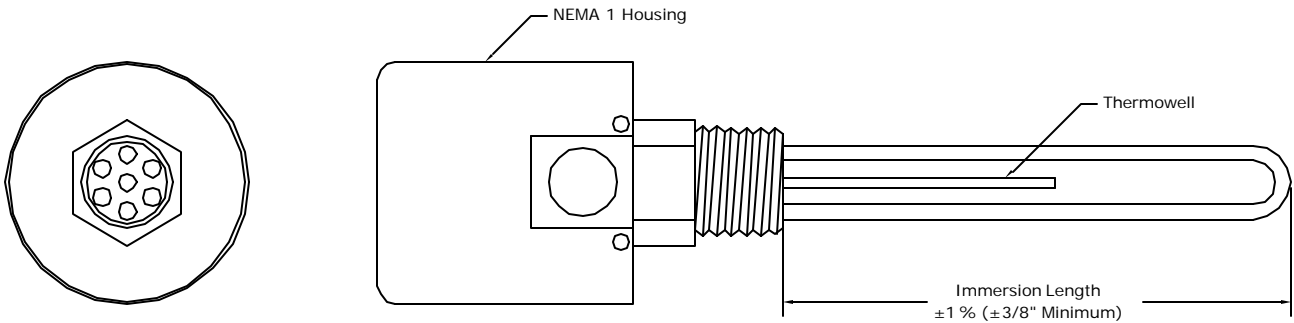
4. VOLTAGE
Specify



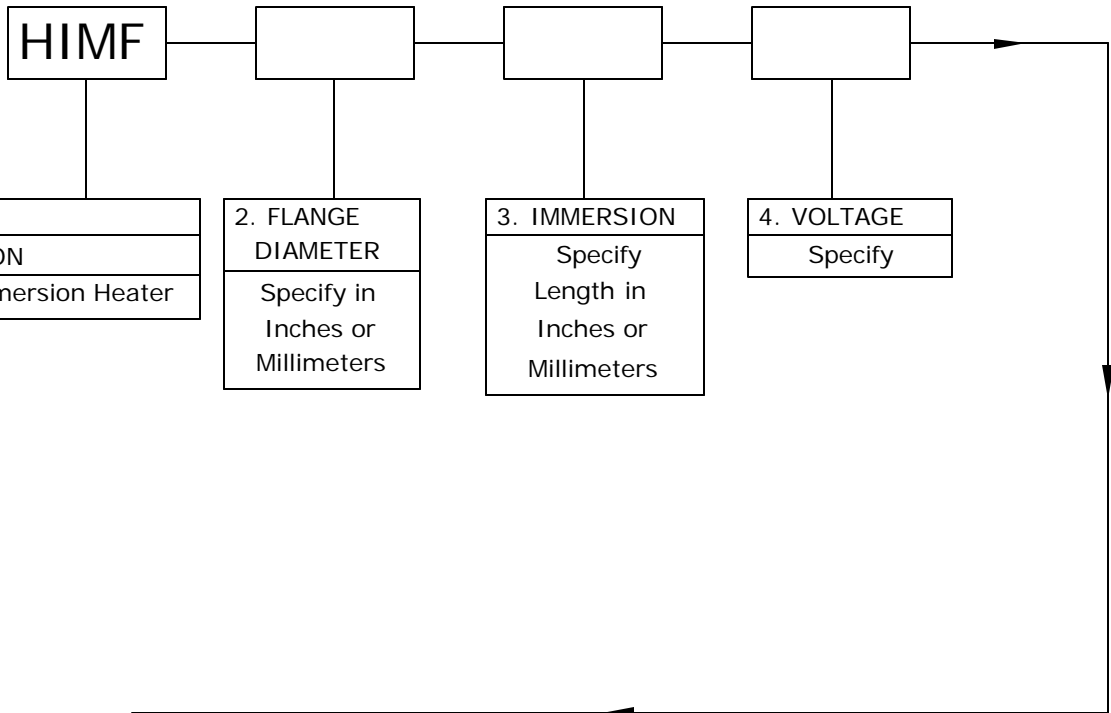
5. WATTAGE
Specify

6. HOUSING	
CODE	DESCRIPTION
00	No Head, Exposed Terminals
H1	NEMA 1
H4	NEMA 4
H7	NEMA 7

7. OPTIONS	
CODE	DESCRIPTION
TS	Thermostat



FLANGED IMMERSION HEATERS

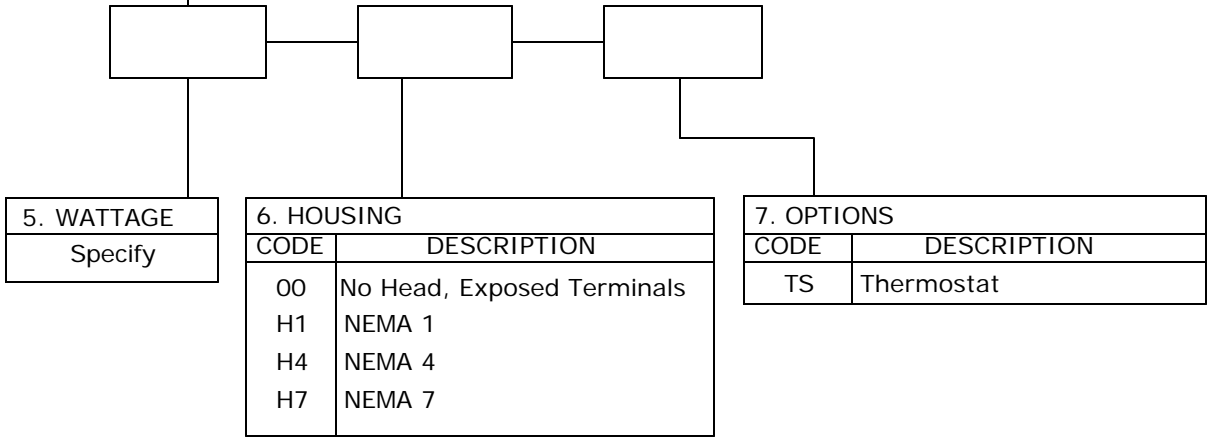


1. STYLE	
CODE	DESCRIPTION
HIMF	Flanged Immersion Heater

2. FLANGE DIAMETER
Specify in Inches or Millimeters

3. IMMERSION
Specify Length in Inches or Millimeters

