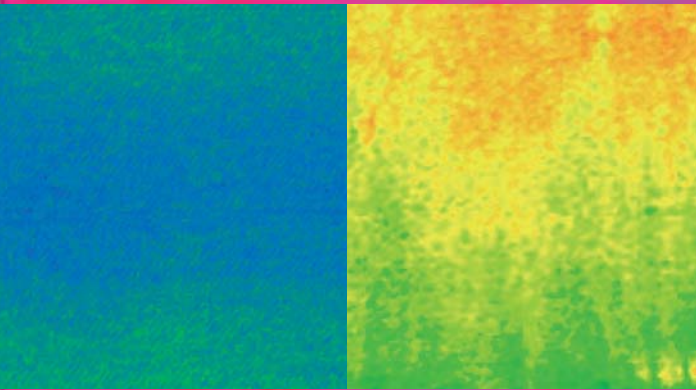


# HICOTEC TP

Thermal Power –  
innovative solutions for radiant heating.



GASKETS

TECHNICAL TEXTILES

EXPANSION JOINTS

INSULATION

NEW MATERIALS



creating  
hightech  
solutions

# Light. Flat. Simple.

## HICOTEC® TP – a smart solution.

**Extremely fine carbon fibres that convert electricity into heat – sounds simple. And is too, of course. Because we have developed a solution for heating systems that is as innovative as it is simple: HICOTEC® TP.**

HICOTEC® TP Composite Film is a thin, closed and fibre-reinforced PET film with incorporated copper contacts. Thanks to the homogeneous and dense network structure formed by the conductive fibres, the material heats up consistently and is insensitive to damage.

The conductive network structure has more advantages than just these, however. The film can be adapted precisely to your requirements – irrespective of whether you would like to laminate HICOTEC® TP under PVC flooring or are planning a process heating system that can be used in an industrial environment or whether your customer is interested in innovative room heating. Because we develop an individual solution on the basis of your current and voltage specifications – by choosing the optimum electrical surface resistance level\*: in this context, higher fibre density means lower resistance and thus higher heating capacity. A clever system that guarantees highly individual solutions for your customers too.

HICOTEC® TP provides consistent, comprehensive heat distribution with minimal temperature differences no matter what the application; the surface material is subjected to considerably less thermal and mechanical strain as a result.

HICOTEC® TP is suitable for applications of many different kinds. Implement your ideas now and provide your customers with a modern solution for radiant heating elements or process heating systems.

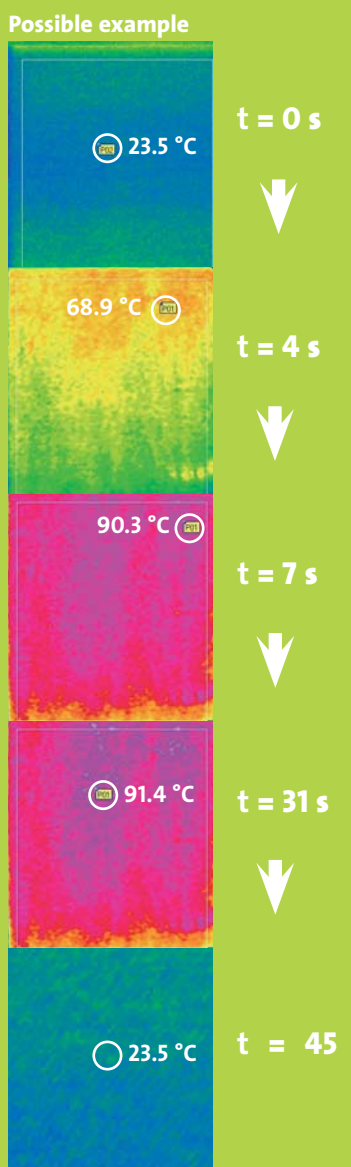
$$* R_s = R \frac{B}{L}$$

where:

R = resistance measured on the component  
B = heat conductor length  
L = distance between the contacts



# Thermal Power – from 0 to 140 in a matter of seconds.



## Heat up

The thermoscan proves it: HICOTEC® TP heats up in a matter of seconds – all over. Controllably up to 140 °C, depending on the application.

