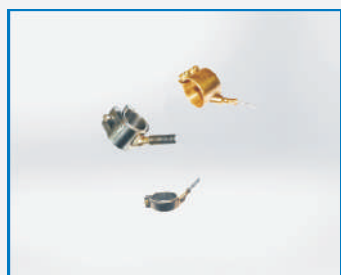
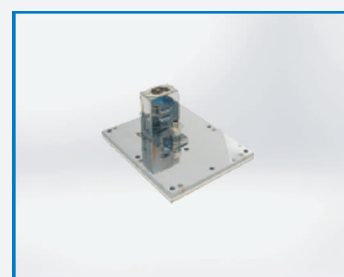
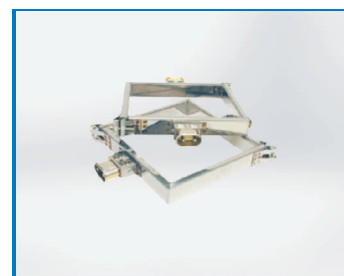


# ELECTRIC HEATING



*we get to the point...*

# Experience and competence

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made in germany



we get it to the point...

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Our expertise of more than 40 years in the development and production of temperature sensors has enabled us to become one of the leading manufacturers of temperature, measurement and control systems.

Our product portfolio includes more than 5000 different active articles with more than 20000 variations. Therefore, we are in a position to cover almost all areas, where temperature, measurement and control systems are used. Today, our sensors, control units, control systems, actuators, melt pressure transducers as well as our products from the electric heating technology range are applied in the plastics, pharmaceutical, food and raw material processing industries worldwide.

We provide countless solutions in the fields of temperature, measurement and control engineering to the full satisfaction of our customers every day. Our success is mainly based on our broad expertise and our common goal of constant improvement.



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The organisational structure of Gräff GmbH is specially aimed at optimum functionality and customer-friendly service. Well-defined competences and flat hierarchies enable short decision-making processes and quick responses to all customer requests and market situations.

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The company was founded in 1946 by Heinrich Gräff, the grandfather of today's Managing Partner, Marion Hupperich, as a craft enterprise. After constant further development it started the production of temperature sensor technology in 1964 laying the foundation for our current product portfolio. We moved into the new production and administration buildings in Bonner Straße in 1985. Today, we manufacture high-quality products with state-of-the-art machines and plants on more than 2500m<sup>2</sup>.

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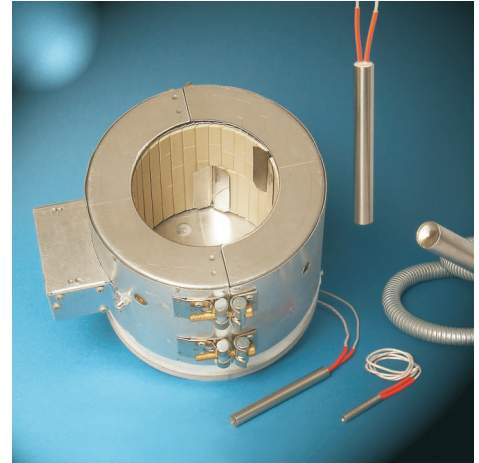


we get it to the point...

## Quality and precision

Electric heating systems by Gräff GmbH provide high quality and are characterised by great workmanship, a long life cycle and efficiency. .

Our experience in the construction and manufacturing of heaters enables us to adjust every heating device to your individual requirements or to redesign it, respectively. You receive a product that can be optimally integrated into your application and thus unfold its entire performance spectrum in service.



The use of first-class materials as well as company-wide certified and monitored processes ensure a constant quality of heaters by Gräff, which will certainly meet your requirements.

Special solutions in the field of electric heating technology are not considered a problem at Gräff but rather a challenge to be mastered. Even if your application is characterised by confined conditions or other complex structural circumstances, we will gladly provide solutions for your company.

Of course, we also offer the respective accessories for any heaters provided. We also offer special accessories solutions for electric heating technology upon request.

## General

Our heating cartridges serve the purpose of direct heating of tools or tool components. The most frequent application areas of heating cartridges include: moulds, tools, heating bars and various mechanical parts, for example in the plastics processing and packaging industry.

Today, there are mainly three different versions of heating cartridges.

