PIROWATT
- High Power Cartridge Heaters -

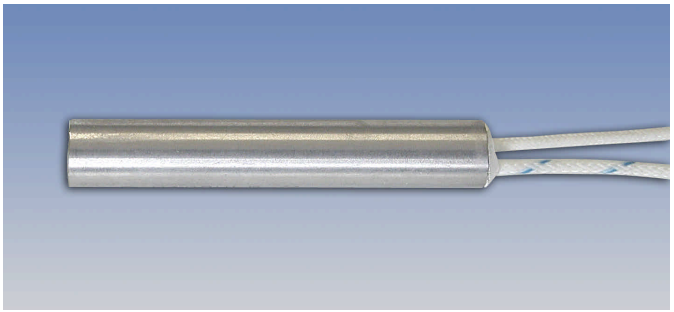
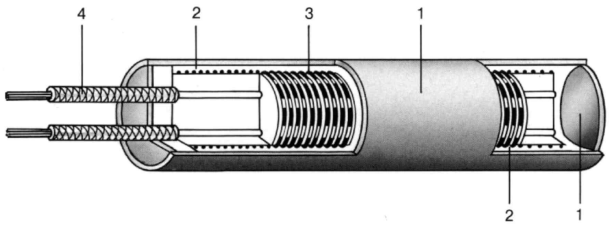


Figure 1



GENERAL CHARACTERISTICS

These heaters are characterised by a ***high specific power and a high reliability***: These qualities are essential in the applications for which they have been conceived.
These heaters can reach specific powers as high as 50 W/cm² and operating temperatures up to 750 °C.
PIROWATT cartridge heaters power supply cables are embedded into the heater head (see Figure 1) without junctions or stiff parts: this manufacturing solution has eliminated all the problems and allows to limit the non-heating ("neutral") section to a 3 ÷ 4 mm.
These heaters undergo final acceptance testing as required by EN 60335-1 specification and are manufactured to comply with VDE 0720 specifications.

APPLICATIONS

These heaters are used in the heating of moulds, plates, injection nozzles and hot-channel injection nozzles. They can be employed, inserted into appropriate slots, in the heating of all metallic masses, provided that the operating temperature does not exceed 750 °C.

TECHNICAL DATA (see Figure 1)

1. **METALLIC SHEATH** made of stainless steel suitable for high temperatures. The sheath surface is ground and the bottom is water-tight and corrosion resistant
2. **ELECTRICAL INSULATION** made of highly concentrated pure magnesium oxide
3. **RESISTIVE WINDING** made of Nickel/Chrome 80/20
4. **POWER SUPPLY** provided by a couple of pure nickel conductors, with a silicone-impregnated fibreglass insulation.

DIMENSIONS

PIROWATT cartridge heaters are available on stock in several dimensions which differ in diameter and/or length (see table below).
For all heaters the dimensional tolerances are $f^{-0.02}_{-0.08}$ for the nominal diameter and ± 1.5 % (with a maximum of 2 mm) for the length. The nominal length is the real cartridge length.

POWER

PIROWATT heaters are normally manufactured with a specific power of about 25 W/cm^2 but it is possible to manufacture them up to 50 W/cm².
PIROWATT heaters heating power is constant even if they belong to different production lots: the nominal power is guaranteed with a tolerance of ± 10 %. Thanks to this characteristic it is possible to insure an overall stability of the heating system also after the replacement of several heaters.

COUPLING SLOT

PIROWATT heaters shall be inserted into appropriate slots which have been machined inside the mass to be heated. A Slots surface finishing shall be very good for the coupling to be optimum: the presence of scores or grooves creates stagnant air pockets which, even if very small, insulate thermally the heater causing locally a strong increase of the temperature and a reduction of the heater life (see also Figure 2).

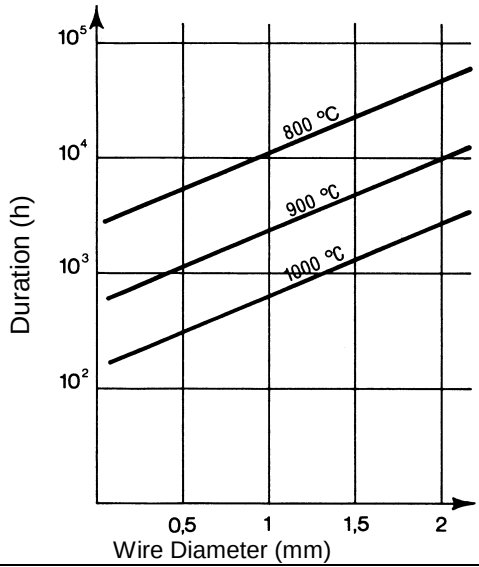


Figure 2: Nickel/Chrome 80/20 winding lifetime (in hours) as a function of the operating temperature and of the wire diameter

The cartridge heater, when hot, expands by few cents of a mm. Hence the tolerances on the slot dimensions is less important than the surface finishing quality. The best result is obtained with an H7 reamer.

ELECTRICAL CONNECTION

The connection to the power supply (monophase) is normally via a couple of nickel cables. Upon request, special cable terminals (see section "Special Constructions") can be provided.