That is not only convenient but also extremely economic.

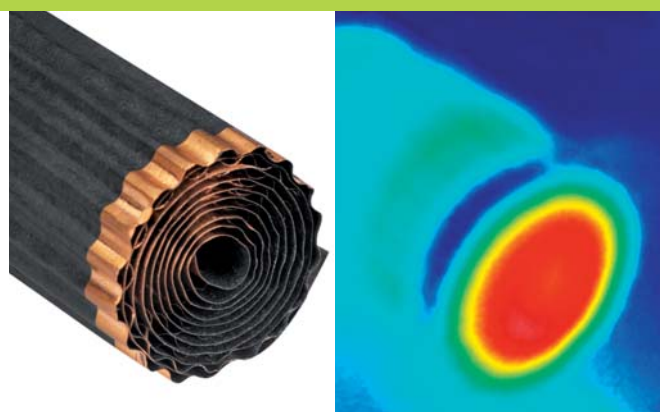
## Cool down

Optimum control: back to the original temperature in a matter of seconds too.

Do you have any questions about your application?

The HICOTEC® TP service will help you:

[hicotec@frenzelit.de](mailto:hicotec@frenzelit.de)



# Flexible. Practical. Handy.

## Optimum convenience and capacity.

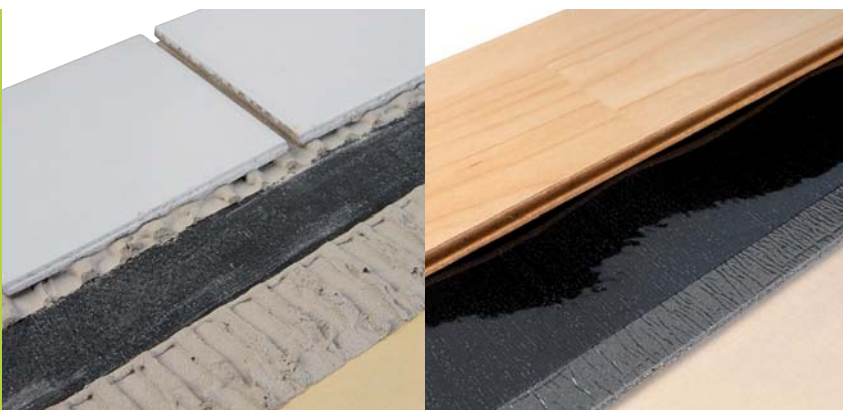
HICOTEC® TP is extremely simple and absolutely safe for your customers to handle. Simple because the material is practical to process from reels. Safe because it can be designed for low-voltage operation. There are hardly any restrictions on the use of HICOTEC® TP. We are giving you an insight into the most important areas here. Use the information provided to find inspiration – you will definitely find an appropriate solution for your product and your customers too.

### Tailor-made heating

Offer your customers an inexpensive and practical alternative for new building projects or modernisation exercises. HICOTEC® TP is particularly popular as a convenient back up heating system, e.g. to cover particularly cold spells and to make life more comfortable. HICOTEC® TP has even proved to be an effective solution as the only heating system in building extension projects. HICOTEC® TP is very simple for your customer to process himself too, whether he opts for wall heating or modern underfloor heating. The thin film can be included as a functional layer directly beneath the floor covering –



which has the advantage that floor thickness is only increased minimally and that spontaneous and economic heating is possible. Which in turn guarantees customer satisfaction when building and renovating.



# Heat and more – your ideas set new standards.

## Heating with feel-good benefits



Your customers want to relax in a particularly feel-good atmosphere in wellness areas, bathrooms and similar settings. Offer them an innovative solution now: our tests have demonstrated that HICOTEC® TP does not change in wet conditions and can be glued underneath tiles with optimum results. HICOTEC® TP guarantees homogeneous radiant heating here – in the shortest possible time, of course.