### High-performance heating cartridge

The high-performance heating cartridge (HLP) has emerged as standard heater with a variety of application areas in the past few decades. The advantage of the HLP is its design with a particularly small distance from the heating conductor winding to the outer sheath and the excellent resulting heat transfer. This design enables surface loads of 30 W/cm<sup>2</sup>.

### Spiral heating cartridge compacted

A compacted heating cartridge HPV constitutes a design compromise between a high-performance heating cartridge and an uncompacted heating cartridge. Spiralised heating conductors are run through hole ceramic for this design. It is particularly suitable for applications that do not require high surface loads, i.e. a maximum of 12 W/cm<sup>2</sup>.

This extremely robust heater can also be manufactured with great lengths.

### Spiral heating cartridge uncompacted

These heating cartridges mainly differ from the heaters described above due to their uncompacted design. The heating conductor is embedded in magnesium oxide (MgO) for this design. You can implement surface loads of up to 5 W/cm<sup>2</sup> with this cost-efficient heater.



## Technical Data

- **Diameters of the heating cartridges (metric)**  
6,5 mm, 8 mm, 10 mm, 12,5 mm, 16 mm 20 mm
- **Diameters of the heating cartridges (in inches)**  
1/4", 3/8", 1/2", 5/8", 3/4"
- **Connection voltage**  
230 volt AC, 400 volt AC  
Special voltage possible
- **Connection types**  
Reduced litz wire, straight outlet  
Angular outlet in the form of a pipe section, pipe bend, etc..
- **Electrical connection**  
Standard glass-fibre-insulated nickel litz wire  
PTFE, Teflon-insulated litz wire, silicone cable
- **Feeder protection**  
Metal braided hose, metal corrugated hose  
Glass-fibre hollow hose, ceramic beads

The products shown here are basic versions  
and can be adjusted to your requirements..

## General

Our heating bands of the type series ZHB (micanite version) and KHB (ceramic version) serve the purpose of direct heating of tools, moulds and cylinders from almost all sectors of industry. Apart from their variable connection options (connection fitting with or without built-in box as well as a connection line) these heating bands are characterised by user-friendly fastening options, which enables quick and trouble-free replacement.



## Equipment / characteristics

- Stainless steel version, steel-zinc-plated, steel-chrome-plated
- Customer-specific version
- Version with heating wire made of sheet steel (ZHB)
- Version with heating wire made of ceramic (KHB)
- Variable fastening system
- Variable connection system
- Temperature range of up to 650°C
- Heating power of up to 9.0 W/cm<sup>2</sup>
- Heat protective shell (optional)
- Heat conduction sheet (optional)
- Bore holes and gaps
- Bore hole and holder for temperature sensors

## Technical data

### ZHB

- **Customer-specific design**
- **Maximum temperature**  
350 °C
- **Minimum diameter**  
35 mm
- **Minimum heating band height**  
20 mm
- **Maximum heating band height**  
800 mm
- **Heating power**  
5,0 W/cm<sup>2</sup>

### KHB

- **Customer-specific design**
- **Maximum temperature**  
650 °C
- **Minimum diameter**  
60 mm
- **Minimum heating band height**  
21 mm
- **Maximum heating band height**  
optimal
- **Heating power**  
9,0 W/cm<sup>2</sup>

The products shown here are basic versions and can be adjusted to your requirements.

