Cartridge Heaters Metric Insertion Heaters.com
Call...1-877-674-9744

Heat Calculations & Watt Density for Cartridge Heaters & Other Heater Applications:

Manual Calculation of total heat requirements for insertion heaters applications:

$$KW = \frac{W \times C \times \Delta T}{3412 \times hrs}$$

***W* = Weight of material in lbs.**

***C* = Specific Heat of material (platen, block etc.)**

ΔT= Delta T = Change in temperature, °F

***KW* = Kilowatts**

***3412* = Conversion factor, Btu to kWh**

***Hours* = Heat-up time in hours to reach set point**

Automated calculator tool for calculating heating of solids, fluids or gases within a specific time:

http://www.cartridge-heaters-metric-insertion-heaters.com/calculator-for-heating-solids-fluids-and-gases.asp

Determining, Quantity, Size and Rating - Once total heat requirements are established, the quantity, size and rating of cartridge heaters can be decided. Plan for enough heaters to permit even temperatures through the part during heat-up and operation. The sensor for the temperature control should be placed close to the working surface for accurate control.

Important Formula To Know:

How to Determine Watt Density

The term "Watt density" refers to the heat flow rate or surface loading. It is the number of Watts per square inch of heated surface area. For calculation purposes, stock cartridge heaters have a 1/4" unheated length at each end. Thus, for a 3/4" x 10" heater rated 1200 Watts, the Watt density calculation would be as follows:

Watt Density = W / (Π x D x HL)

Where:
W= wattage = 1200 W
Π = pi (3.14)
D= diameter = 0.75 inch
HL = Heated Length = 9.5 inch
Watt Density = 1200/(3.14 x .75 x 9.5) = 53.64 W/in

Use the Watt Density Calculator Below for Quick Automated Results:

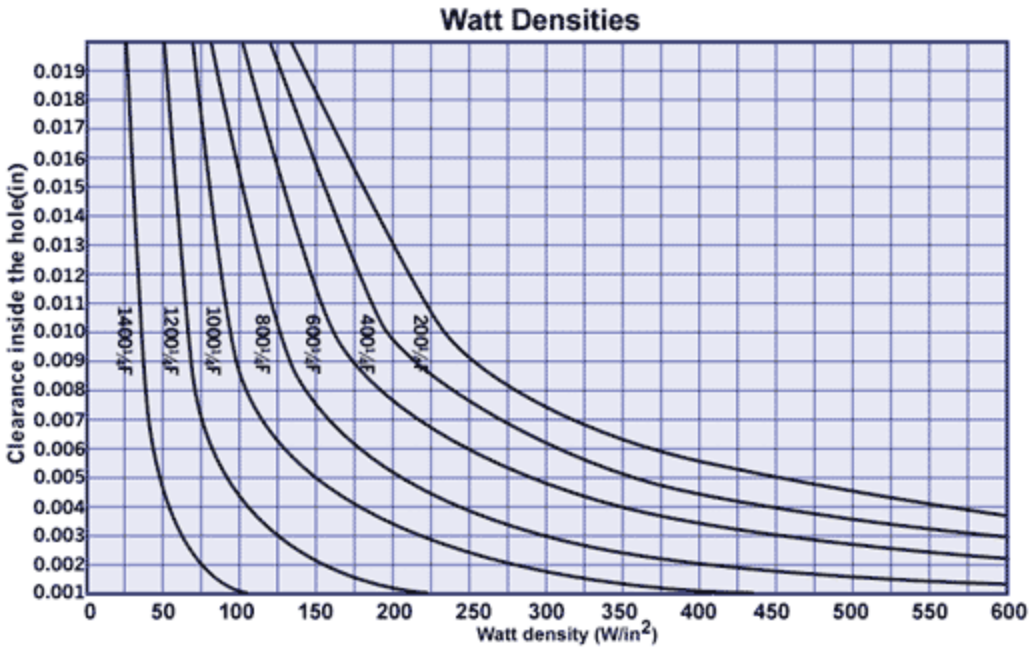
Watt Density Calculator

Calculate Watt Density and Fit - After the wattage for each heater has been established, the watt density and fit must be calculated. Then, use graph below to be sure that the watt density is within allowable limits. For example a 3/4" x 10" heater rated 1200 watts has a watt density of 53.64 W/in^2 . If it were used in a part with an operating temperature of 1000°F with a fit of 0.01", the allowable watt density from the graph would be 90 W/in^2 . Thus, the actual watt density of 53.64 W/in^2 is well below the maximum allowed. A substantial safety margin would exist and high reliability can be expected.

If the heater selected had a watt density higher than that allowed by the graph, consider the following changes.

1. Using more heaters of lower watt density.
2. Using longer or larger diameter heaters.
3. Improving the fit.
4. Reducing heat requirements by reducing heat losses or by allowing for longer heat up time.

Using the Maximum Allowable Watt Density Graph - This graph is useful for choosing type NPH cartridge heaters. The curves should be considered as guides and not precise limits. The graph is based on a 1400°F resistance wire temperature inside the cartridge heater, when the heater is installed in an oxidized mild steel block. Watt density values from the graph should be lowered by about 10% or more when other materials are used which have a lower thermal conductivity or lower emissivity than oxidized mild steel. Contact National Plastic Heater Sensor and Control Inc's Sales office.



Cartridge Heaters-Specifications:

DIAMETRE (NAME)	1/4	5/16	3/8	1 /2	5/8	3/4	1
DIAMETRE (ACTUAL)	0.246	0.310	0.371	0.496	0.621	0.746	0.996
LONGUEUR MAX	36"	36"	72"	96"	96"	96"	96"
VOLTAGE MAX (CSA)	240V	240V	480V	480V	480V	480V	480V
VOLTAGE MAX	250V	250V	600V	600V	600V	600V	600V
WATTAGE MAX AT 240V	1200W	1300W	2000W	3000V	5300W	5300W	5300W
TOLERANCE WATTAGE	+5%						
TOLERANCE DIAMETER	- 10%						
TOLERANCE LENGTH	+/- 0.002"						
TOLERANCE BOMBAGE	+/- 2% OF LENGTH						
	0.010" PER FT UP 12in						

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Terms and Conditions posted at http://www.nphheaters.com/terms.htm apply