



Cartridge-Heaters-Metric-Insertion-Heaters.com
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Cartridge Heaters–Installation Tips & Preventive Maintenance:

Avoiding Contamination

When using a release agent, to ease heater removal from its hole, be sure to wait until agent is bone dry before inserting the heater into the hole. If the heater is inserted before the agent is dry, some of the liquid will usually be pushed towards the lead end and then will soak into the heater through the lead insulation or through the lava or ceramic plug at that end. When that happens, the heater can be expected to fail as soon as the power is applied. (Choosing the lead option of Teflon wire insulation and a Teflon plug can reduce the likelihood of water entering the heater, but this does not provide a fully hermetic seal, and the lead end of the heater must be restricted to 400°F)

- Moisture, oil or other liquids on the lead wires can be wicked into the heater and cause early failure.
- Oil or other organic material on the lead end cap of the heater will carbonize at elevated temperature, causing a short from the leads to the sheath.

Avoiding Over-Temperature

- A loose fit of the cartridge heater in its hole will reduce the heater's life time because the heat generated is not transferred efficiently to the object or material being heated, causing the heater to run at a higher temperature to transfer its energy. The higher the operating temperature, the shorter the lifetime. A rule-of-thumb for the fit is to make the hole diameter no more than .005 inches greater than the diameter of the heater.
- Choose the lowest wattage heater that will maintain the desired operating temperature of the part being heated and still provide a short enough start-up time. Choosing a heater with higher wattage than required will result in the controller

turning the heater on and off to maintain the desired temperature and a higher operating temperature during on-time. These conditions will shorten the heater life.

- If used as an immersion heater, the type of fluid and its velocity passing over the heater are important factors. Ask for assistance from a NPH Applications Engineer.

Excessive Cycling

- The way that National Plastic Heater evaluates the lifetime of their own cartridge heaters and those from competitors is to cycle the units from 150° F to 1,400° F and count the cycles to failure. Cycling reduces lifetime because the surface of the element wire oxidizes rapidly at higher temperatures; if the higher temperature is maintained, the oxide coating actually protects the wire from further oxidation, but if the wire temperature is reduced substantially, the oxide coating breaks off due to contraction and exposes fresh metal to more oxidation. With continuous cycling, the wire diameter is eventually reduced, and the resistance of the element is increased to the point that it becomes too hot. At that point, the element wire either melts and breaks open the circuit, or it causes the insulation over the wire to break down, causing a short to the sheath.

What Shortens the Lifetime of Resistance Heaters ?

Aside from mechanical abuse and manufacturing defects, there are three basic causes of early heater failure:

Five Common Causes of Cartridge Heater Failures and Tips for a Longer Heater Life

1. **Contamination:** Hydraulic fluids, material and moisture have shortened the lives of more cartridge heaters than just about anything else out there. In instances where contamination cannot be avoided, there are lead configurations that can help retard the contamination entering the heater and often, if there is a moisture problem, you can run the heater at a reduced voltage for a few minutes to reduce the chance of the element shorting to the sheath when you apply full power.
2. **Lead Failure Due To Heat:** Our standard leads are only rated to 842 degrees Fahrenheit under optimum conditions. This rating decreases with higher amperages, so often, reducing the wattage or increasing the voltage will solve the problem or you can use the cartridge heater configuration which utilizes ceramic beads over the pin wires as insulation.
3. **Lead Failure Due To Excessive Movement:** The first, easiest and least expensive fix for this is to use swaged leads rather than crimped leads. The swaged leads are connected internally and are able to withstand bending from the point of exiting the cartridge heater while the crimped lead configuration has a solid nickel pin wire exiting the cartridge heater to

which the stranded lead wire is crimped and then covered with a high temperature boot for insulation. Another possible fix is to use flexible stainless steel hose which retards the ability of the wire to make repeated sharp bends.

4. **Improper Usage:** As discussed earlier, if there is a heated part of the cartridge heater exposed to air while the rest is inserted in something conducting the heat away, the heater will fail prematurely. If you need to have a section of the heater exposed, you can specify a cold section when ordering your cartridge heater.
5. **Wattage or Amperage Too High:** This is pretty straightforward. The lower the watt density, the longer your cartridge heaters will function. There's always a trade-off with start up time and heater life.

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