# Electric heating technology

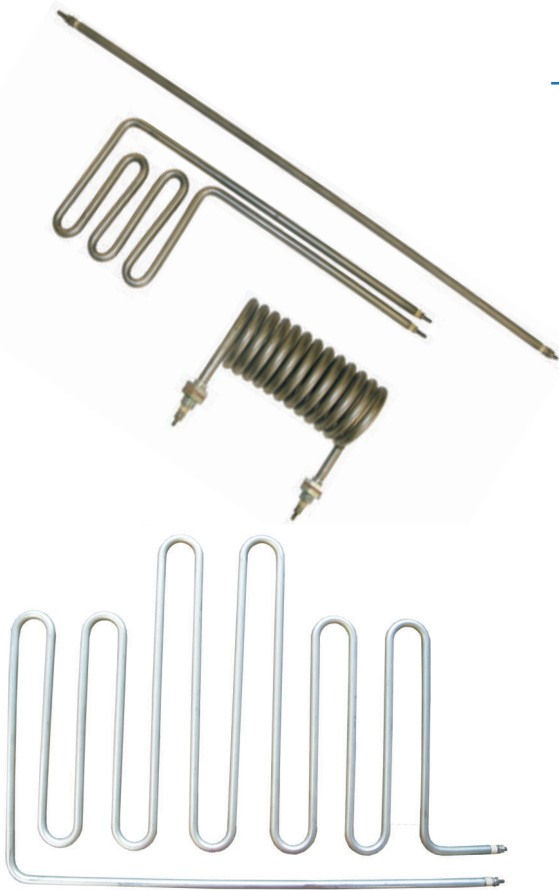
## Product groups

### RHK series / tubular heaters



we get it to the point...

## General



Our tubular heaters have a diameter of 6.5mm and 8.5mm and consist of high-alloyed chromium-nickel steel. The current-carrying, spirally-wound heating conductor is made of high-temperature-resistant chromium-nickel resistance wire. This heating conductor is centrally embedded and insulated inside the jacket pipe. Fine-grained magnesium oxide characterised by its particularly good heat conductivity and excellent insulation values even in case of high temperatures is used for insulation. The heat element ends are unheated and sealed as well as locked with a ceramic end bead according to their intended purpose. The surface load of the tubular heaters in  $W/cm^2$  depends on the intended purpose. Therefore, the performance and dimensions of all tubular heaters have to be designed according to their intended purpose..

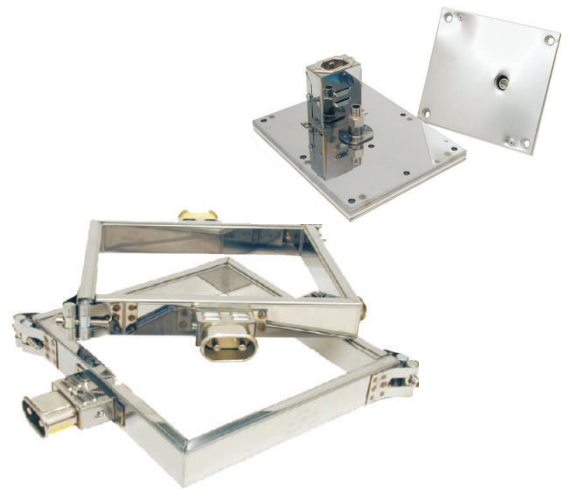
## Technical data

- **Heating jacket materials**
  - Stainless steel material No. 1.4571
  - Stainless steel material No. 1.4828
  - Stainless steel material No. 1.4404
  - Incoloy 800 material No. 1.4876
  - Incoloy 825 material No. 2.4858
- **Electrical connection**
  - Standard threaded bolt M 4
  - Smooth bolt
  - Contact pin
  - Glass-fibre-insulated nickel litz wire
- **Bent shapes**
  - U-shape
  - W-shape
  - Meander-shape
  - Spiral-shape and special shapes
- **Voltage**
  - 230 Volt AC
  - 400 Volt AC
  - Special voltage possible
- **Stretched length**
  - d = 6,5 mm max. 3.600 mm
  - d = 8,5 mm max. 5.000 mm
- **Heater**
  - Locked, bendable-annealed
  - Bending radius min. R 9.0mm
- **Performance**
  - Adjusted to medium/temperature
- **Unheated length**
  - Both-sided minimum of 50mm
- **Permissible current**
  - Maximum of 16 ampere

The products shown here are basic versions and can be adjusted to your requirements..

## General

Our box and panel heaters of the type series KHK / FHK (micranite version) serve the purpose of direct heating of tools and moulds for plastics processing machines and other process-engineering applications. Apart from the variable design and the different connection options these heating elements are characterised by dimensional stability as well as corrosion resistance. A short heating-up time is ensured due to the low mass of heating elements.



