Cartridge Heater

Wattco develops and manufactures a series of cartridge heaters, a specialty-heating element for process applications.

The Wattco Cartridge Heater is a cylindrical-shaped, heavy-duty Joule heating element. It has a heating coil consisting of a metal alloy, wound on a ceramic core. The metal alloy used is Nichrome, a Nickel-Chromium mixture, for the wire. Electricity flows through this wire when a two or three-phase voltage is applied. The electricity heats the wire and, subsequently, the cartridge sheath. The watt density (in Watt/inch2) depends on the number of spirals or turns per inch. The sheath comes in contact with the surface being heated and uses high quality stainless steel or Incoloy with a high temperature rating. Insulation in the cartridge heater ensures that the heating wire never comes in contact with the sheath and protects the sheath from melting in case of any mishap. The leads that come out of the heater terminal have metal conduit, or silicon sleeves to protect from high temperature. Lead wires are often fiberglass or silicon rubber.

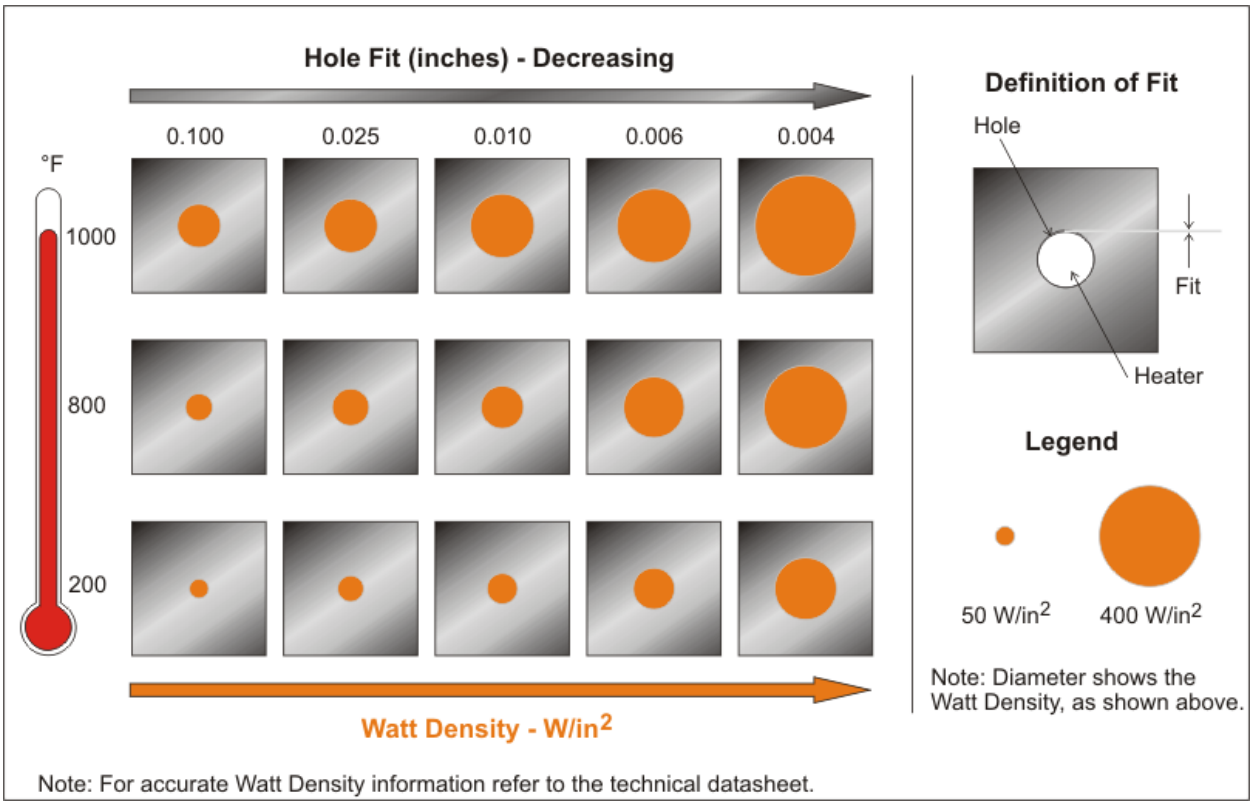
Application

Cartridge heaters are used in heating applications, for example, in heating a solid metal block or a mold. The primary use of cartridge heaters is in process heating required for manufacturing, automotive, laboratory, or food equipment industries.

Selecting the most appropriate cartridge heater depends on several factors such as: wattage need, voltage used, heated length, lead lengths and diameter, maximum and ambient temperature, time needed to reach maximum temperature.

Maximum wattage depends on your application. Use only a watt density that is suitable for your application and one that meets the limits of safety margin.

Consider heating application of a metal block: A very tight fit (see the illustration attached) facilitates adequate heat transfer but installation and removal is difficult. A hole drilled through the entire metal block is desirable for removal of the heater. A simple drilling is sufficient for medium watt density. However, for high watt density application, drilling and reaming are both necessary for the hole in the metal block. The following illustration shows a typical relation of watt density with temperature.



Temperature Control

In order to control temperature, the temperature must be measured with a temperature sensor. You may use surface mount temperature sensors for cartridge heater application. Place the sensor between the working surface of the metal block and the heater. A particular gap or distance is used (consult the technical data sheet) in selecting the maximum allowable watt density.

For high watt density applications, you must use a power control. Two types of power control are available: on-off control and Thyristor-based power control. On-off control causes significant variation in the temperature of parts or the cartridge heater.

You can use one of the different sensors used for cartridge heater application. Each type of sensor (such as: thermocouple, or a Thermistor) comes with adhesive backing for proper placement on the surface of the metal block.

For most applications, use a digital temperature controller that connects to thermocouples as input and provides a DC pulse output. Unlike an on-off control, a DC pulse output is beneficial as it provides a longer time to switch the heater load that increases the heater life.

Frequently Asked Questions

What is the watt density for a cartridge heater?

Watt density is the heat flow rate per square inch of heated surface area of the cartridge heater. It depends on the Wattage (W) of the Nichrome wire and calculated as

W / (3.14 x Diameter in inches x Heated Length in inches)

Do you need maximum wattage?

Maximum wattage depends on your application. Use only the watt density that is suitable for your application and ensure that your cartridge heater meets the safety margin.