KERAFOL®
Keramische Folien GmbH

CERAMIC TAPES & SUBSTRATES (CTS)

Solutions for **special requirements**

KERAFOL®
Keramische Folien GmbH

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 9001:2000 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 / thick-film substrates, special kiln furniture and ceramic wear protection substrates.

Modern production facilities

Our ceramic green tapes, substrates and setter 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 setter plates can be machined into customer specific dimensions by laser- or waterjet cutting.

International Distribution Network

Environment-Friendly

Future-Oriented

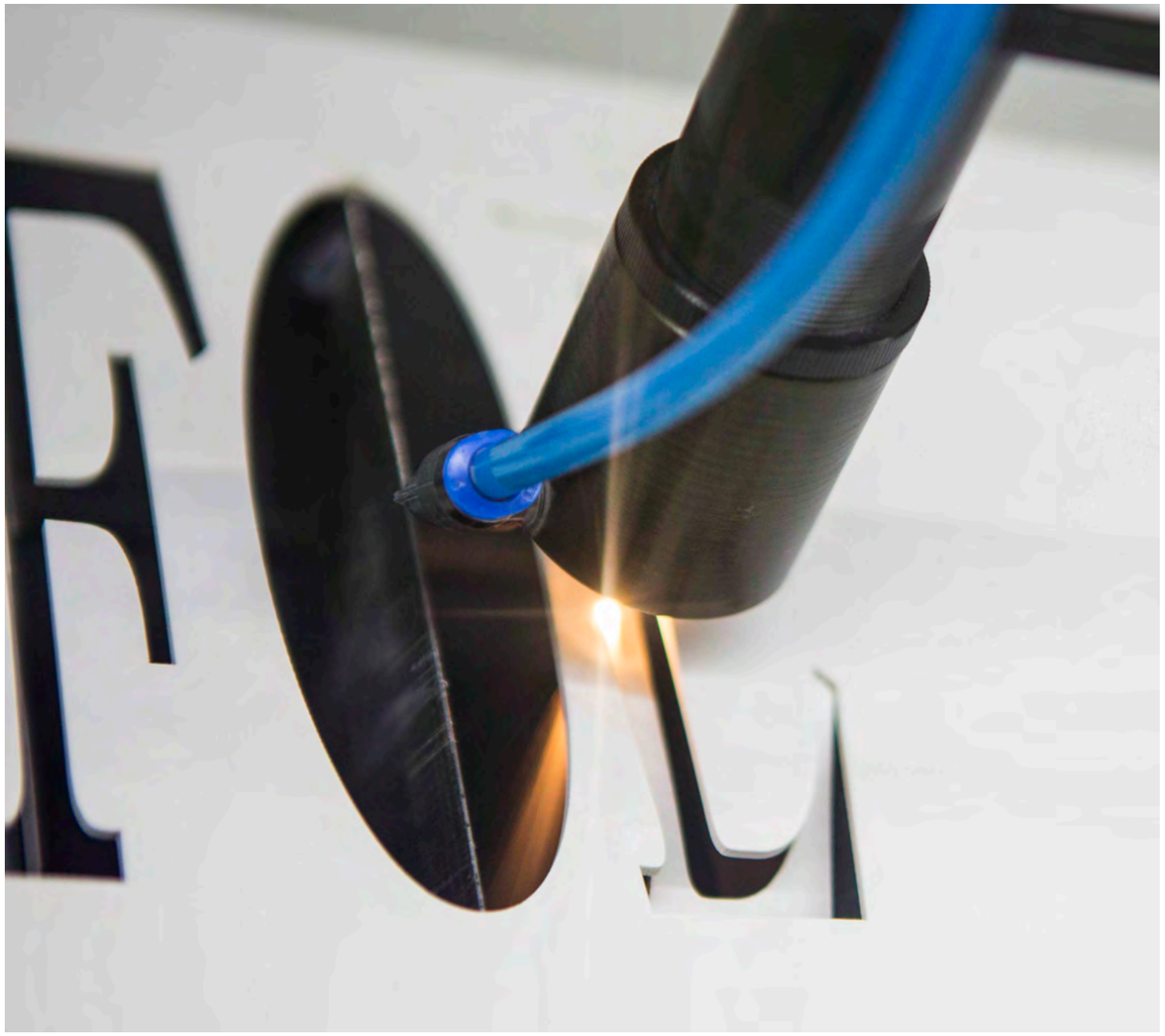
Many years of experience and a wide variety of innovative solutions make KERAFOL® your essential partner in the field of "Ceramic Tapes & Substrates".