## Equipment / characteristics

- Stainless steel version
- Variable connection system
- Heating power max. 5.0 W/cm<sup>2</sup>
- Stainless steel pressure plate
- Quick mounting and demounting
- Temperature range of up to 350°C
- Stainless steel tenter frame

## Technical data

### KHK

- **Maximum temperature**  
350 °C
- **Maximum performance**  
3.5 W/cm<sup>2</sup> optionally up to 5.0 W/cm<sup>2</sup>
- **Heating element**  
Micranite version
- **Connection voltage**  
230 volt AC, 400 Volt 3ph
- **Installation size**  
according to customer specifications

### FHK

- **Maximum temperature**  
350 °C
- **Maximum performance**  
3.5 W/cm<sup>2</sup> optionally up to 5.0 W/cm<sup>2</sup>
- **Heating element**  
Micranite version
- **Connection voltage**  
230 volt AC, 400 Volt 3ph
- **Installation size**  
according to customer specifications

The products shown here are basic versions and can be adjusted to your requirements..

# Electric heating technology

## Product groups

### DHB series / nozzle heater bands



we get it to the point...

## General



Our heater bands of the type series DHB (micranite version) serve the purpose of direct heating of nozzles in plastics processing and other process-engineering applications. Apart from their variable options with regard to the cable outlet and connection cables the heater bands are characterised by their little space requirement and their plastic sealed version. The clamping system of these heater bands is particularly user-friendly, which enables quick and trouble-free replacement.

## Equipment / characteristics

- Brass or stainless steel version
- Cable outlet axial, radial or tangential
- Heating power of up to 9.0 W/cm<sup>2</sup>
- Version with tension band
- Variable connection cable
- Temperature range of up to 500°C
- Certification CE

## Technical data

### DHB brass version

- **Maximum temperature**  
350°C
- **Minimum diameter**  
35 mm
- **Maximum diameter**  
110 mm
- **Minimum heating band height**  
20 mm
- **Maximum heating band height**  
80 mm
- **Heating power**  
3,5 W/cm<sup>2</sup>

### DHB stainless steel version

- **Maximum temperature**  
500°C
- **Minimum diameter**  
28 mm
- **Maximum diameter**  
100 mm
- **Minimum heating band height**  
20 mm
- **Maximum heating band height**  
80 mm
- **Heating power**  
6,5 W/cm<sup>2</sup>

The products shown here are basic versions and can be adjusted to your requirements. .

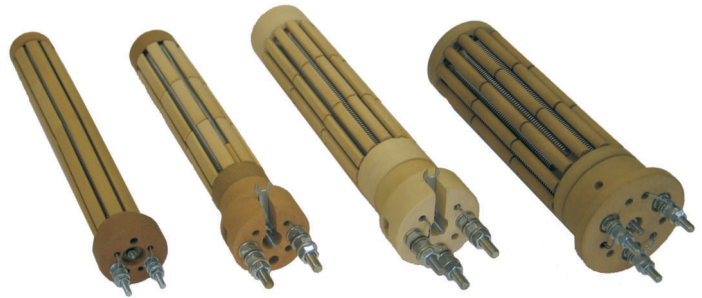


## General

Our ceramic sectional heaters of the type series KGH serve the purpose of indirect heating of different liquid and gaseous media.

Areas of application:

- Domestic water heating
- Heating water warming
- Cleaning fluids
- Cleaning bath
- Hydraulic oil
- Thermal oil
- Gearbox oil
- Cooking oil and fat
- Other liquid media



Replaceability constitutes an essential difference to all other heating elements used. Gräff ceramic sectional heaters are positioned in protective pipes made of stainless steel or steel; these protective pipes can be welded in, screwed in or flanged on a container. The heating elements can be replaced at any time without having to drain the medium from the container.

## Equipment / characteristics

- Ceramic building block with high electrical insulation values
- High-temperature-resistant heating wire in spiral-shape
- Voltage 230 V AC / 400 V AC / 400 volt 3ph
- Electrical connection  
Threaded pins or flexible pure-nickel litz wire
- Installation length according to customer specifications
- Horizontal fitting position

## Technical data

- **Diameter of the heater**  
32 mm, 36 mm, 46 mm, 57 mm, 70 mm
- **Installation length of the heating element**  
up to 5.000 mm
- **Connection voltage**  
230 volt AC, 400 volt AC, 400 volt 3ph  
Special voltage possible
- **Electrical connection**  
Threaded pins M 6, flexible pure-nickel litz wire
- **Fitting position**  
horizontal, vertical possible upon request
- **Connection housing**  
possible upon request

The products shown here are basic versions and can be adjusted to your requirements..