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HEATERS WITH EMBEDDED THERMOCOUPLE

When there is not enough room for the separate installation of a thermocouple, heaters with embedded thermocouple can be used.
Standard heaters, available on stock, contain a J-type thermocouple with an Iron/Constantan junction. The thermocouple is located close to the bottom of the heater and is isolated from the metallic sheath.
Other constructions are possible too. Please consult section "Special Constructions"

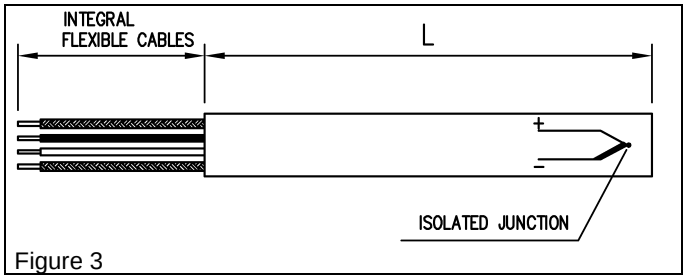

Figure 3

INSTALLATION INSTRUCTIONS

Each heater shall be inserted into its appropriate slot. Please make sure that the surface finishing of the slot is very good (see section "Coupling Slot"). To prevent a blockage of the heater within the slot after a long period of operation, NEVER-SEEZ lubricant (see data sheet in Figure 4) can be used. This product, however, shall not be used to compensate poor finishing conditions of the slots: i.e. it is not possible to use this lubricant to fill scores, grooved, excessive clearance.
Heaters cables shall be installed such that rubbing and pressure points are avoided: this, in fact, is necessary to avoid an early damage of the insulation. Under this respect, it shall be verified that the movements of the heated masses do not damage the electrical connection areas.
Silicone-rubber insulated cables should be used in place of fibreglass-silicone ones (see section "Special Constructions") whenever the environmental temperature allows to do so. These cables, in fact, can provide the best flexibility, especially if they are spiral-winded

Figure 4:**NEVER-SEEZ Lubricant**

Very effective against corrosion, makes the heater extraction easier after a long operational period.
Operating Temperature: -180 °C / + 1200 °C

SUGGESTIONS FOR THERMAL CONTROL

The adoption of a proper thermal control system is a key parameter if an efficient heating of the mass to be heated is desired. In addition, such systems allow to insure the longest lifetime to the heaters.
First of all, it is recommended to locate the temperature sensors, as much as possible, at equal distance from the surrounding heaters: this will avoid (see also Figure 5) excessive heating (high thermal inertia due to an excessive distance between sensor and heater - ①) or high-frequency heating cycles (too rapid response caused by a too short distance between sensor and heater -②).

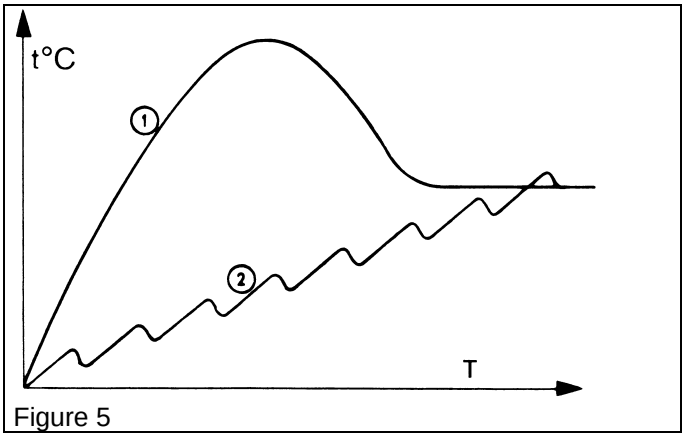

Figure 5

The use of thermo-regulators using SCR components is recommended. These systems, in fact, turn the heaters ON only when the sinusoidal curve crosses the zero ("Zero crossing" activation) thus reducing considerable the thermal shocks on the heater resistive winding (See Figure 6 – point①)

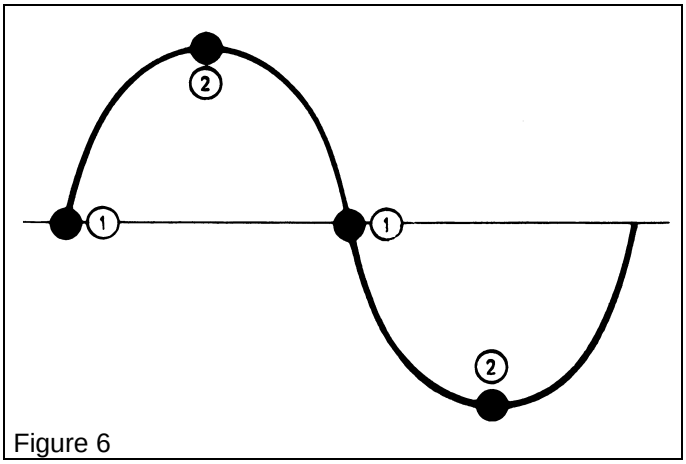

Figure 6

ON/OFF regulators can turn the heaters ON in any point of the sinusoidal curve (see Figure 6 – point②) causing very high thermal shocks on the heater winding and a consequent reduction of the heater lifetime.