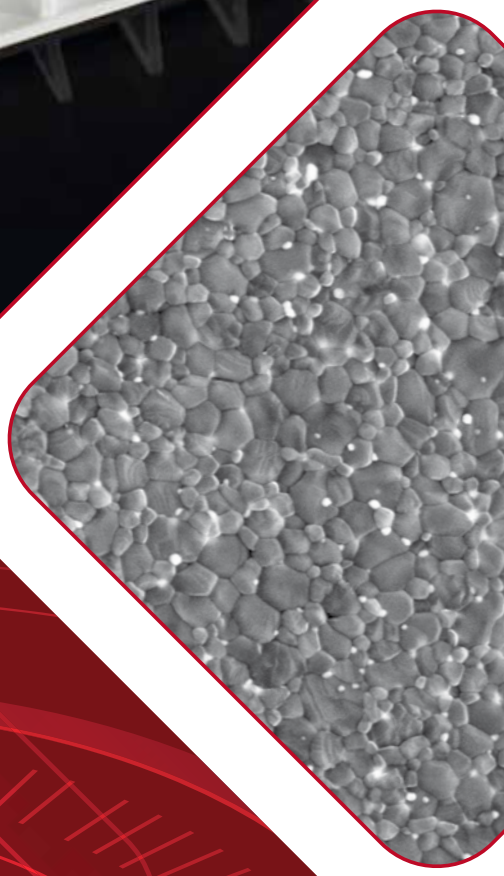
KERAFOL®
Keramische Folien GmbH & Co. KG

MADE IN GERMANY



CERAMIC TAPES & SUBSTRATES (CTS)

High performance technical ceramics
for **special requirements**

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Disclaimer: NOTE: The information provided in this Technical Data Sheet (TDS) including the recommendations for use and application of the product are based on our knowledge and experience of the product as at the date of this TDS. The product can have a variety of different applications as well as differing application and working conditions in your environment that are beyond our control. KERAFOL® is, therefore, not liable for the suitability of our product for the production processes and conditions in respect of which you use them, as well as the intended applications and results. We strongly recommend that you carry out your own prior trials to confirm such suitability of our product. All specifications are subject to change without notice. Any liability in respect of the information in the Technical Data Sheet or any other written or oral recommendation(s) regarding the concerned product is excluded. In case KERAFOL® would be nevertheless held liable, on whatever legal ground, KERAFOL®'s liability will in no event exceed the amount of the concerned delivery. All Kerafol products are sold pursuant to the KERAFOL®'s Terms and Conditions of sale and delivery in effect from time to time, a copy of which will be furnished upon request."

KERAFOL®

Your partner for special thin- and thick film substrates, kiln furniture, wear protection substrates and customer specific development and services!

Quality Assurance

Research & Development

Optimum Price-Performance-Ratio

Development, quality control and evironmental compatibility

All KERAFOL® products are manufactured under the quality assurance standard EN ISO 9001:2015 and environmental assurance standard EN ISO 14001. In order to offer our customers competent, customized advice and individual problem solutions, our engineers and staff are constantly doing research, development and tests on new, innovative and high quality materials in our in-house R&D laboratory.

"Ceramic Tapes & Substrates" products are RoHs- and REACH compliant!

KERAFOL® – Customer satisfaction in all areas

KERAFOL® offers a wide range of products, suitable for diverse applications, for example in sensors for oxygen, temperature and humidity control, microelectronics, special kiln furniture and special wear protection.

Our foremost goal is to provide our customers with competent, customer oriented product solutions, which we guarantee through continuous quality control, optimization of processes and manufacturing steps.

Experienced, innovative and customer-oriented

Many years of experience with ceramic materials, continuous development of innovative and customer-focused solutions and a global sales and distribution network with short delivery times and a fast reaction time are just some of the reasons, why we are one of the leading specialists and manufacturers of thinfilm / thickfilm substrates, special kiln furniture and ceramic wear protection substrates.

Modern production facilities

Our ceramic green tapes, substrates and sinter plates are produced in a continuous process on the latest production facilities either for standard or customer specific products. For customized geometries the ceramic green tape products can be cut by laser or customized punching tools.