## Reasons for using ISOMA insulating collars by Gräff

ISOMA insulating collars by Gräff for heating zones of plastics processing machinery were developed to increase productivity of the machines and lower production costs at the same time. Furthermore, the surface temperature is lowered significantly by using ISOMA insulating collars by Gräff and thus significantly contribute to higher occupational safety.

## Areas of application for insulating collars

The inner surface of a standard insulating collar by Gräff consists of a PU-coated glass tissue, equipped for high temperatures. A special silicone-coated glass tissue is used for the outer surface in order to protect the collar from the build-up of dirt and spattering of plastics material. A mechanically reinforced glass needle mat is sewn into the glass tissue of the inner and outer surface, serving as a thermal insulator. Various fastening variations, such as hooks and eyes, eye slip hooks, press fasteners as well as Velcro straps are used.

## Areas of application for insulating collars

Our insulating collars have been specifically designed for injection moulding and extrusion machines in order to reduce the specific power consumption and heat emission in the injection area as well as on the cylinders of extrusion machines. The modular construction allows them to be adapted to any given machine. Retrofitting of existing machines can be easily done.

Recesses and apertures may be executed everywhere on the insulating collar. Individual adaptation to specific customer requests is therefore possible.

Exception:

On machines where screw geometry generates too much frictional heat using an insulating collar may lead to heat build-up and thus result in exceeding the required operating temperature. In this case, using an insulating collar is not recommended.

## Savings potential

Measurements prior to and following the installation of insulating collars showed savings in energy consumption of between 22 - 49 %, depending on machine type and workload.

Calculation example:

Injection machine - Polycarbonate, shot weight 117 g, cycle time 42 s, screw speed 55 rpm, dosing stroke 78mm, cylinder temperatures 270 / 275 / 280 / 290 / 245°C

Insulating collar 830 x 550 x 20mm for a heating unit with an outer diameter of 128mm. Energy consumption:

The power consumption was measured over 60 h (converted to 24 h in brackets)

Without insulating collar 204.5 kW (81.8 kW)

With insulating collar 129.6 kW (51.8 kW)

Savings 74.9 kW (30 kW) = 36.6 %

Savings potential:

On the basis of 240 working days and an electricity rate of 7.68 Cent/kWh:

Without insulating collar (204 d x 81.8 kW x 0.0768 €/kWh) = energy costs of € 1,508

With insulating collar (204 d x 51.8 kW x 0.0768 €/kWh) = energy costs of € 955

Savings € 553

Given annual savings of € 553, the purchase price for the insulating collar (€ 350) pays off in less than 8 months.

## General

-Energy costs- and -CO2 reduction- are buzzwords that you are currently hearing and reading about in the media. Rising energy costs are a topic of interest in every corporation. ISOMA insulating collars by Gräff offer you the opportunity to reduce heat loss through thermal conduction and to minimise power requirements by improving thermal efficiency or by realising shorter heating-up time with the same heating power. According to design and application, a reduction in consumption between 20-40 % may be achieved, thus contributing to a reduction in energy costs. Another major advantage is faster thermal adaptation of the cylinder to the required operating temperature and also increased occupational safety by lowering the surface temperature and a marked improvement of the indoor climate in the production halls. ISOMA insulating collars by Gräff may always be installed to new but also to existing production machines.



## Equipment / characteristics

- Easily installation, may be retrofitted any time
- Resilient and durable
- Sustained temperature resistance
- Good chemical resistance
- Energy cost reduction 20 - 49 % according to machine type and workload
- Made-to-measure according to customer requests
- Shorter heating-up time of the production equipment
- Ideal protection against accidental contact

## Technical data

- **Standard temperature range**  
500°C, optionally up to 1000°C
- **Chemical resistance against**  
Oil, petrol, lubricants, watery solutions and more
- **Standard insulation thickness**  
25 - 30 mm
- **Fastener design**  
Velcro Teflon strap with stainless steel buckle
- **Insulation material**  
Glass needle mat
- **Recesses / apertures according to customer request**
- **Thermal conductivity coefficient >0.1 W/mK**
- **Reusable, corrosion-resistant, non-inflammable**
- **According to design and application, outer coating with:**
  - PTFE-coating tissues
  - Silicone/coating tissues
  - Vapour-resistant tissues

## Gräff - Products



**Melt pressure technology**



**Insulations**



**Temperature control**



**Electric heating**



**Temperature technology**



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