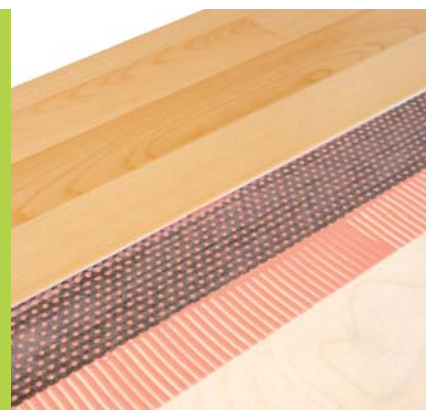
## Flexibility on the move

You can surprise your customers in mobile applications too: with a modern heating concept in your caravans and boats, because it goes without saying that HICOTEC® TP can be used for convenient underfloor heating here. All your customer needs is an electricity connection. The same applies for using it for drying purposes or to facilitate thawing in mobile cooling facilities.

Details about this special application can be found in the product folder for caravans, boats and mobile facilities, which is available free of charge on request.

## For your own idea too

Radiant heating radiators made from marble, artificial stone or other materials: HICOTEC® TP warms to special ideas. Integration in a sandwich structure, for example. An important feature here: perforation of the film enables it to be glued or laminated particularly easily. Even if it is only applied on one side, adhesive is still suitable for ideal attachment of the layers. This is true of all conventional gluing systems, such as resin or dispersion adhesives.



# Innovative. Versatile. Convincing.

## A single solution – with numerous advantages.

Offer your customers a very special and modern heating solution too. Implement your heating ideas very simply with HICOTEC® TP – because your product innovations can be as imaginative as you like now thanks to the flexibility, simplicity and versatility with which the material can be used.

Satisfy your customers' exacting demands and requests even more effectively now. Thanks to the special properties of HICOTEC® TP, you are excellently prepared for difficult assignments. This naturally applies not only to new developments but also to incorporation in existing solutions.

Discover the practical properties and advantages of HICOTEC® TP now and develop innovative heating ideas – surprising your customers too as a result.

### HICOTEC® TP at a glance

- The **film-like** structure makes the material particularly **compact**.
- The conductive network of carbon fibres guarantees **insensitivity** to damage.
- The incorporated flush conductors provide **ideal bonding properties** and **ideal contact resistance** levels between the heating film and the contact.
- **Perforation** is possible without any adverse effect on functionality.
- The film is **easy** for you and your customers to **handle** in laying, bonding or final use.
- The modern material is **insensitive to water**, so it is highly suitable for bathrooms and wellness areas too.
- The flat film is a particularly popular choice for underfloor heating systems, because its **thin structure** and can be **bonded directly** and **inexpensively** to existing tiles or composite flooring.
- The material **resists ageing, is hard-wearing** and confirms the quality of your workmanship to your customers.
- HICOTEC® TP provides genuine radiant heating without any major temperature gradients.
- The system responds **spontaneously**, because the material heats up **quickly** and cools down quickly again.

