
Thermcraft Ceramic Refractory Heaters

This file provides data to model a type of ceramic refractory material radiant heater, produced by Thermcraft, Inc.

<https://thermcraftinc.com/wp-content/uploads/2017/09/CeramicRefractoryHeaters.pdf>

also available at <https://web.archive.org/web/20190224231022/https://thermcraftinc.com/wp-content/uploads/2017/09/CeramicRefractoryHeaters.pdf>

In[194]:=

```
<< materialDataARK`
```

In[205]:=

```
thermcraftHeater[id_, name_, watts_, len_, od_,  
  grooveid_, numGrooves_, volts_] := <|"Model" → name, "ID" → 1.0 id,  
  "OD" → 1.0 od, "Length" → 1.0 len, "Watts" → watts, "Volts" → volts,  
  "Groove ID" → 1.0 grooveid, "Number of Grooves" → numGrooves|>
```

Calculation for volume, taking into account a number of grooves cut out from the heater structure. Later used to estimate the thermal mass.

In[196]:=

```
thermcraftHeaterVolume[h_] :=  
  Block[{len, id, od, grooveVolume, halfCylVolume, vol},  
    len = h["Length"];  
    id = h["ID"];  
    od = h["OD"];  
    grooveVolume = h["Number of Grooves"] (h["Groove ID"]/2)^2 π len;  
    halfCylVolume = len  $\left( \frac{1}{2} \pi \left( \left( \frac{od}{2} \right)^2 - \left( \frac{id}{2} \right)^2 \right) \right)$ ;  
    vol = halfCylVolume - grooveVolume  
  ];
```

In[206]:=

```

in = Quantity["Inches"];
sMullite = materialLib["CeramicHeater"] ["s"];
thermcraftHeatersList =
{thermcraftHeater[1.25 in, "RH211", 100, 2 in, (2 + 1/16) in, 3/16 in, 8, 28.5],
 thermcraftHeater[3 in, "RH251", 360, 3 in, 4.25 in, 1/4 in, 14, 57.5],
 thermcraftHeater[(3 + 3/4) in, "RH261", 825, 6 in, 5 in, 5/16 in, 16, 115],
 thermcraftHeater[(4 + 1/8) in,
 "RH267", 850, 6 in, (5 + 3/4) in, 5/16 in, 16, 115],
 thermcraftHeater[(4 + 1/8) in, "scaled 4 in RH267",
 850 *  $\frac{2}{3}$ , 4 in, (5 + 3/4) in, 5/16 in, 16, 115 *  $\frac{2}{3}$ ],
 thermcraftHeater[7 in, "RH292", 1170, 6 in, (8 + 3/4) in, 5/16 in, 24, 230],
 thermcraftHeater[7 in, "RH292-9Inch",
 (1170 + 2300)/2, 9 in, (8 + 3/4) in, 5/16 in, 24, 230],
 thermcraftHeater[7 in, "RH293", 2300, 12 in, (8 + 3/4) in, 5/16 in, 24, 230]
};
thermcraftHeatersList =
(Append[#, "Volume" → thermcraftHeaterVolume[#]] & /@ thermcraftHeatersList;
thermcraftHeatersList = (Append[#, "Mass" → #["Volume"]  $\rho$ Mullite]) & /@
thermcraftHeatersList;
thermcraftHeatersList = (Append[#, "HeatCapacity" → #["Volume"] sMullite]) & /@
thermcraftHeatersList;
thermcraftHeatersList = (Append[#, "Heating Rate" → UnitConvert[Quantity[
#["Watts"], "Watts"] / #["HeatCapacity"]]]) & /@ thermcraftHeatersList;
thermcraftHeaters = Association[(#["Model"] → #) & /@ thermcraftHeatersList] //
Dataset;

```