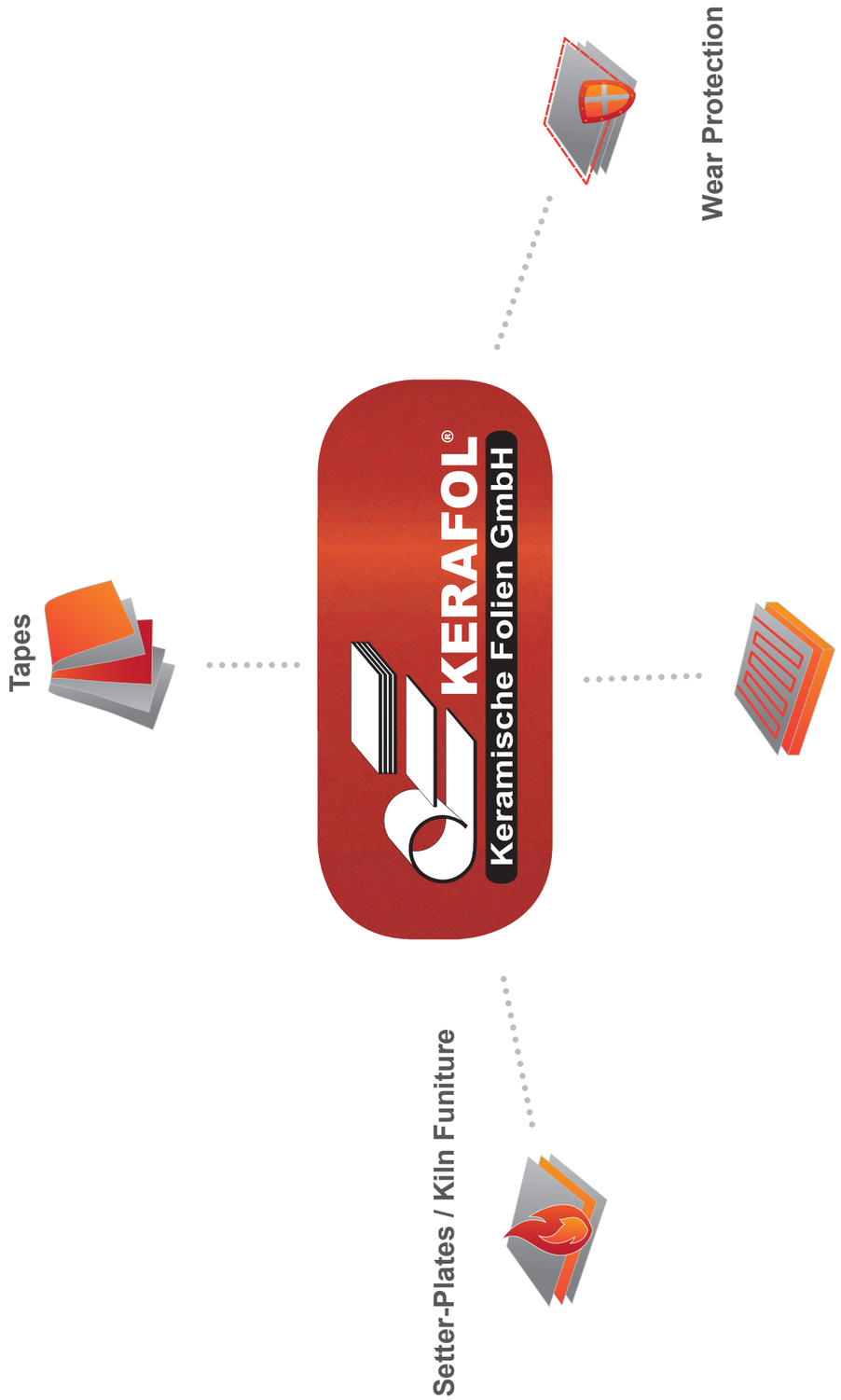
Why “Ceramic Tapes & Substrates” from KERAFOL®?