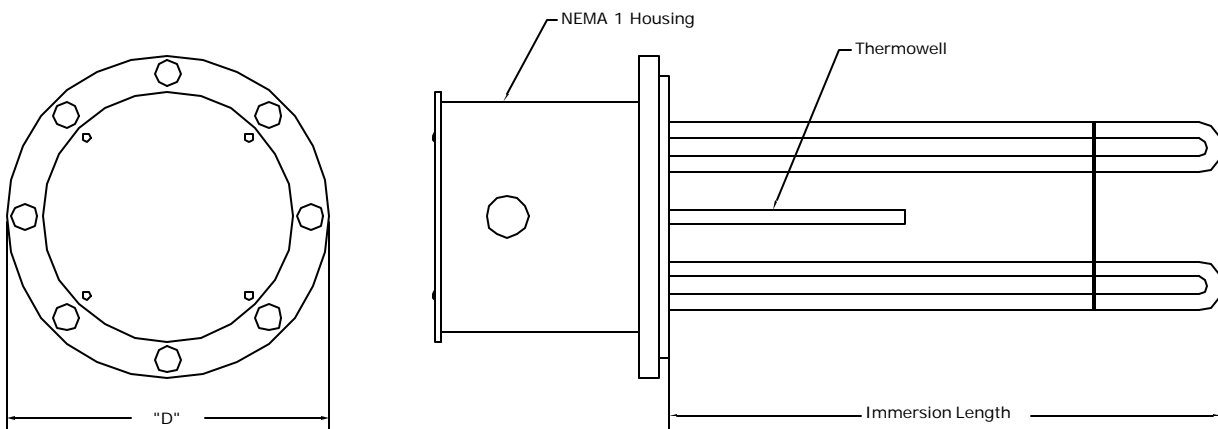
4. VOLTAGE
Specify



5. WATTAGE
Specify

6. HOUSING	
CODE	DESCRIPTION
00	No Head, Exposed Terminals
H1	NEMA 1
H4	NEMA 4
H7	NEMA 7

7. OPTIONS	
CODE	DESCRIPTION
TS	Thermostat



AIR HEATERS

Air Heaters

In-line air heaters are used to heat air or gas in a wide variety of applications such as:

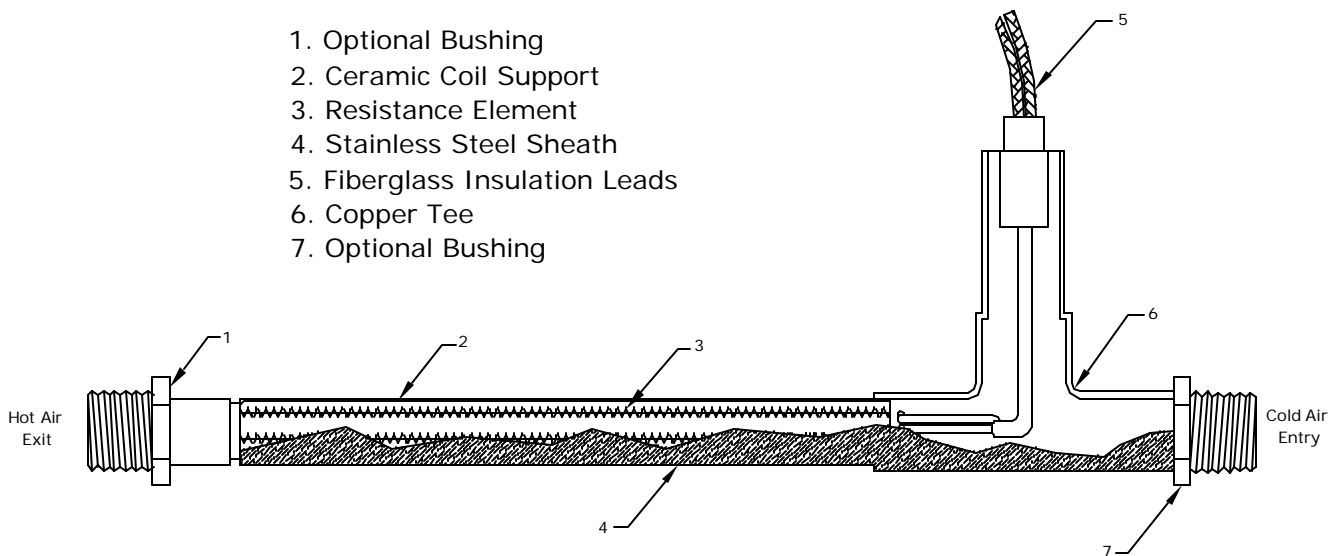
- Baking
- Drying
- Laminating
- Metal Working
- Packaging
- Plastic Welding
- Preheating
- Sealing
- Shrink Fitting