HICOTEC® TP: compact CFA



HICOTEC® TP: perforated CFP

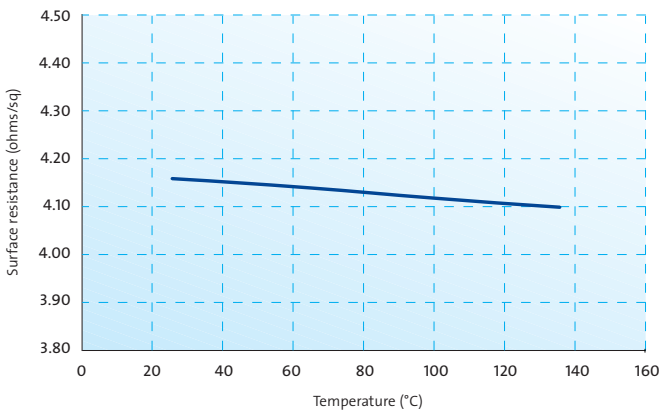


HICOTEC® TP: insulated CFI



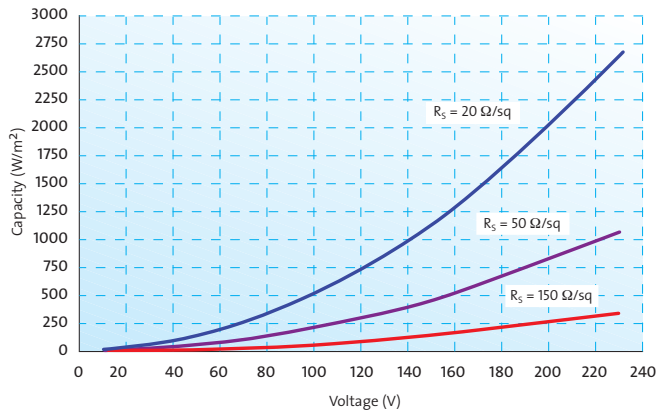
# Technical information about HICOTEC® TP Composite Film:

Typical NTC properties of HICOTEC® TP CF

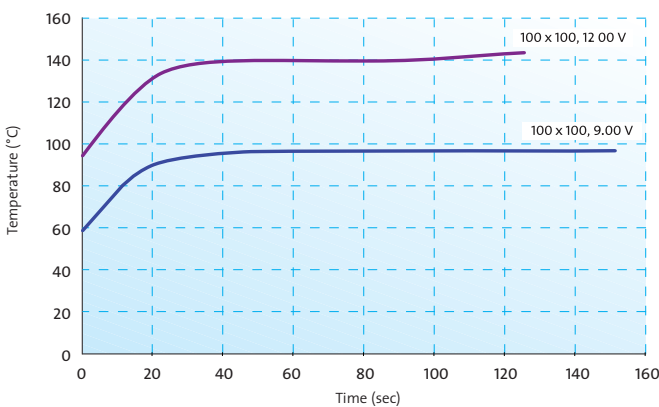


Example showed relates to HICOTEC® TP VP 003869

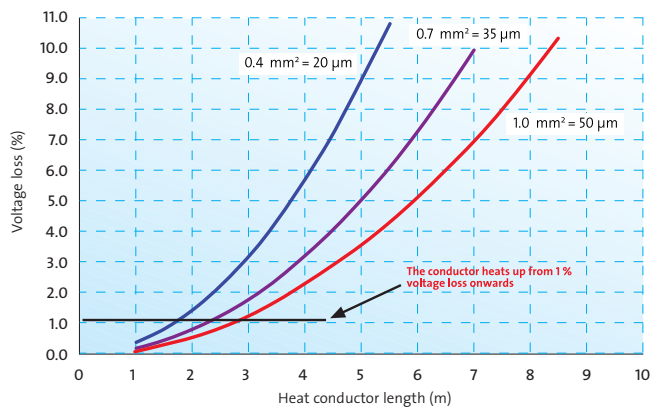
Possible heating capacity (W/m²) depending on the voltage



Constant temperature after reaching the state of thermal equilibrium  
Change in voltage ~ change in temperature



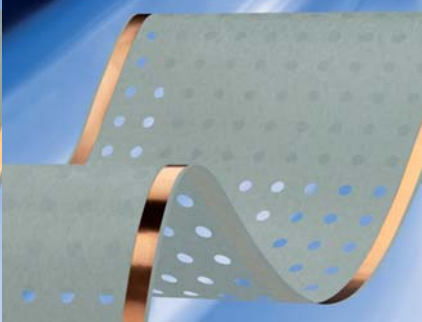
Line loss/heat conductor length with different Cu contact circuit cross sections  
(e.g. U = 24.0 V; P = 85 W/m²; copper circuit width 20 mm)