KERAFOL® - Keramische Folien GmbH 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.





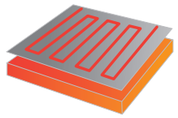
Ceramic Tapes and Substrates Products

Setter / Kiln Furniture

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

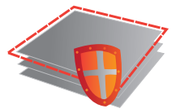
Thin- and Thickfilm Substrates

Thinfilm Substrates made by KERAFOL® are based on alumina, zirconia oxide or zirconia toughened alumina. These substrates are especially developed and used for thinfilm applications. The 96% alumina thickfilm substrates can be used for circuit boards or for example heat sinks.



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

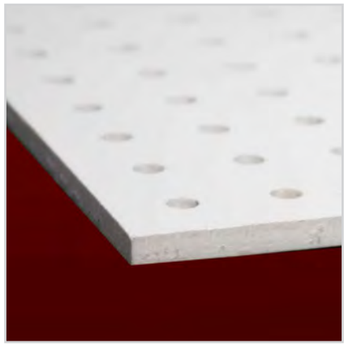
The department “Ceramic Tapes & Substrates” of KERAFOL® offers tapes based on alumina, zirconia or porcelain body.

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.

Made in Germany

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	60
Camber	%	< 0.3
Porosity	Vol.%	36 - 38
Average pore size	µm	1
Dimensions	mm	10 x 10 up to 350 x 350
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 setter and kiln furniture. The demand of time and energy for heating up and cooling down the kiln furniture is significantly reduced by using KERAFOL® setter plates.

Our customers use these setters 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 setter during the debinding and sintering process easily.

The parts do not adhere to the setter during the debinding process. Keralpor 99 can be used best as a setter 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 setter possible
- gases and liquids can freely diffuse through the sintered plate

Applications

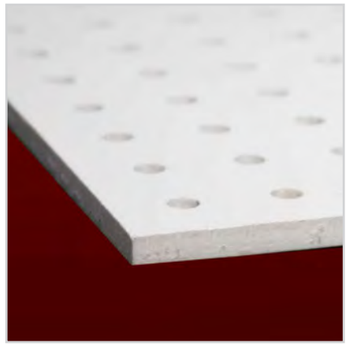
- setter for MIM - production
- setter for ceramic or dental ceramic production
- gas-permeable membranes for sensors

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

Setter-Plates / Kiln Furniture

Keralpor S

Alumina 92% + 8% Zirconia



Typical characteristics	Unit	Value
Colour	-	white
Gross density	g/cm³	2.8
Surface roughness R_a	µm	0.7
Bending strength	MPa	80
Camber	%	< 0.3
Porosity	Vol.%	38
Dimensions	mm	10 x 10 up to 350 x 350
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 setter, 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 38% porous structure, adhesion of the sintered part will be prevented.

Due to the porous structure of the setter, 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 setter
- 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 setters are possible
- gases can freely diffuse through the settermatrix

Applications

- setter plate for Metal Injection Moulding (MIM) parts
- setter plate for Ceramic Injection Moulding (CIM) parts
- setter 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.

RT

Single-use tape with
99.7% alumina quality

Typical characteristics	Unit	Value
Colour	-	withe
Bulk density	g/cm^3	2.5
Dimensions	mm	on request
Thickness	mm	0.3
Main components	%	99.7 Al_2O_3
Maximum operation temperature	T_{max}	1600°C
Ignition loss	%	~ 13
Maximum particle size	µm	~ 3

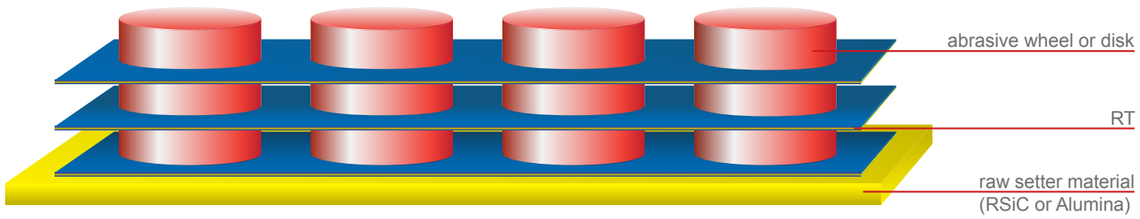
The RT is a tape for one-time use. It consists of almost 87% special alumina powder, which is embedded in a special organic carrier matrix. The high flexibility allows, for example, also the lining of 3D setters in the sintering and casting technology. The organic components of the tape are free of phthalates and burn free of residue at temperatures of about 500°C and oxidizing kiln atmosphere. The remaining alumina powder prevents adhesion of the products to the setter and allows an optimum slipping and shrinkage of the sintered product during the firing process.

