

HotMicroCoils Nozzle Heaters

Dear Customer,

we would like to use this opportunity to thank you for buying this product from Friedr. Freek GmbH.

Please read this document carefully before installing the heater in order to learn important facts regarding the product's safety and use.

More information about our products you can find on our website: freek-heaters.com.



Inhalt:

Introduction.....	2
Safety	2
General Remarks	2
Instructions for Installation.....	3

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Introduction

Our HotMicroCoil heating elements can be used in a wide variety of applications. Their high level of plasticity ideally suits them to the heating of hot runner nozzles and for accurately heating the contours of three-dimensional surfaces. Many of our customers order HotMicroCoil elements in their unformed state and perform the subsequent shaping work themselves, while others commission us to shape and fit the elements. A large number of ready-to-fit system solutions are available for plastic injection nozzles with clamping mechanisms, housing bezel, reflection tube or heat conduction sleeve.

In micro-injection moulding systems and high-performance tools with small cavity spacings, the preferred elements are MicroCoils, which are as thin as 1 mm, while where there is more space in the hot runner or the heat demand is higher, the more powerful HotCoils are used. With its larger cross-section, the latter type has its connection point at one end as standard, and a Type J or K thermocouple can also be integrated on request.

Safety

As a manufacturer of heating elements, Freek is not responsible for the conditions in which its heating elements are installed and connected in the various customer-specific applications in which they are used, nor is it responsible for how the heating elements are controlled there. Rather, it is the customer's responsibility to be aware of and observe good engineering practice as it is recognised in the application and business markets in question. For example, many machines and their equipment are subject to the standard EN 60204 "Safety of machinery – Electrical equipment of machines".

Additionally, the customer is responsible for ensuring that electrical heating elements are only ever connected under the responsibility of a qualified electrician. This is because only a qualified electrician will know the risks associated with electrical heating elements, such as fire, explosion, combustion or electric shock, and – even more importantly – will know the safety measures that need to be put in place in order to prevent such events from occurring, even if the heating elements malfunction. Examples of these safety measures include protection against contact, thermal insulation, electrical insulation, temperature control, overtemperature prevention, earthing, residual current operated circuit breakers, overcurrent circuit breakers and miniature circuit breakers.

General Remarks

- Because of the hygroscopic characteristic of the used ceramic insulation materials they absorb **moisture**. In order to slow down this process and, at best, to avoid it completely, our heating elements are specially sealed by means of suitable preventive measures. Additionally we send our HotMicroCoil heating elements usually in air-tightly sealed plastic bags. If the bags are opened and the heating elements are not used at once, we recommend to repack the elements air-tightly. Despite all preventive measures taken it can occur in single cases, especially after long „open“ storage and in extreme climatic conditions, that the insulation resistance is very low ($< 5 \text{ M}\Omega$) before initial operation. This might lead to tripping of the residual current circuit breaker, especially in high-cavity tools without controlled start-up. It is absolutely important to check the insulation resistance before use and – if necessary – to dry the elements (controlled start-up or drying oven).
- The **temperature stress** of max. 750 °C on the tube is not valid for the connection area nor brazed heating elements (e.g. HotMicroCoil with Reflection Tube) The latter must not be operated at temperatures higher than 600 °C as this could fuse the braze. The temperatures arising in the connection area determine decisively the suitability of the available terminations.
- The stated **nominal voltage** must not be exceeded, otherwise overheating is risked. For example, 253 V instead of 230 V (+10%) lead to 21% higher power!
- Generally it can be said: the better heat is carried off, or flows into the work piece respectively, the higher the **surface watt density** on the sheath can be. When calculating the power, the temperature control and the position of the thermocouple must always be taken into consideration.
- A too slag **fit** obstructs the heat conduction and leads to heat accumulation that could overheat and eventually destroy the heater.

Operating Instructions

- In every practice application there are working and environmental parameters which cannot be calculated exactly in theory. That is why we recommend generally to test HotMicroCoil elements in the application under real working conditions before series use.

Instructions for Installation

Our straight, bendable, annealed HotMicroCoil heating elements can be formed into almost any three-dimensional shape by coiling and bending or pressed into complex groove geometries. If this **shaping or fitting is carried out by the customer/user**, it is essential that the customer/user observes the following service life/functionally relevant instructions:

1. Square and rectangular heater sections tend to "tilt" during **coiling**. Therefore, after the coiling process it must be ensured that the coils are again parallel to the cylinder to be heated and lie flat. This is the only way to ensure the optimum heat transfer. When using our HotMicroCoil heating elements without an external housing, it is recommended that the inner diameter is produced in undersize. This provides additional pre-tension to the windings that lie flat against the surface.
2. When **bending** the cold connection area, the first winding can easily lift off the cylinder surface to be heated if the procedure is not carried out correctly. The heating zone in question can no longer transfer its heat as intended and will invariably overheat. Temperatures of over 750°C are then quickly reached on the heater, creating layers of scale that further prevent heat transfer. It is always possible that an otherwise functioning heater thus fails.
3. When coiling and bending our HotMicroCoil heaters, the **minimum bending radii** given in the table below must always be respected. In the case of rectangular cross-sections, these always refer to bending over the "small side".

MicroCoils				HotCoils			
■	1,0 x 1,6	min. Inside-∅	4 mm	■	1,8 x 3,2	min. Inside - ∅	8 mm
●	1,3	min. Inside - ∅	4 mm	■	2,2 x 4,2	min. Inside - ∅	8 mm
■	1,3 x 2,3	min. Inside - ∅	6 mm	■	2,5 x 4,0	min. Inside - ∅	12 mm
■	1,4 x 2,4	min. Inside - ∅	6 mm	●	3,0	min. Inside - ∅	6 mm
●	1,8	min. Inside - ∅	6 mm	■	3,0 x 3,0	min. Inside - ∅	8 mm
●	2,0	min. Inside - ∅	6 mm	■	3,2 x 3,2	min. Inside - ∅	12 mm
				●	3,3	min. Inside - ∅	8 mm
				●	4,0	min. Inside - ∅	12 mm
				■	4,0 x 6,0	min. Inside - ∅	24 mm

4. Please note that HotMicroCoil heaters can break because of work hardening if they are **bent several times** at the same point. Corrective bending is still possible, but should be done gently and at best at a different position than the original bending point.
5. Sharp-edged tools are to be avoided for all **bending processes**. Otherwise it is possible that the sheath of the heater is damaged or deformed. Both can destroy the heating wire, the connection wire or the insulation inside the heater and thus result in failure.
6. The heated area of the heating element can be slightly deformed when **pressed into the groove or pressed on the nozzle**. A too strong deformation can critically reduce the insulation distances of the current-carrying parts inside to the sheath and lead to a short circuit. If the deformation also reduces the section, this can affect the heater length as well as the resistance of the heater. The heating wire can become narrower due to the forces involved and can burn as a result, but it also can become brittle and break. The degree of deformation that is acceptable cannot be accurately predicted in theory. For this reason we recommend to test HotMicroCoil heaters in the specific operating conditions before using them in series and to contact us.

In case you have any questions regarding installation / bending of our HotMicroCoil heaters, please do not hesitate to contact us. We are happy to help.

No warranty claims can be derived from these user instructions.