Features

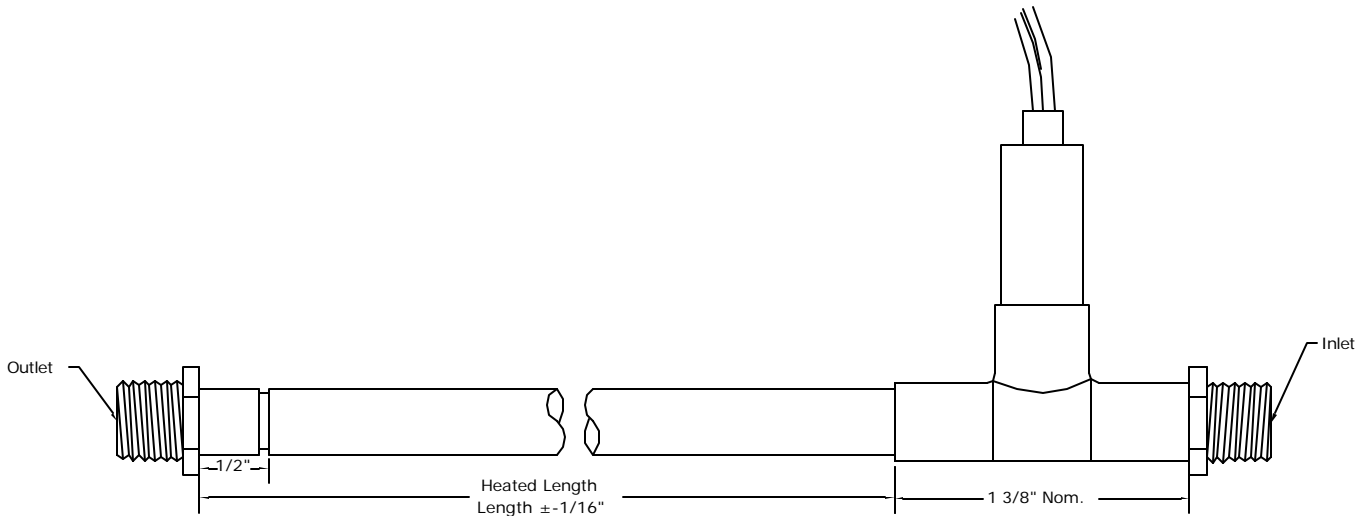
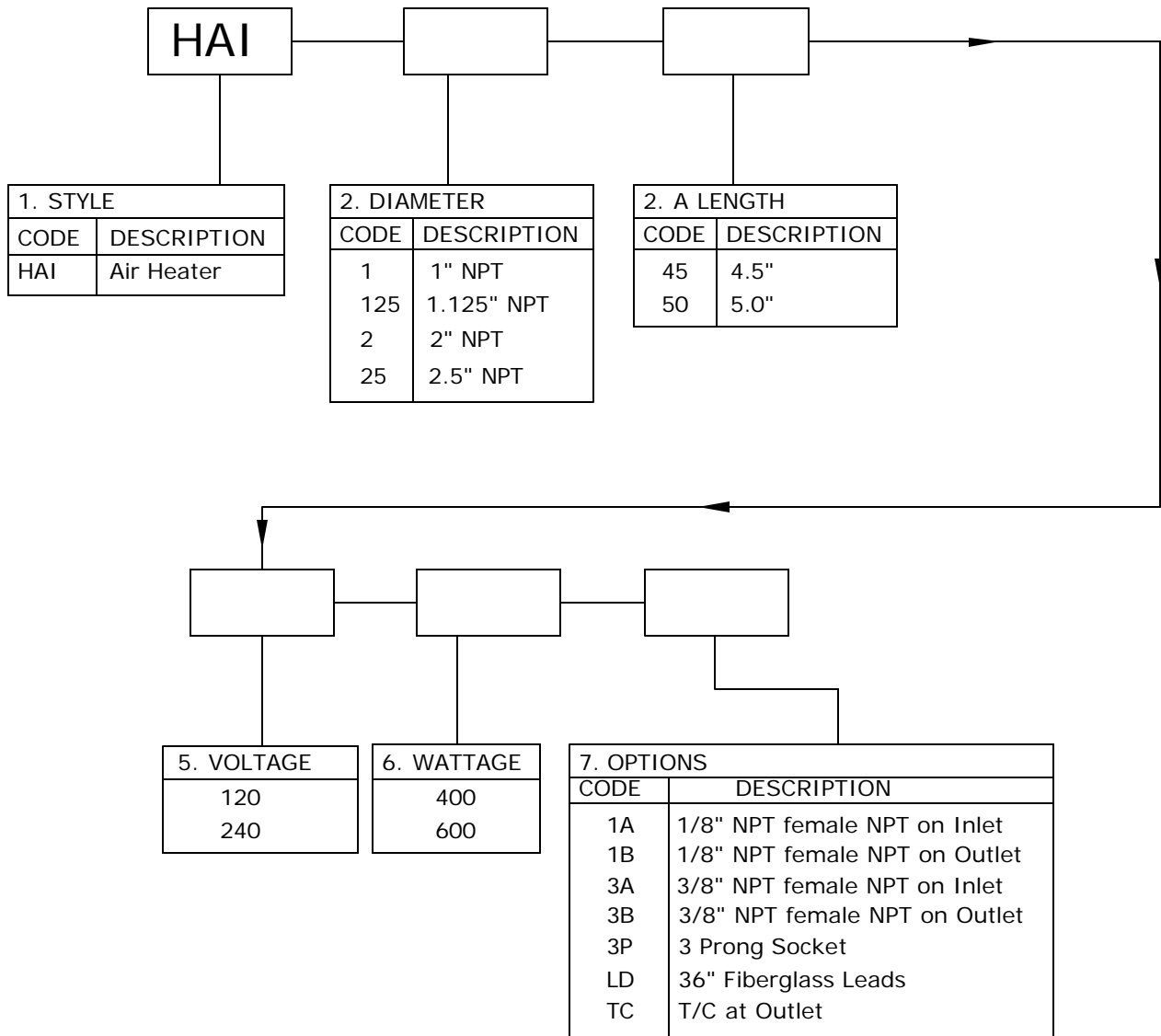
- Heat air to temperatures as high as 1000°F
- 1/2" and 3/4" diameters available
- Available with a variety of fittings
- Optional thermocouple at outlet for temperature control

Construction

1. Optional Bushing
2. Ceramic Coil Support
3. Resistance Element
4. Stainless Steel Sheath
5. Fiberglass Insulation Leads
6. Copper Tee
7. Optional Bushing



AIR HEATERS



BARREL HEATERS - MEGADRUMS & FLEXIDRUMS

Megadrum and **Flexidrum** heaters are used to pre-heat liquids in drums or pails to make them less viscous and more flowable. They are suitable heat sources when heat is required to handle liquids during pouring, dipping, coating or mixing operations. Megadrum and Flexidrum heaters are made to brace a drum externally and they are easily installed and removed when needed.

Megadrums

Megadrums have a rugged construction, made to withstand the harsh industrial environment. They are available in two styles. The GCX model is a one piece construction heater that comes with a spring loaded handle and a snap action bi-metal temperature controller (220° F). The HDX model is a two piece construction heater that has a latch and trunion fastener with a bulb and capillary thermostat (250° F).

Flexidrums

Flexidrum heaters are made of layers of fiberglass reinforced silicone rubber sheets. When these sheets are vulcanized and bonded under heat and pressure, they form a material that can withstand industrial rough usage, and is highly flexible, durable and tough. Prior to vulcanization, the electrical resistance wire web, and its protective metallic grid (which acts as an electrical ground) are carefully placed between the silicone layers.

Flexidrum heaters are resistant to most chemicals, fungus and moisture, and can be easily cleaned. The temperature is controlled by a B-200 bimetal thermostat (400° F).

BARREL HEATERS - INSTALLATION & MAINTENANCE

INSTALLATION

Since heat has the tendency to move upwards in liquids, drum heaters should be installed close to the bottom of a vertical drum. Horizontal vessels should have their drum heaters installed such that the terminal box is positioned on the side. This will protect the box from overheating and maintain accessibility to the controls. The HDX model has a quick disconnect latch and trunion fastener, while the GCX model has spring loaded handles that have to be stretched to slide the heater to its proper position on the drum. The Flexidrum is very flexible and will easily adhere to the drum surface. However, when a Megadrum is used, it is recommended to tap gently on both its rims to ensure tightness and good heat transfer.

CONTROL

Megadrum comes with temperature controllers. When the pilot lamp is on, the heater is active. HDX models have bulb and capillary thermostats (250° F). GCX models have snap action bimetal temperature controllers (220° F). After an initial trial these controllers have to be set in proportion to the maximum settings and required temperature. Flexidrum comes with B-200 bimetal thermostats (400° F).