Advantages

- organic carrier tape with high alumina content
- fine powder matrix with low organic binder content
- components slide freely on the powder matrix during the firing process
- tape can be easily cut with scissors, knifes or laser
- very smooth and particle free tape surface

Applications

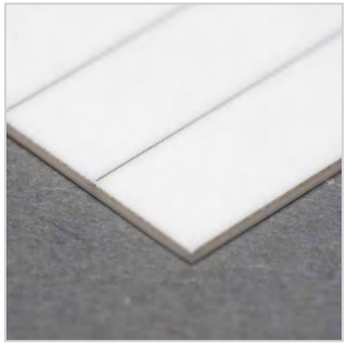
- one-time use high temperature setter tapes
- separating agent



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

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	$10^{-6}K^{-1}$	~ 10
Thermal conductivity	W/mK	2
Standard dimension	mm	101.6 x 101.6
Thickness	mm	0.15
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

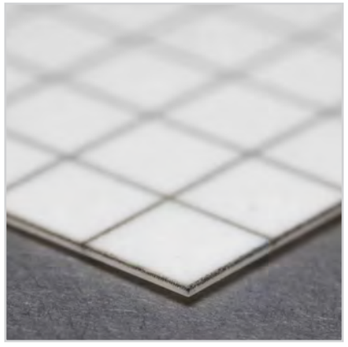
- sensor substrate for thin film application
- sensor protection plate

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	3.9
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 thinfilm 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.

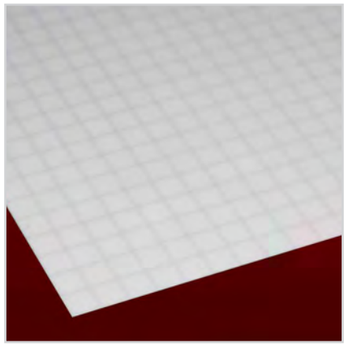
Main Applications

- 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

Alumina content ≥ 99.6%



Typical characteristics	Unit	Value
Colour	-	white
Gross density	g/cm³	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

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.

Thin- and Thickfilm Substrates

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 thickfilm 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.

Keraprotec

Yttria Stabilized Zirconia

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.

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	~ 2
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

We lasercut the material according to your wishes!

Please send in your CAD data.

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

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.

Keraflex®

Porcelain tape

Keraflex® is a soft porcelain tape, which was developed explicitly for art and design objects. Artists, designers, schools or hobbyists use Keraflex® tape to create jewelery, lighting elements, furniture components, objects of the plastic arts or origami sculptures. The tape is based on ceramic raw materials and an organic binding matrix. The high flexibility even allows the production of complex origami - objects.

The tape can be sintered in every traditional pottery kiln. For beginners KERAFOL® offers also the attractive porcelain starter kit box. The material can be purchased from one of our dealers mentioned in our purchase information on our homepage: www.keraflex.com

Sintered porcelain

Typical characteristics	Unit	Value
Colour	-	white - beige
Surface roughness R_{max}	µm	1.6
Thickness	mm	0.5 / 1.0
Gross density	g/cm³	2.4
Firing temperature	°C	1280
Bending strength	MPa	23
Ceramic material	-	soft porcelain
Dielectric strenght at 20°C	kV/mm	> 12.0
Thermal expansion coeffizient	$10^{-6}K^{-1}$	7.0
Translucence	-	yes

Green tape

Typical characteristics	Unit	Value
Colour	-	beige
Solvent	-	slightly water soluble
Tensile strength at 20°C	N/mm²	1.35
Dielectric strenght	kV/mm	12.0
Gross density	g/cm³	1.6
Standard dimensions	DIN A	3 / 4
Shelf life	month	12
Shrinkage at 1280°C	%	~ 18.0

