

## Flat Heating Elements (over 200°C)

Heating Elements in Micanite, Phlogopite and Ceramic

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](http://freek-heaters.com).



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## Introduction

Flat heating elements are used wherever a flat side has to be heated symmetrically and effectively. Constructed of coiled wire, printed circuit or ink and two shifts of insulation, custom-made adaption to nearly any surface and dimension is possible. Simultaneously an optimal heat distribution over the heated flat side is achieved.

The main selection criterion for flat heating elements is the maximum surface temperature permitted for the insulation material being used. Especially the 200 °C threshold is of major importance as for applications exceeding this temperature the most versatile and flexible polymer insulated Silicone mat heaters, Kapton-Polyimide film heaters and Polyester heaters are no longer an option. Above this 200 °C limit Micanite insulated flat heaters (< 350/450 °C) and ceramic heaters (> 450 °C) are available.

When using a flat heating element properly an optimal temperature distribution can be achieved on the surface to be heated. Uneven contact of the heater to the surface may lead to hot spots. It is important that the produced heat can flow off. Conducting the heat is only possible with an ideal contact to the object to be heated. Poor contact leads to partial overheat on the heating wire. Thus the insulation is damaged and a flashover may occur. The overstrained heating wire embrittles, breaks or burns out.

## 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 & Handling

- The leads must not be strained (danger of tearing the leads off).
- The max. working temperature according to insulation given in the catalogue resp. internet must not be exceeded:
  - Micanite: max. 350 °C (short-term: 700 °C)
  - Phlogopite: max. 450 °C (short-term 900 °C)
  - Ceramic: max. 450 °C
- Our heating elements are designed for being operated at defined voltages. Operation at higher voltages may reduce lifetime considerably or result in immediate failure (15% more voltage = 32% more power!).
- Heating elements should not be bent or creased.
- Uneven contact of the heater to the surface can lead to heat accumulation. It is important that the generated heat can dissipate. The dissipation of heat can only be achieved by an optimal contact to the object to be heated.
- In the case of micanite heaters, this requires pressing on by means of a counter plate. Insulation should only be applied after the contact pressure plate.

# Operating Instructions

- Insufficient contact leads to partial overheating on the heating wire. This damages the insulation and can lead to a breakdown. The overstressed heating wire becomes brittle and breaks or burns through directly.
- If the flat heating element is used to heat a filling material or a liquid, the application mustn't be empty when operated.
- In temperature critical applications we strongly recommend to protect the flat heating elements from over-temperature by using limiters and fuses or additional safety temperature sensors to be integrated into an existing controller unit.
- 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 our flat heating elements in the application under real working conditions before series use.

## Fastening

Micanite and phlogopite are mica insulating materials impregnated with a heat-resistant binder and then pressed into sheets in several layers under heat and high pressure. These materials are resistant up to 350 °C (micanite) or 450 °C (phlogopite) and are used for the winding strip as well as for the upper and lower cover plate. Due to the "sandwich" construction typical of these surface heating elements and their mostly high power density, it is necessary to use a pressure plate to clamp them onto the surface to be heated. The surface heating elements can be enclosed in metal for mechanical stabilisation. The resulting flexibility also makes it possible to build them as a sleeve.

Uneven contact between the heater and the surface can lead to heat accumulation. It is important that the generated heat can dissipate. The dissipation of heat can only be achieved by an optimal contact to the object to be heated. For this purpose, these heaters need to be pressed on by means of a counter plate. Insulation should only take place after the pressure plate.

No warranty claims can be derived from these user instructions.