ELECTRICAL RATING

Megadrum and Flexidrum are made for 120V or 240V power supplies. Appropriate power cords and plugs are supplied for each voltage and wattage. The power supply should be rated to handle the amperage drawn by the heater. Different liquids absorb heat at different rates so the wattage of a Megadrum should be selected accordingly.

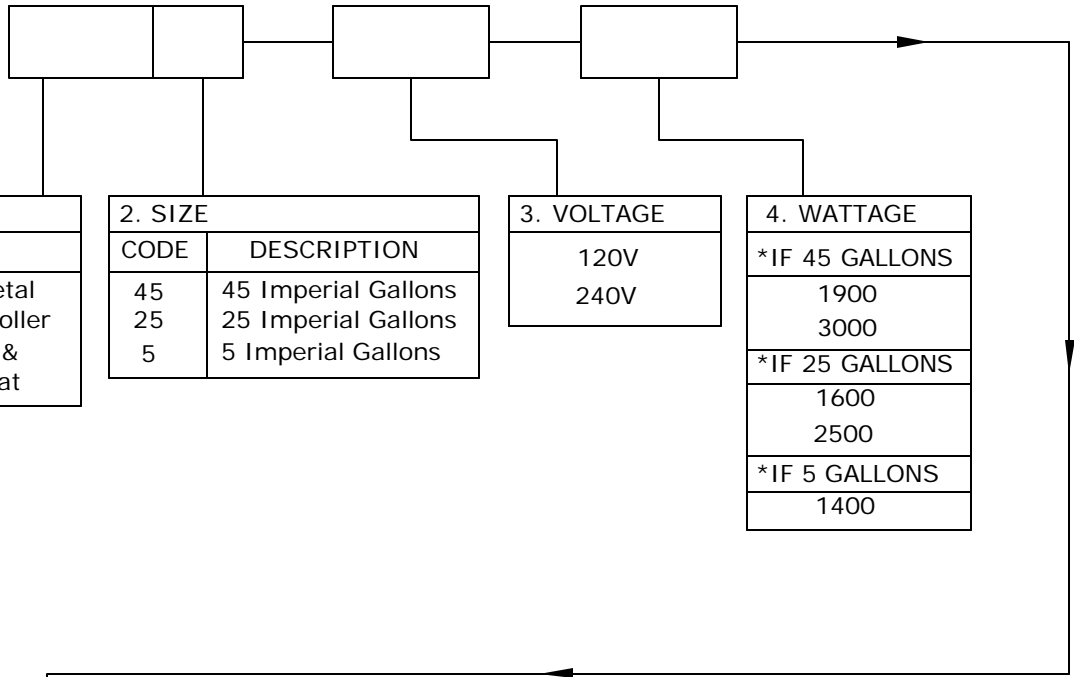
MAINTENANCE

Since the Megadrum is not a sealed product, it should be used indoors and kept away from moisture and contamination. The Flexidrum is moisture and chemical proof, but not waterproof. Flexidrum should always be used indoors since water can leak into their thermostat box. In general, Megadrum and Flexidrum are maintenance free. A periodic check to ensure that they are securely fastened to the drum is recommended. The power cord is rated to withstand 220° F and should never come in contact with the heater.

WARNING

Megadrum and Flexidrum should not be used on pressure tight containers, containers with explosive materials, or in explosive environments.

BARREL HEATERS - MEGADRUMS



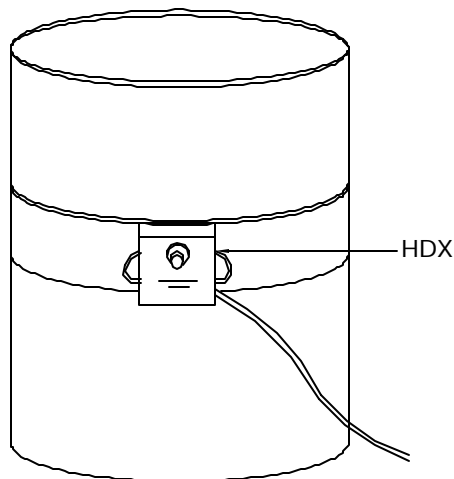
1. STYLE	
CODE	DESCRIPTION
HM1	One-Piece w/ Bi-Metal Temperature Controller
HM2	Two-Piece w/ Bulb & Capillary Thermostat

