

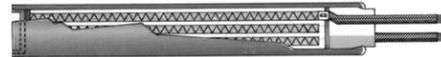
December 13, 2012

Cartridge Heaters: How They Are Made & Why They Fail

Are your heaters failing prematurely? Would you like someone to tell you why they are failing? **PRIME** has an engineer, John Zerbo, Sr., with over 40 years of experience solving electric heater applications. He can tell you why your heaters are failing and what you can do to extend their life.*

The useful life of a cartridge heating element is determined by how quickly the heat generated in the resistance wire can be dissipated to the outside sheath. To accomplish a useful life of the heater, two methods of manufacturing cartridge heaters are available; **STANDARD** cartridge heaters and **SWAGED** cartridge heaters. Although both type of heaters look identical, the internal construction is very different.

STANDARD CARTRIDGE HEATERS



Nichrome wire heater coils are inserted in holes formed in ceramic tubes. Pure magnesium oxide filler is vibrated into the holes housing the heating coils to allow maximum heat transfer to the stainless steel sheath. The heater then has a heliarc welded end cap inserted on the bottom of the heater and insulated leads are installed.

SWAGED CARTRIDGE HEATERS



Nichrome wire is wound around a ceramic core which situates it in close proximity to the heater sheath. Pure magnesium oxide (MGO) is then vibrated in and the heater is swaged to a specific diameter. This compresses the MGO so it becomes an improved conductor of heat from the wire while maintaining its dielectric properties. This improves the heat transfer rate and allows for higher watt densities to be used on swaged cartridge heaters. Swaged heaters can operate at higher temperatures and vibration applications with trouble free service.

WHY DO CARTRIDGE HEATERS FAIL?

1. IMPROPER FIT!

The most common cause of cartridge heater failure is an improper fit in the hole into which it is inserted. If the heater cannot dissipate the heat being generated by contact with the sheath, the temperature inside the heater will continue to rise until the MGO or resistance wire breaks down and the heater fails.

2. MOISTURE AND/OR IMPURITIES ARE PRESENT!

The MGO used in cartridge heaters is hygroscopic. Every time power to electric heaters is eliminated, an internal vacuum occurs which draws in air from the surrounding area. If moisture or impurities (oil, gas, etc.) are present, they can be drawn into the heater and cause a short circuit resulting in heater failure.

3. WATT DENSITY IS TOO HIGH!

If the watts/square inch is excessive, the heater will not be able to dissipate the heat and the heater will fail.

4. INCORRECT VOLTAGE!

The wattage of any electric heater varies as the square of the voltage. If a 120 volt heater is powered on 240 volts, the wattage will be 4 times greater than that for the same 120 volt heater. This may result in heater failure.

PRIME INDUSTRIAL

PRIME has been providing solutions to electric heater applications for over 40 years. We have cartridge heaters; round, square, and rectangular from 1/8" to 2-3/8" diameter and metric sizes from 6 mm to 20 mm. We have special features for lead configuration and protection, end seals for adverse environmental situations, and sheath materials from stainless steel to titanium.

Check out some of the electric heaters that we offer by clicking on the links below:



*John Zerbo, Sr. is available to visit your facility to examine a failed heater and recommend a more suitable replacement. To schedule a visit, please contact our office at 201-262-9090 or email sales@prime-industrial.com.

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