The sintered substrates and sinter plates can be machined into customer specific dimensions by laser- or waterjet cutting.

International Distribution Network

Environment-Friendly

Future-Oriented

Many years of experience and a wide variety of innovative solutions make KERAFOL® your essential partner in the field of "Ceramic Tapes & Substrates".

Why “Ceramic Tapes & Substrates” from KERAFOL®?

KERAFOL® - Keramische Folien GmbH & Co. KG was founded in 1985 and has over 200 employees at the moment.
We develope and produce ceramic tapes for versatile applications with a special manufacturing process.
These tapes may then be used unsintered as a final product or sintered as a planar ceramic component.

All products of our department “Ceramic Tapes & Substrates” (CTS) are produced at KERAFOL® in Eschenbach i. d. OPf. (Bavaria, Germany).

KERAFOL® can therefore offer its customers smaller series production to an attractive cost-performance ratio.
The premises are located in an area where still space for expansion exists.

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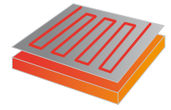
Customized Tapes



Thin- and Thickfilm Substrates

Sinter plates / Kiln Funiture

Wear Protection

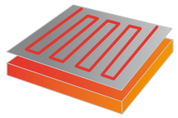
Ceramic Tapes and Substrates Products

Sinter plates

Due to our special production method, our sinter plates show a very smooth surface with high porosity but small pores. KERAFOL® sinters are especially developed for debinding and sintering processes of ceramic injection moulding (CIM), metal injection moulding (MIM) Solid Oxide Fuel Cells SOFC processes and metal + ceramic 3D-Printing.

Thin- and Thick-Film Substrates

Thinfilm Substrates made by KERAFOL® are based on alumina, zirconia or zirconia toughened alumina. These substrates are especially developed and used for thinfilm applications. The 96% alumina thick-film substrates can be used for circuit boards.



Wear Protection

KERAFOL® offers special thin ceramic substrates for wear protection applications. Due to the excellent tribological material properties KERAFOL®´s zirconia is characterized by a high wear resistance and very good gliding properties. It is especially used for applications where metal and plastic are overstrained and when space and weight of the protected section are limited.

Tapes

KERAFOL® has a long experience in the development and production of customized porous and dense ceramic tapes of different polymer / ceramic, ceramic and glass-ceramic materials for different applications. KERAFOL® offers the complete development and production of a tape based on a customized powder.

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Keralpor 99

Alumina 99.5 % porous

Typical characteristics	Unit	Value
Colour	-	white
Gross density	g/cm³	2.56
Surface roughness R_a	µm	0.7
Bending strength	MPa	>50
Camber	%	< 0.3
Porosity	Vol.%	36 - 38
Average pore size	µm	1
Dimensions	mm	10 x 10 up to 310 x 310
Standard thicknesses	mm	1.0 / 1.5 / 2.0
Main components	%	99.5 Al_2O_3
Maximum operation temperature	T_{max}	1500°C

Due to the low heat capacity, the demand of energy for the kiln is lower, compared to conventional sinter plates. The demand of time and energy for heating up and cooling down the kiln furniture is significantly reduced by using KERAFOL® sinter plates.

Our customers use these sinters for sintering Low Temperature Co-fired Ceramics (LTCC), Solid Oxide Fuell Cells, dental ceramics and for debinding and sintering stainless steel Metal Injection Moulded (MIM) components. The high planarity of Keralpor 99 leads to accurate sinter results. Due to the high porosity of the alumina matrix the gases can diffuse through the sinter during the debinding and sintering process easily.

The parts do not adhere to the sinter during the debinding process. Keralpor 99 can be used best as a sinter plate on your silicon carbide, mullite, korundum, molybdenum or grafite kiln-furniture.

All sizes are available with a thickness of **1.0 / 1.5 / 2.0 mm!**

Please ask for your tailormade dimensions and we will create your Keralpor 99 quickly.

Advantages

- dust-free / particle-free surface
- homogeneous pore size distribution
- good mechanical strength compared to the high porosity
- material can be cut by laser or waterjet
- very good planarity and surface quality
- big customized dimensions of the sinter possible
- gases and liquids can freely diffuse through the sintered plate

Applications

- sinter for MIM - production
- sinter for ceramic or dental ceramic production
- gas-permeable membranes for sensors

Data for design engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.