2. SIZE	
CODE	DESCRIPTION
45	45 Imperial Gallons
25	25 Imperial Gallons
5	5 Imperial Gallons

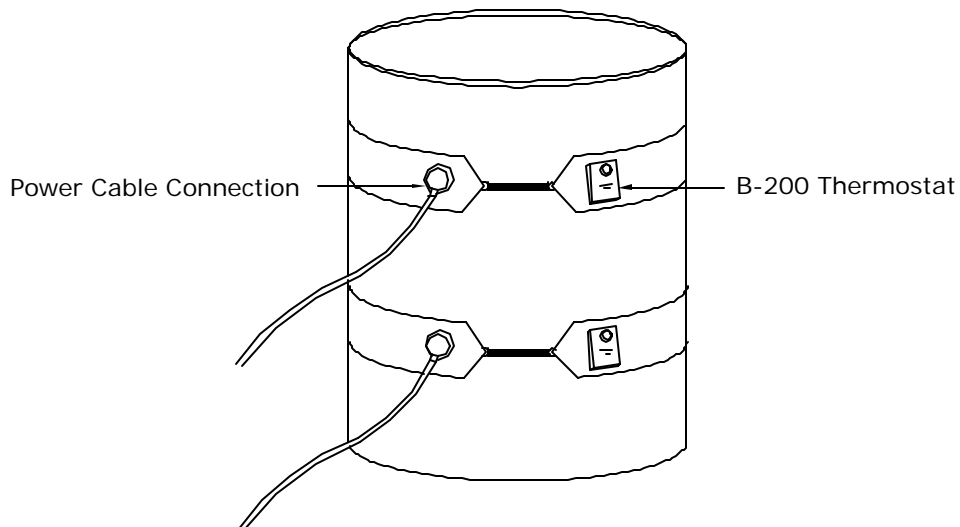
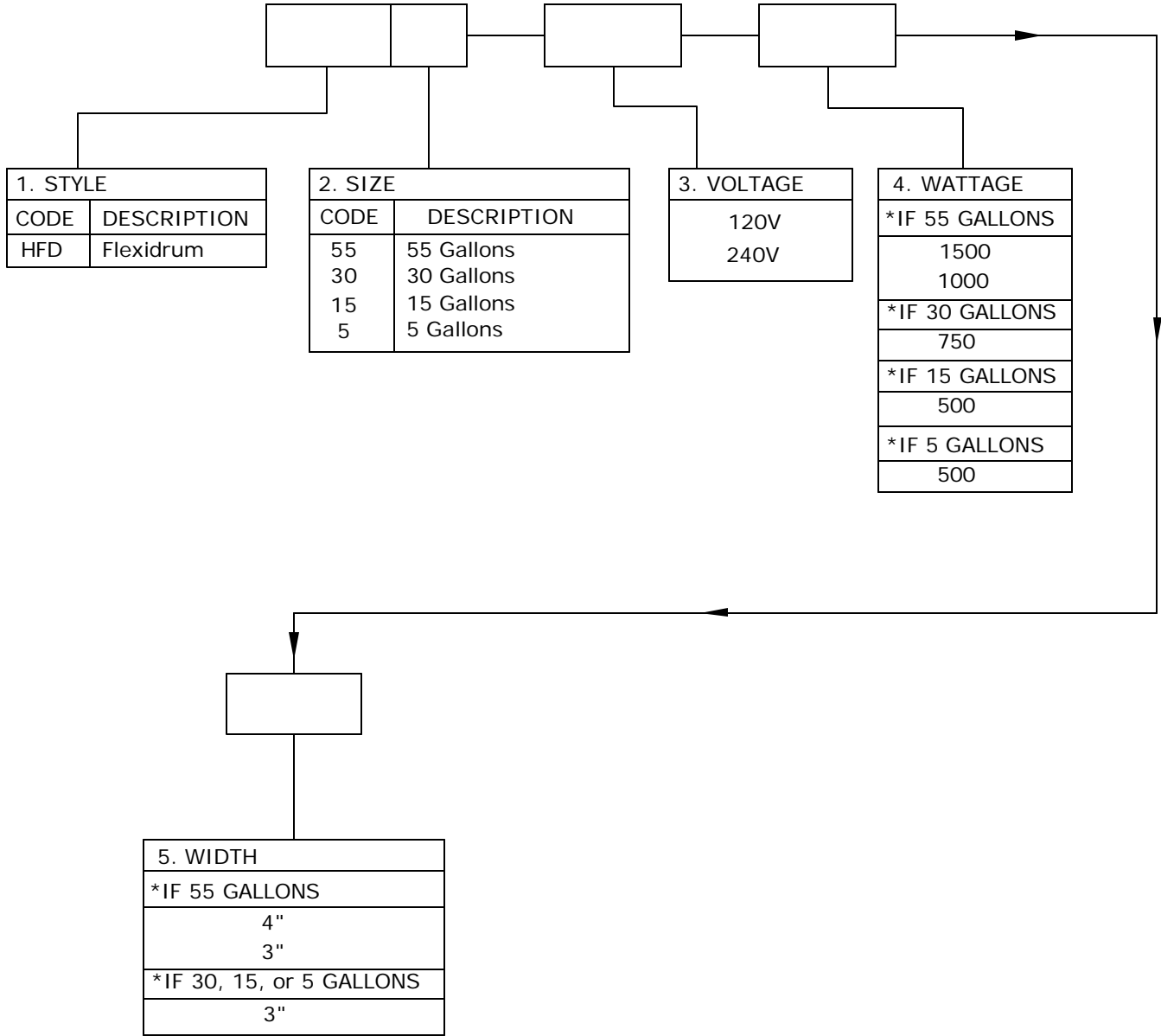
3. VOLTAGE
120V
240V

4. WATTAGE
*IF 45 GALLONS
1900
3000
*IF 25 GALLONS
1600
2500
*IF 5 GALLONS
1400

5. CLAMPING	
CODE	DESCRIPTION
LT	Latch & Trunion
SL	Spring Loaded

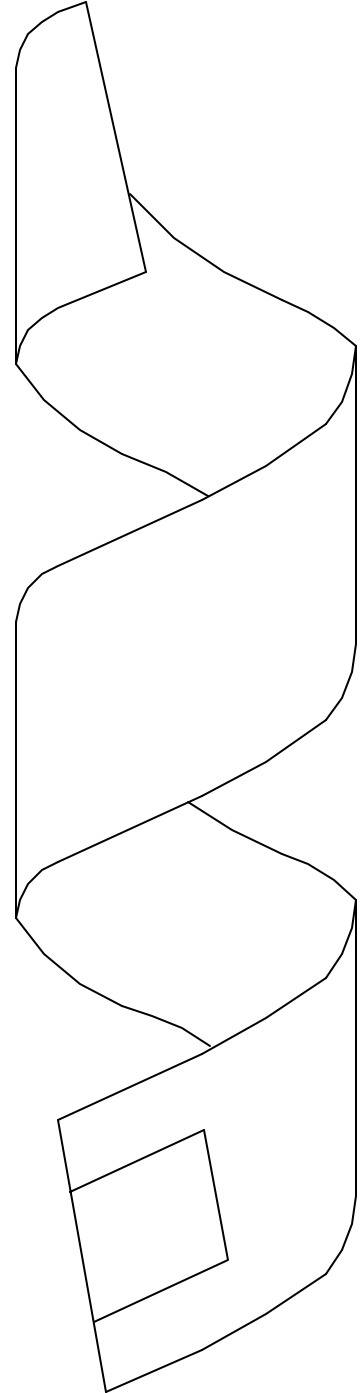
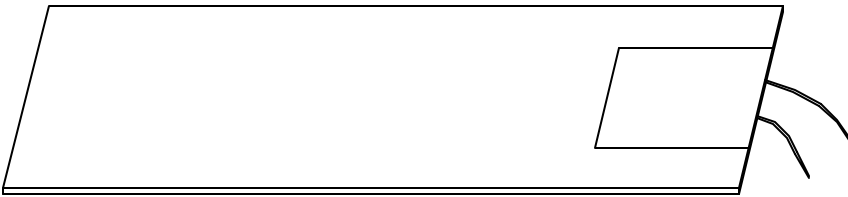
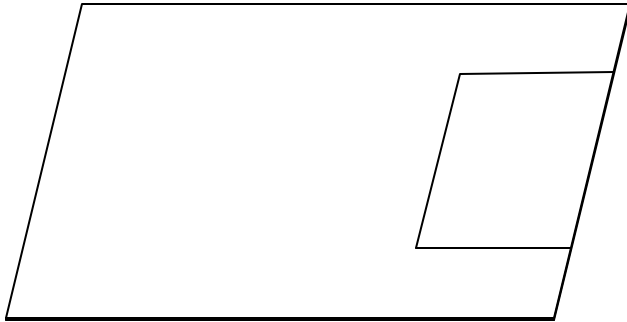


BARREL HEATERS - FLEXIDRUM



SILICONE RUBBER HEATERS

Silflex fiberglass reinforced silicon rubber heaters have a rugged construction yet still remain thin and flexible. They can be made to adhere to almost any surface and are moisture and chemical resistant. Silflex heaters are suitable for temperatures less than 500° F. They can accommodate holes and cutouts, and can come with a thermostat or PSA back.



