Cartridge heater installation notes

Warning: The suitability of cartridge heaters for any application is solely the responsibility of the end user.

Only an electrically qualified person should install these products.

Avoid installing heaters in an atmosphere containing combustible gases and vapours.

Hole size

General speaking cartridge heaters are designed to be inserted into a hole in some kind of metal block. The hole size drilled should be as close to the nominal diameter of the heater as possible. Cartridge heaters are designed to have a diameter a fraction under their stated size to allow a good fit into a hole of the stated diameter.

When drilling the hole it is recommended that a reamer is also used to make sure the hole size is as accurate and as smooth as possible inside.

If a heater is loose in its working position, even with minimal air gaps, it cannot dissipate its heat as efficiently and it can fail prematurely. The poorer the fit the higher the chance of premature failure. If the heater can move in the hole side to side even a minute amount then the hole is too big.

Contamination

Along with incorrect hole size one of the most common reasons for premature failure of a cartridge heater is contamination. This can take many forms, one of the most common is heat transfer compound. This can become less viscose at temperature and flow through the standard end cap (ceramic) into the exposed electrical connections at the lead exit end of the heater. This can then cause electrical shorts and failure.

Moisture present locally can also penetrate the lead exit end of the heater again causing failure. Water and other liquids can also wick along the woven lead wires beyond the end cap and short the heater.

If moisture or other contaminants are present in the application environment then it is advisable to seal the lead exit end of the heater and use non- woven lead wires such as silicone or PTFA.

Avoid using any adhesive based sticking tapes on the leads as the adhesive on tapes can become less viscose if heated and drip into the lead exit.

Excessive temperature

It is important to make sure that the correct lead wires are specified and these are capable of withstanding the temperatures and environmental conditions of where they are installed.

Lead wires should always exit the heater outside of the hole the heater is inserted into and never inside the hole. If the application is particularly high temperature then the provision of other lead connections should be considered, such as crimping on externally onto solid pins that exit the heater with high temperature sleeving over the join or ceramic beads on the first portion of lead wires.

The heated portion of the heater should not be exposed to air, for example when inserted into a block you should avoid having any part of the heater sticking out if it is part of the heated section. The first small section of the heater at both ends is cold (the length varies between diameters, check the heater data sheet for dimensions of cold sections) beyond this the heater is hot and in free air it will get as hot as its watt density will allow, far hotter than the section that is inserted. In most cases this would result in premature failure.

Excessive movement

Movement of the heater wires in the application can also have a profound effect on its longevity. If the lead wires are constantly under stress through movement or tight bends then they can become frayed and break down causing an electrical short or open circuit.

Soft silicone potting can be used in the lead exit end of the heater in conjunction with more flexible silicone wires to mitigate some movement, working temperature permitting. Other forms of strain relief are also possible such as springs, additional sleeving or metal conduits.

Temperature control

It is recommended that close control is used to regulate the temperature of cartridge heaters. A temperature sensor should be placed as close as possible to the heaters and control such as PID should be used where possible.

Large swings of temperature should be avoided as this can reduce the life of the heater by weakening the resistance wire. Smooth control such as PID in conjunction with solid state switching is the ideal.

Storage

Care must be taken when heaters are stored, the internal construction contains materials that are hygroscopic. If the environment is too humid then moisture can be absorbed from

the air into the heater. This can cause earth leakage problems and or failure. Heaters that have taken on moisture often take out MCB's/RCD's on power up.

In some cases moisture can be baked out of heaters by putting the heaters into an air oven at a temperature of around half the maximum temperature of the lead material. However it is of course better to prevent moisture ingress in the first place by selecting an appropriate environment to store the heaters and by placing the heater into sealed bags.