Sinter-Plates / Kiln Furniture

Keralpor S

Alumina 92% + 8% Zirconia

Typical characteristics	Unit	Value
Colour	-	white
Gross density	g/cm³	2.7
Surface roughness R_a	µm	0.7
Bending strength	MPa	>100
Camber	%	< 0.3
Porosity	Vol.%	32
Dimensions	mm	10 x 10 up to 310 x 310
Thickness	mm	1.6
Main components	%	92% Al_2O_3 + 8% ZrO_2
Maximum operation temperature	T_{max}	1400°C

The Keralpor S is a sinter, which can be used for sintering various of Metal Injection Moulded (MIM) - products and materials. The advantage of this porous zirconia toughened alumina is its good thermal shock resistance and high mechanical strength. Through the 32% porous structure, adhesion of the sintered part will be prevented.

Due to the porous structure of the sinter, adherences of the overlying green ware can be avoided. Customers use Keralpor S especially for debinding and sintering stainless steel MIM products and for fast cooling processes in the kiln.

All sizes are available with a thickness of **1.6 mm!**

Please ask for your tailormade dimensions and we will create your Keralpor S quickly.

Advantages

- dust-and particle-free surface
- homogeneous pore distribution over the entire sinter
- very good mechanical strength despite to the high porosity
- cutting by water jet or laser is possible
- good thermal shock resistance
- good planarity and surface quality
- customized dimensions of the sinters are possible
- gases can freely diffuse through the sintermatrix

Applications

- sinter plate for Metal Injection Moulding (MIM) parts
- sinter plate for Ceramic Injection Moulding (CIM) parts
- sinter plate for high demand of thermo shock resistance

Data for design engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.

Keralpor benefits

Your choice when it comes to state of the art economical sinter plates

saving energy costs

Porous light weight material, less extra material to heat

no tooling cost

Rapid sizing due to tape casted products and
laser cutting process

no costs and storage for extra charging plates nesessary

Can be used for charging, debinding and sintering at once

increase in yield

Porous but smooth surface
no sticking or molten binders, irritations, discolourations

save process time

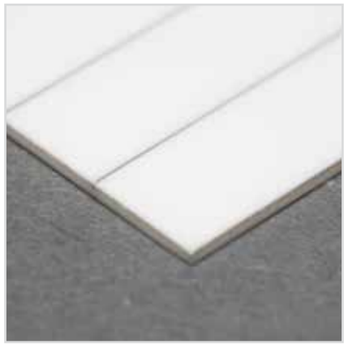
Strong enough for automation or robot handling

no or even less post-processing

High purity porous alumina plates 99,5%
homogeneous shrinkage

3YSZ - Sensor

3mol% Yttria Stabilized Zirconia



Typical characteristics	Unit	Value
Colour	-	white
Density	g/cm^3	6.03
Surface roughness R_a	µm	< 0.1
Bending strength	MPa	> 1.000
Thermal expansion coeffizient	$10^{-6}K^{-1}$	~ 11
Thermal conductivity	W/mK	5.3
Standard dimension	mm	101.6 x 101.6
Thickness	mm	0.15 / 0.12
Structure	-	dense
Main components	%	95% ZrO_2 + 5% Y_2O_3
Dielectric strength at 20°C	kV/mm	> 10

3YSZ is a special partially stabilized zirconia which is used for thin film applications. Among others, it can also be used as an ion conductive ceramic membrane for Solid Oxide Fuell Cells (SOFC). This material is characterized by its excellent flexibility, extremely high bending strength and high fracture toughness. Another advantage is that this material can be manufactured in small thicknesses. The standard substrate thickness is 0.15 mm. Other dimensions are possible. Please send in your inquiry.

Advantages

- very fine-grained homogeneous grain structure of 1 µm
- good electric insulation properties at room temperature
- extremely good mechanical strength
- can be cut by laser or waver saw
- good evenness
- standard thickness of 0.15 mm with high flexibility

We lasercut the material according to your wishes!

Please send in your CAD data.