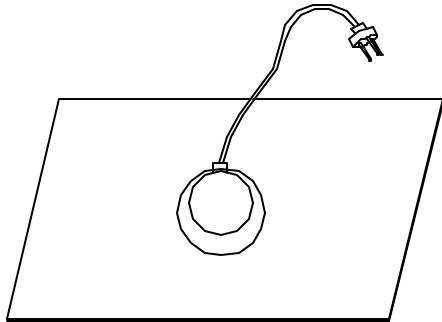
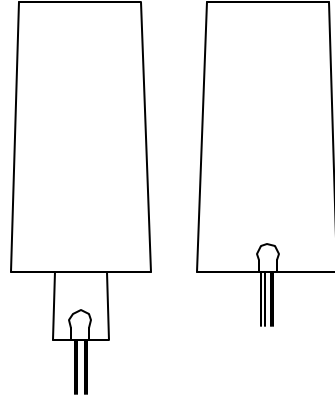
SPECIFICATIONS	
Max. Size	38" x 98"
Thickness	0.060"
Max. Temp	450° F
Max. Voltage	480 VAC
Wattage	+5/-10%
Standard Lead Wire	12" Teflon Insulated
Dielectric Strength	1000 VAC

SILICONE RUBBER HEATERS

Lead Wire Styles

Teflon or Silicone Lead Wires

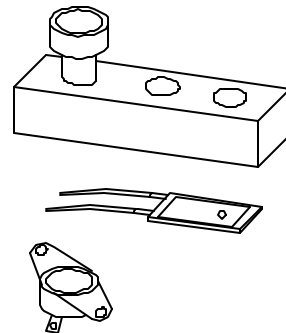
The leads are set between layers of silicone and a small patch is inserted at the exit point to provide extra support and protection. The result is a small bump where the wires are attached. To prevent this, a small external tab can be attached.



SJO Power Cables

Siliflex heaters can be made with power cables that exit from a silicone transitions box attached to the heater. Proper electrical plugs are available with the power cables.

Siliflex heaters can accommodate pre-set or adjustable thermostats, thermal cutoffs and external "J" type thermocouples. Each has a specific temperature range and maximum amperage capability; the factory should be consulted for their availability.

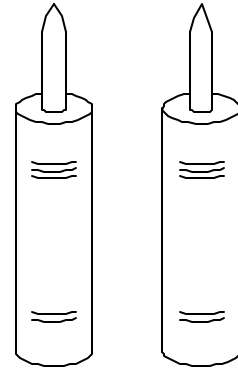


SILICONE RUBBER HEATERS

Attachment Methods

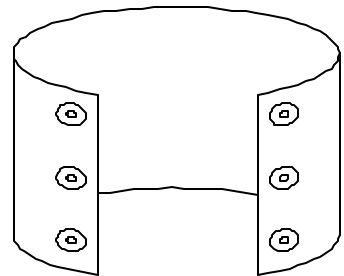
RTV Adhesives

Adhesive pastes can be used at room temperature to provide a strong bond to application surfaces. Red coloured RTV 106 and transparent RTV 116 are the two types of adhesives available. These are adequate for temperatures up to 500° F.



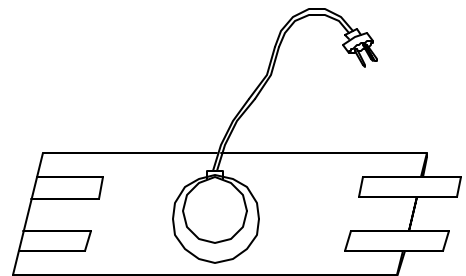
Pressure Sensitive Adhesive

Silflex heaters can be made with a thin layer of adhesive backing that can be stuck onto almost any surface. The adhesive can withstand temperatures up to 300° F. The watt density of the heater should not exceed 5 watt/in² when PSA is used.



Factory Vulcanization

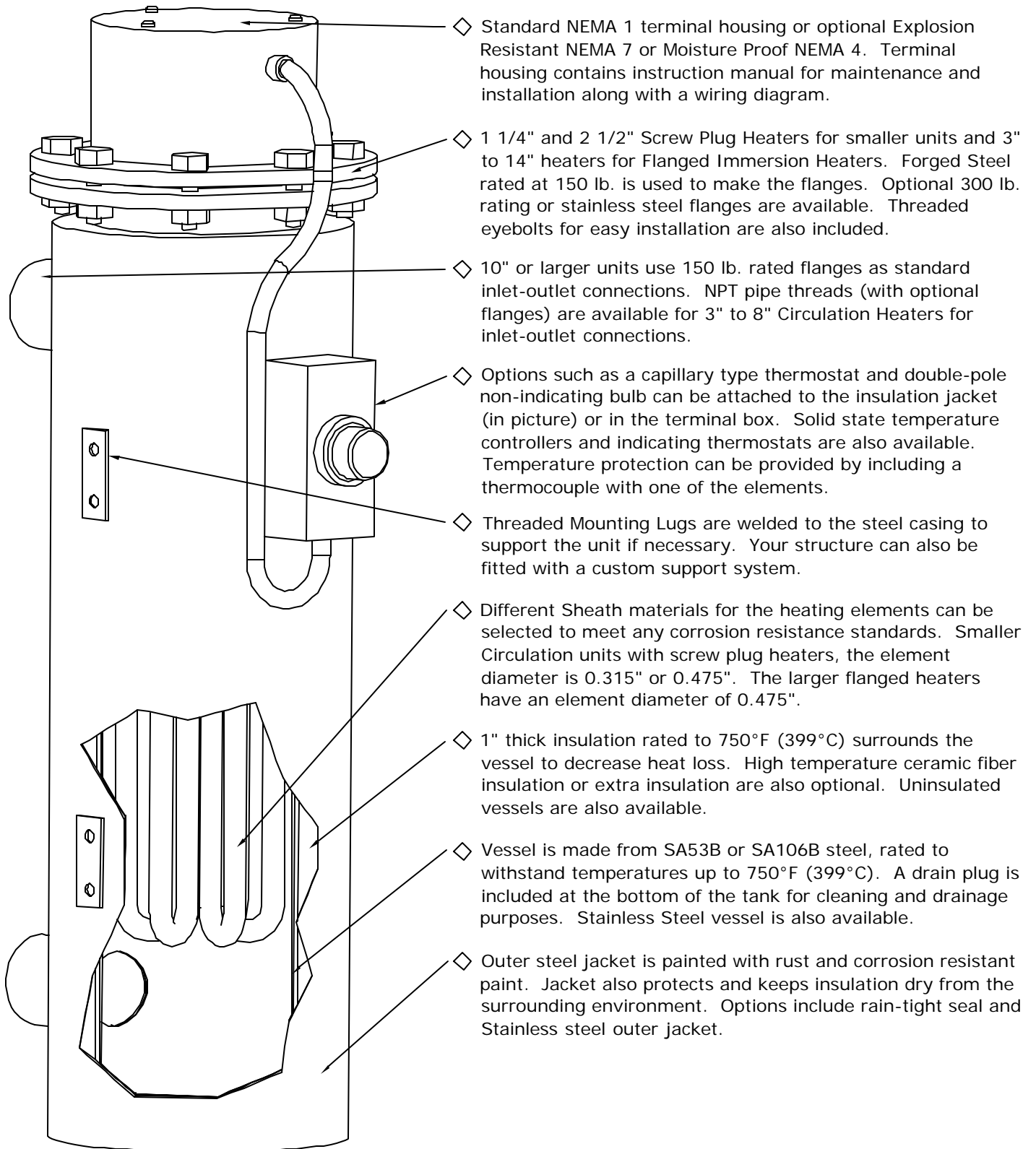
Using high temperature and pressure, silflex heaters can be vulcanized to a surface. This is highly efficient but it can only be performed in the factory.