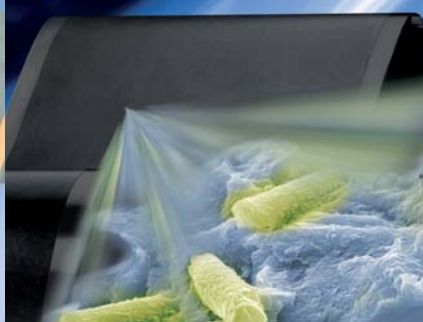
HICOTEC® TP HT: compact CFA



HICOTEC® TP FR: perforated CFP



HICOTEC® TP Composite Film: structure



# Material data

## General information

Matrix polymer	PET / PEEK / PPS
Functional fibre	Carbon fibre
Identification colour	black or green
Reel lengths	Typically 125 or 250 m or as arranged
Customs statistics number	39219010

Property	Test standard	Unit	Value*
<b>Mechanical data</b>			
Basis weight	QS-006-002	[g/m <sup>2</sup> ]	100–150
Heat conductor thickness without insulation		[µm]	80–110
Density		[g/cm <sup>3</sup> ]	1.3
Maximum tensile strength	DIN/EN/ISO 527-1	[MPa] (LD)	280
	DIN/EN/ISO 527-1	[MPa] (CD)	190
Elongation at break	DIN/EN/ISO 527-1	[%]	2.7
Modulus of tension	DIN/EN/ISO 527-1	[GPa] (LD)	7.8
	DIN/EN/ISO 527-1	[GPa] (CD)	5.8

<b>Electrical data</b>			
NTC			
Surface resistance R <sub>s</sub>		[Ω/sq]	3–150
Nominal voltage SELV		[V] AC	max. 48
		[V] DC	max. 120
Mains voltage		[V] AC	230
Electrical power		[kW/m <sup>2</sup> ]	max. 4
Temperature resistance			
HICOTEC® TP		[°C]	130
HICOTEC® TP FR		[°C]	190
HICOTEC® TP HT		[°C]	280
Surface insulation	Dielectric strength	[kV]	0–4.5

<b>Contacts</b>			
Material			Copper
Typical cross sections		[mm <sup>2</sup> ]	20 • 0.02
		[mm <sup>2</sup> ]	20 • 0.035
		[mm <sup>2</sup> ]	20 • 0.05
Contact spacing	External, max.	[mm]	570 or 1 100
Special dimensions	Available on request		