Applications

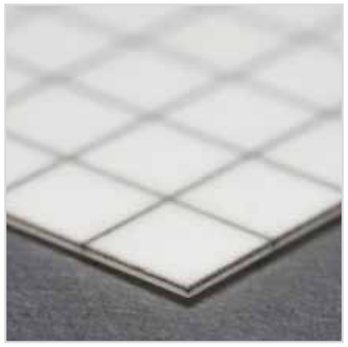
- sensor substrate for thin film application
- sensor protection plate

Data for design engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.

Thin- and Thickfilm Substrates

ATS

Alumina Thinfilm-Substrates



Typical characteristics	Unit	Value
Colour	-	white
Density	g/cm^3	4
Surface roughness R_a	µm	< 0.08
Bending strength	MPa	> 600
Evenness	µm	50
Dielectric strenght at 20°C	kV/mm	> 10
Thermal conductivity	W/mK	22
Standard dimensions	mm	101.6 x 101.6 and 50.8 x 50.8
Thickness	mm	0.25 up to 0.38
Structure	-	dense
Main components	%	96% Al_2O_3 4% ZrO_2

This zirconia toughened alumina substrate material shows very good results after laser scribing and breaking, or even when cut with a waver saw. ATS has been developed especially for thin-film applications. ATS can be easily cut or structured by laser or waver saw. Due to its inner mechanical strength and fine grains the material has much less material chipping at the processing edges during manufacturing process compared to other materials. Due to the very fine grains of the ATS very fine Pt-structures are possible.

Advantages

- very fine-grained homogeneous grain structure < 1 micron
- good electrical insulation properties
- high mechanical strength
- processing by laser or waver saw possible, very low on chipping
- very good evenness
- outstanding performance for thinfilm applications

We lasercut the material according to your wishes!

Please send in your CAD data.

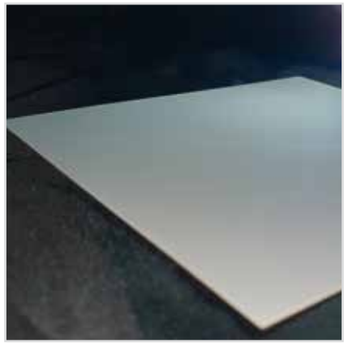
Applications

- thinfilm application, e.g. temperature sensors

Data for design engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.

Keral 99 TF

Thinfilm-Substrates



Typical characteristics	Unit	Value
Colour	-	white
Density	g/cm³	4
Surface roughness R_a	µm	< 0,09
Bending strength	MPa	> 500
camber longest edge	%	0,2
Dielectric strenght at 20°C	kV/mm	> 10
Thermal conductivity	W/mK	30
Standard dimensions	mm	101.6 x 101.6 and 50.8 x 50.8
Thickness	mm	0.38
Structure	-	dense
Main components	%	99,6% Al2O3
Gransize media	µm	< 1,5

When we are talking about reliable and economic thin film quality, we are talking about **K99TF.**
Due to the unique formulation and raw material choice our R&D department formed a substrate material which shows reliable quality, high performance at ambient pricing. The smooth surface, strength and accuracy in size is a great advantage when it comes to deal with new thin film projects or even replace other available qualities.

Advantages

- very fine-grained homogeneous grain structure
- good electric insulation properties at room temperature
- extremely good mechanical strength
- can be cut by laser or waver saw
- good evenness

We lasercut the material according to your wishes!

Please send in your CAD data.

Applications

- thinfilm application, e.g. temperature sensors

Data for design engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.

Keral 96

Alumina content 96%

Typical characteristics	Unit	Value
Colour	-	white
Gross density	g/cm³	3.78
Surface roughness R_a	µm	0.6
Bending strength	MPa	400
Dielectric strenght at 20°C	kV/mm	15
Thermal expansion coeffizient 20 - 600°C	$10^{-6}K^{-1}$	~ 7
Thermal conductivity	W/mK	24
Dimensions	mm	on request
Thickness	mm	0.25 up to 1.5
Structure	-	dense
Main components	%	96% Al_2O_3

Keral 96 is a substrate material for thick-film coating applications. This material has good electrical properties and a good thermal conductivity. Other ingredients are mainly SiO_2, MgO and CaO. It is a low-cost alternative thick-film substrate material compared to Keral 99.