Mechanical Fasteners

Silflex heaters can be wrapped around an application. The end can therefore be fastened by attachments used on fabrics. Eyelets with lacing cords, Velcro hook and loop, metallic fasteners with springs, and independent straps are the most commonly used fasteners.

CIRCULATION HEATERS



- ◇ Standard NEMA 1 terminal housing or optional Explosion Resistant NEMA 7 or Moisture Proof NEMA 4. Terminal housing contains instruction manual for maintenance and installation along with a wiring diagram.
- ◇ 1 1/4" and 2 1/2" Screw Plug Heaters for smaller units and 3" to 14" heaters for Flanged Immersion Heaters. Forged Steel rated at 150 lb. is used to make the flanges. Optional 300 lb. rating or stainless steel flanges are available. Threaded eyebolts for easy installation are also included.
- ◇ 10" or larger units use 150 lb. rated flanges as standard inlet-outlet connections. NPT pipe threads (with optional flanges) are available for 3" to 8" Circulation Heaters for inlet-outlet connections.
- ◇ Options such as a capillary type thermostat and double-pole non-indicating bulb can be attached to the insulation jacket (in picture) or in the terminal box. Solid state temperature controllers and indicating thermostats are also available. Temperature protection can be provided by including a thermocouple with one of the elements.
- ◇ Threaded Mounting Lugs are welded to the steel casing to support the unit if necessary. Your structure can also be fitted with a custom support system.
- ◇ Different Sheath materials for the heating elements can be selected to meet any corrosion resistance standards. Smaller Circulation units with screw plug heaters, the element diameter is 0.315" or 0.475". The larger flanged heaters have an element diameter of 0.475".
- ◇ 1" thick insulation rated to 750°F (399°C) surrounds the vessel to decrease heat loss. High temperature ceramic fiber insulation or extra insulation are also optional. Uninsulated vessels are also available.
- ◇ Vessel is made from SA53B or SA106B steel, rated to withstand temperatures up to 750°F (399°C). A drain plug is included at the bottom of the tank for cleaning and drainage purposes. Stainless Steel vessel is also available.
- ◇ Outer steel jacket is painted with rust and corrosion resistant paint. Jacket also protects and keeps insulation dry from the surrounding environment. Options include rain-tight seal and Stainless steel outer jacket.

SELECTING THE PROPER CIRCULATION HEATER

The longevity and trouble-free service of a Circulation Heater depend on selecting proper sheath materials, watt densities, and operation temperatures.

Standard Element Sheath Materials

Incoloy® 800 - A Nickel (30-35%), Chromium (19-23%), Iron alloy. The high nickel content of this alloy contributes to its resistance to scaling and corrosion. Used in air heating and immersion heating of potable water and other liquids that are not corrosive to an Incoloy 800 sheath. Sheath temperatures to 1600°F (871°C).

Low Carbon Steel - Applications include fluid heat transfer media, tar, high to low viscosity petroleum oils, asphalt, wax, molten salt, and other solutions not corrosive to steel sheath. Sheath temperatures to 750°F (399°C).

316 Stainless Steel - A Chromium (16-18%), Nickel (11-14%), Iron Alloy with Molybdenum (2-3%) added to improve corrosion resistance in certain environments, especially those which would tend to cause pitting due to the presence of chlorides. Applications include deionized water. Sheath temperatures to 1200°F (649°C).

Copper - Mainly used in clean water heating for washrooms, showers, rinse tanks and freeze protection of storage tanks. Sheath temperatures to 350°F (177°C).

Optional Element Sheath Materials

304 Stainless Steel - A Chromium (18-20%), Nickel (8-11%), Iron Alloy used in the food industry, sterilizing solutions, air heating, and many organic and inorganic chemicals. Sheath temperatures to 1200°F (649°C).

321 Stainless Steel - A Chromium (17-20%), Nickel (9-13%), Iron Alloy modified with the addition of titanium to prevent carbide precipitation and resulting intergranular corrosion that can take place in certain mediums when operating in the 800-1200°F (427-649°C) temperature range. Sheath temperatures to 1200°F (649°C).

Installation

1. Flange heaters are supplied with two drilled and tapped holes for threaded eye bolts, providing ease of handling during installation and flange removal during maintenance cleaning or heater replacement.
2. Replacement of a heater is inevitable. Therefore, provided adequate space for installation, allowing ample room to remove the flange heater for cleaning or replacement.
3. In applications, requiring the circulation heater to be fed by an inline pump, install the pump at the inlet end.
4. To maintain the lowest possible temperature at the terminal box, place the outlet at the end opposite to the terminal box. If your process temperature is circulating at 450°F (232°C) or above (at the nozzle closest to the flange), stand off terminal box construction is recommended.
5. To prevent temperature and/or pressure buildup on closed loop circulation heater systems, adequate and strategically located thermocouples for temperature controllers and pressure relief valves should be installed. Never over-rate pressure relief valves beyond the pressure temperature rating of the flange being used.
6. During the process cycle, flow rate of the medium being heated should never be interrupted or reduced, thus creating and overheating condition. Excess temperature can result in damage to the medium being processed and premature heater failure.
7. Make sure that your circulation heater is being used. NEMA 1-General purpose, NEMA 4-Moisture resistant, and NEMA 7-Explosion resistant.