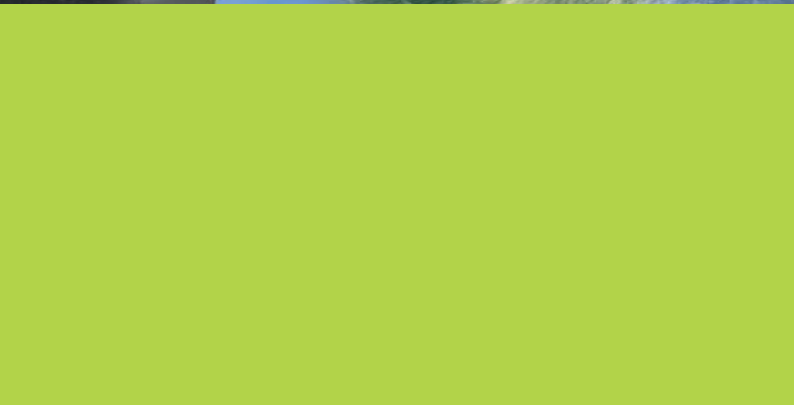
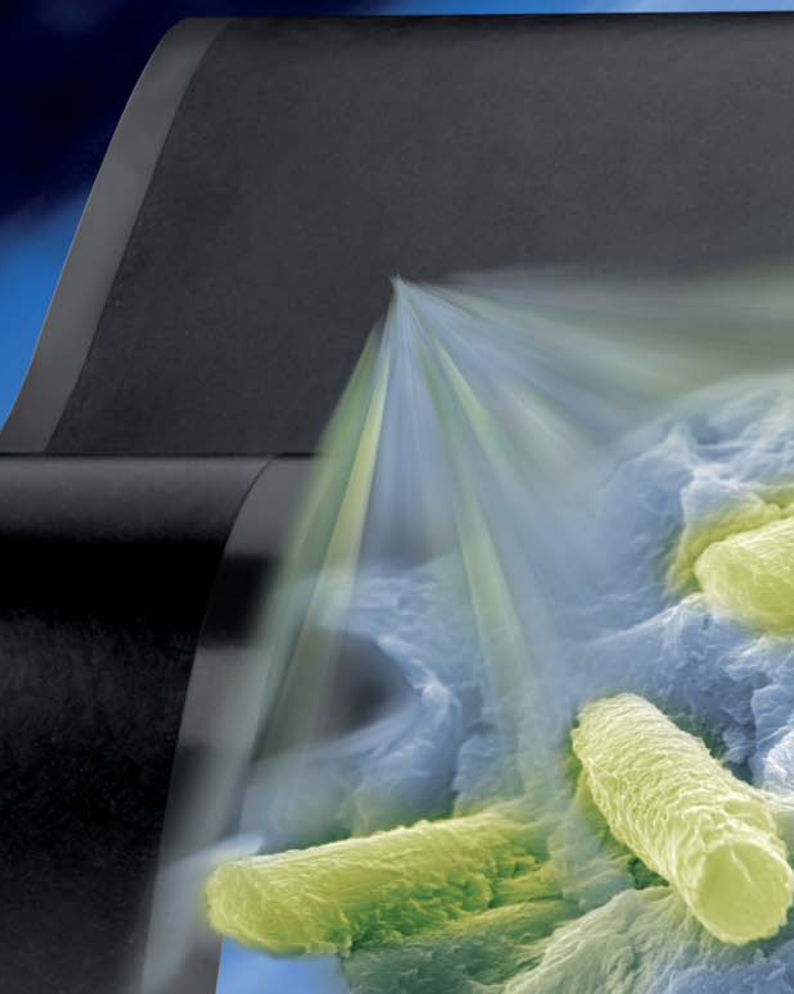
<b>Miscellaneous</b>			
EMC perforated	DIN/EN 50366	Limit 100 µT at 50 Hz/10 cm	9 µT
EMC unperforated	DIN/EN 50366	Limit 100 µT at 50 Hz/10 cm	14 µT
Non-flammability	DIN/EN 90695-2-11	Burning time [s] at 750 °C	< 2
Free area due to perforation		[%]	18
Tile/composite floor bonding (tile removal resistance)	DIN/EN 12004	[MPa]	2
Bond strength to wood	Peel strength based on		
	DIN/EN/ISO 527-1	[MPa]	20
Protection rating			IPX 7 with edge insulation * typical value

Do you have any questions about your application?

The HICOTEC® TP service will help you:

[hicotec@frenzelit.de](mailto:hicotec@frenzelit.de)

ut  
site Film:



# Good for people and the environment.

Frenzelit has obtained certification that the company complies with the requirements of ISO 9001, ISO/TS 16949 and ISO 14001. This means complete transparency in all areas and a high degree of security for our customers.

## Quality management

ISO 9001  
ISO/TS 16949

## Environmental management

ISO 14001

# For everyone who wants to achieve even more: development partnership with Frenzelit.

Perhaps you are one of those companies for which time to market is a key criterion in the competitive environment. Or are one of those engineers who are convinced that their R&D department can do even more.

As a comprehensive system supplier of gaskets, technical textiles, expansion joints, insulation and new materials, we make sure our customers maintain their lead – and help them to increase it day in, day out.

You have the chance to take advantage of this now. Our proposal: our engineers help you to develop, test and implement heatable products and technologies in the context of a development partnership – all the way to series production, if you like.

HICOTEC® TP is a product from the HICOTEC® family supplied by Frenzelit.

GASKETS

TECHNICAL TEXTILES

EXPANSION JOINTS

INSULATION

NEW MATERIALS

Frenzelit Werke GmbH  
P.O.Box 11 40 · 95456 Bad Berneck · Germany  
Phone: +49 9273 72-0 · Fax: +49 9273 72-150  
info@frenzelit.de · www.frenzelit.com



creating  
hightech  
solutions