Advantages

- inexpensive substrate material
- good electrical insulation capability
- good mechanical strength
- good thermal conductivity
- cuttable by laser or waver saw
- good evenness

We lasercut the material according to your wishes!

Please send in your CAD data.

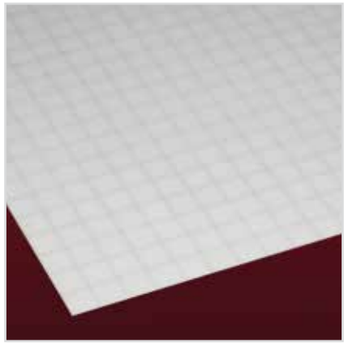
Applications

- alumina substrate material for thickfilm technology
- sensor protection plate
- electrical insulator

Data for design engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.

Keral 99

Alumina content ≥ 99.6%



Typical characteristics	Unit	Value
Colour	-	white
Gross density	g/cm^3	3.88
Surface roughness R_a	µm	0.2
Bending strength	MPa	500
Evenness	µm	50
Dielectric strenght at 20°C	kV/mm	17
Thermal expansion coefficient 20 - 600°C	$10^{-6}K^{-1}$	~ 7
Thermal conductivity	W/mK	30
Standard dimensions	mm	101.6 x101.6 and 50.8 x 50.8
Thickness	mm	0.25 up to 0.5
Structure	-	dense
Main components	%	≥ 99.6% Al_2O_3

Keral 99 is a high alumina substrate material with ≥ 99.6% purity. Due to the high degree of purity and the fine grain structure, it has a very high thermal conductivity up to 30 W / mK. The dielectric strength is the highest of KERAFOL®´s ceramic substrate materials.

Advantages

- fine-grained homogeneous grain structure
- very good electrical insulating ability
- good mechanical strength
- very good thermal conductivity
- cuttable with laser or waver saw
- good evenness

We lasercut the material according to your wishes!

Please send in your CAD data.

Applications

- thickfilm substrate material
- sensor protection plate
- electrical insulator

Data for design engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.

Keraprotec

Yttria Stabilized Zirconia

Typical characteristics	Unit	Value
Colour	-	white
Density	g/cm^3	5.8
Surface roughness R_a	µm	0.8
Bending strength	MPa	800
Evenness	µm	50
Dielectric strenght at 20°C	kV/mm	> 10
Thermal expansion coeffizient 20 - 600°C	$10^{-6}K^{-1}$	~ 11
Thermal conductivity	W/mK	4.8
Standard dimensions	mm	101.6 x 101.6 and 50.8 x 50.8
Thickness	mm	0.25 up to 0.5
Structure	-	dense
Main components	%	approx. 92% ZrO_2 + 8% Y_2O_3

This ceramic substrate material is partially stabilised with 5 mol% yttria. The substrate material has a high bending strength of 800 MPa and a high fracture toughness. It will be used when other wear protecting materials are not longer sufficient. Mainly it is used at high temperatures > 200°C or extremly high pressure occures for long time and where polymeres tend to creep. Applications are, for example, guide rails or sensor protection plates.

Advantages

- very fine-grained homogeneous structure
- good electrical insulation
- very low abrasion because of very good tribological properties
- cuttable with laser or waver saw
- good evenness
- very large substrates customized with large sizes on request up to 350 x 200 x 0.5 mm possible
- customized substrate thickness possible

We lasercut the material according to your wishes!

Please send in your CAD data.

Applications

- wear protection
- sensor protection plate
- heat elements
- thickfilm electronic substrates
- printed heat elements

Data for design engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.