SELECTING THE PROPER CIRCULATION HEATER

Wiring

1. All heater installations must be properly earth grounded to eliminate electric shock hazard. Electrical wiring must be in accordance with Local and/or National Electrical Codes.
2. Circulation heaters are supplied standard with NEMA 1 terminal housings. All power to heaters must be disconnected before removing the terminal housing cover and performing any type of service.
3. Electrical connections on heater terminals must be kept tight. Loose connections will create arcing, over-heating, and eventually will destroy the heater terminal and cause premature heater failure.
4. If the amperage rating of your circulation heater exceeds the amperage capacity of the supplied thermostat, mercury relays or magnetic contactors should be used with the thermostat.
5. Over-temperature protection thermocouples require a second conduit to the control panel for the thermocouple wire.

Maintenance

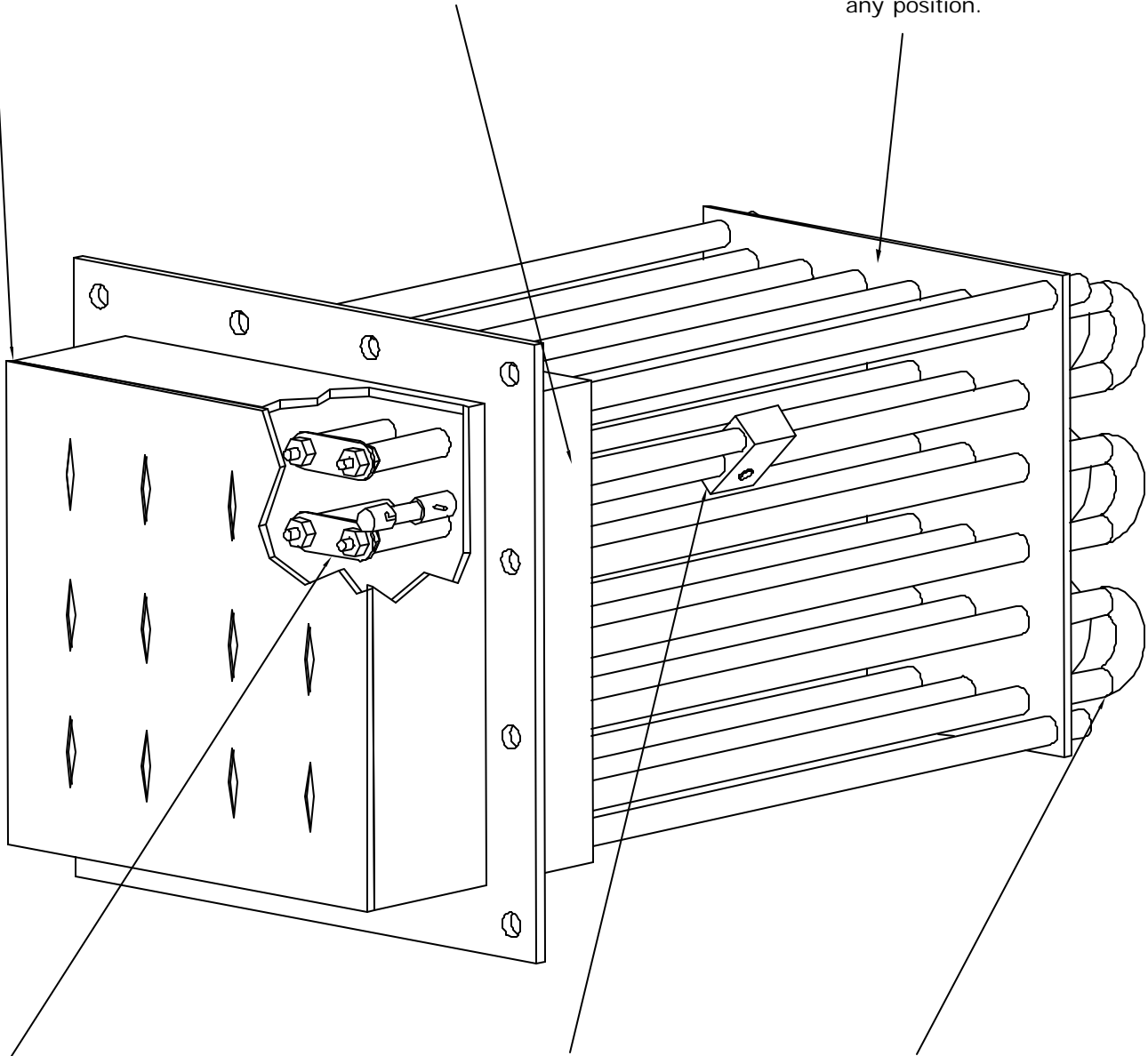
1. Never perform any type of service on the unit prior to disconnecting all electrical power and shutting off all intake lines.
2. Remove sludge deposits through the drain plug.
3. Check the flange bolts for tightness.
4. Check the terminal connections for tightness.
5. Check thermocouple or thermostat bulb for response to temperature changes. If defective, replace immediately.
6. Check for leaks.
7. Depending on operating conditions and medium being processed, the flange or screw plug heater should be periodically removed for physical inspection and cleaning of the element bundle.

DUCT HEATERS

◇ Vented cover enclosing NEMA 1 terminal box. Optional NEMA 4 (moisture resistant), NEMA 7 (explosion resistant), and NEMA 12 (dust resistant).

◇ 3 1/4" (89mm) of mineral insulation in an aluminized steel enclosure minimizes heat loss while keeping electrical wiring cooler.

◇ Heavy duty frame composed of 1/4" (6mm) steel mounting flange, corner posts, and stainless steel support plate support the heating elements in any position.



◇ Single screw quick release "V" clamp holds field replaceable elements. Optional Gas Tight design using compression fittings to attach elements to the flange prevents leakage of ducted gas into terminal enclosure.

◇ 1/4" (6mm) inside diameter thermowell accessed through a 1/8" NPT tapped hole in the flange allows installation of an optional Type J or K thermocouple for sensing the element temperature. An excellent safeguard for your system.

◇ Elements are 0.430 in. (11mm) diameter and have Incoloy* sheaths for excellent corrosion and scaling resistance at high temperatures. Element hairpin bends are spanked in special dies to re-compact the MGO refractory to eliminate any electrical insulation voids.