Tapes

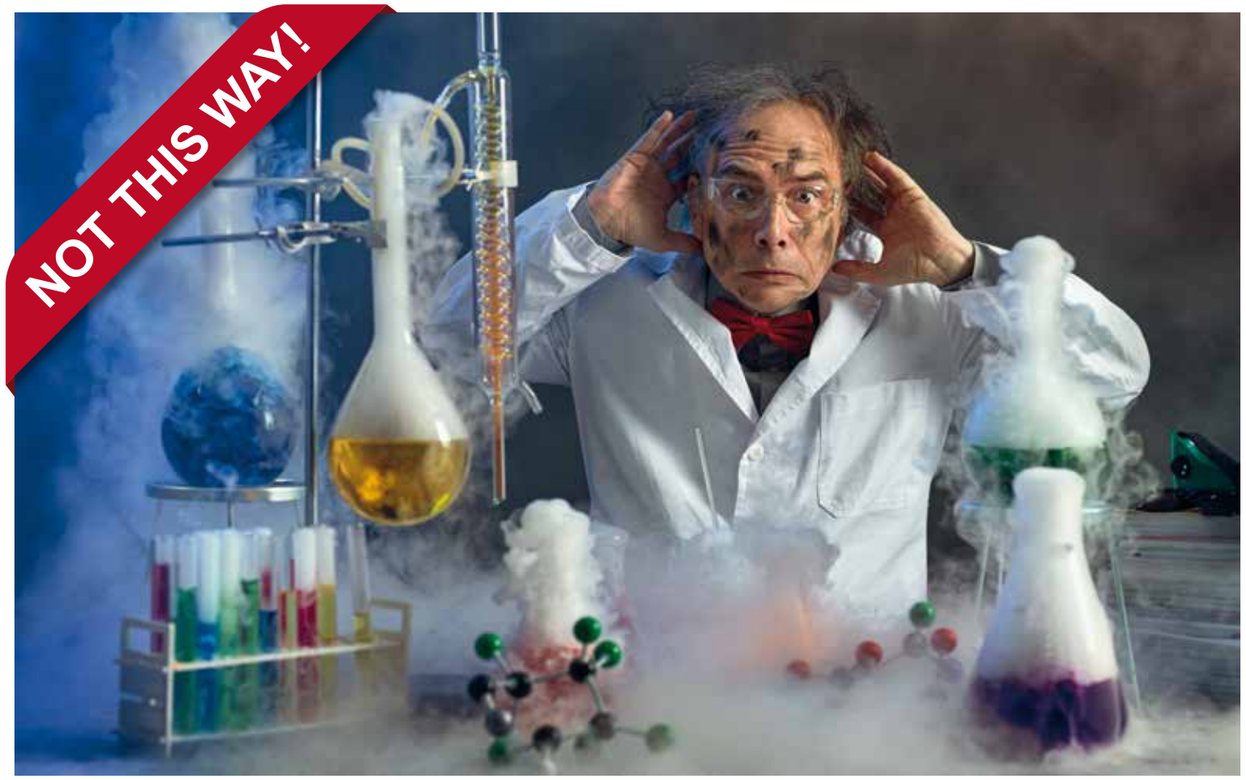
Customized ceramic tape casting

Typical characteristics	Unit	Green tape
Max. tape casting width	mm	950
Thickness max. (depending on material)	mm	2.0
Thickness min. (depending on material)	µm	100

In order to provide expert advice and individual solutions for our customers, our engineers and staff work in well equipped laboratories with advanced testing and measuring instruments. KERAFOL® operates with the-state-of-the-art tape casting devices, based on years of experience in development and manufacturing of tapes for a great variety of applications.

KERAFOL® can offer

- consulting & development
- optimization of existing concepts
- development of new and innovative tape products together with customers and partners
- contract manufacturer for tape casting / sintering



Production process

incoming inspection

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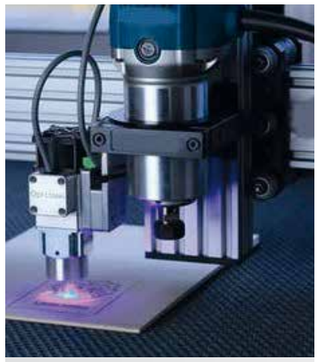
Preparation

Tape casting

Cutting

Sinterng



Laser cutting

Quality Check

packaging & shipping

Notice

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Customized solutions made of high performance technical ceramics

We are looking forward to receiving your inquiry!

KERAFOL® products are applied in vehicle electronics, medical applications, electronics, engineering, processing aids – in fact, in all areas in which high performance ceramic materials are irreplaceable.

Discover our wide variety of products and take advantage of the diverse application possibilities!

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