Advantages

- creativity encouraging ceramic material for artists, designers, schools or hobbyists
- ideal ceramic material for thin-walled design and art objects
- starter kit with extensive information for beginners available

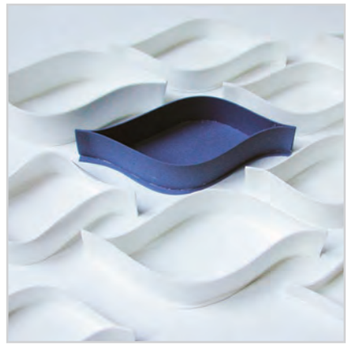
Applications

- construction material for artists and designers
- handcraft material for art schools

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

Keraflex® garnish slurry

Soft porcelain glue



Keraflex® garnish slurry should be used for fixing the parts of green Keraflex® tape together. Garnishing is the process of merging the tape ends or the attachement of the tape parts, by deforming and firmly connecting the tapes with garnish slurry. It is also possible to mix the slurry with water to get the best adherence.

Typical characteristics	Unit	Value
Colour	-	beige
Litre weight	kg/l	1.4
Standard packaging	l	0.25 / 0.5 / 1.0
Main components	-	soft porcelain body
Firing temperature	°C	1260 - 1280
Particle size distribution d_{50}	µm	7 - 8
Shelf life	month	12

Advantages

- special ceramic glue for Keraflex® porcelain tape

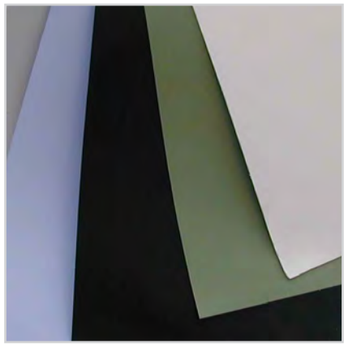
Applications

- waterbased suspension
- ceramic high temperature glue

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

AT 99.9

High Alumina Green-Tape
> 99.9%



AT 99.9 is one of our flexible tape casted high alumina powder films well dispersed and bonded in a phtalate free PVB-binder matrix. We provide our AT99.9 with the PET film just to protect the surface of the green tape from mechanical damage and as an aid in handling. We can provide the AT 99.9 in sheets.

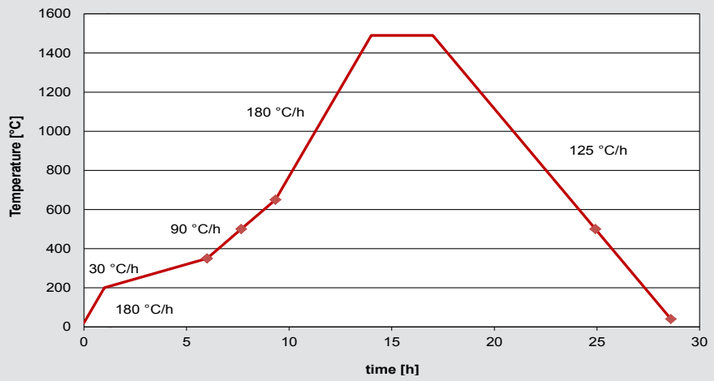
Typical characteristics	Unit	Value
Alumina purity	%	> 99.9
Alumina content	%	85
Colour	-	white
Fired surface roughness R_a	µm	< 0.076
Tape thickness	µm	200
Tape width (usable)	mm	340 (300)
Tape density	g/cm³	2.66
Firing temperature	°C	1510°C (3h)
Shrinkage at 1510°C	%	16.6
Fired density	g/cm³	3.89
Bending strength	MPa	400
Thermal conductivity	W/mK	~ 30
Permittivity 25°C at 10 KHz	-	13.5
Loss tangent 25°C 10 KHz	tanδ	< 0.002
Dielectric strenght at 20°C	kV/mm	> 10
TEC 20-600°C	10^{-6} K^{-1}	~ 7
PET-tape thickness	µm	190 / 250

Applications

- High Temperature Co-Fired Ceramics (HTCC) for example HV applications

Please ask for your special thickness and size!

Firing advice



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

Customized ceramic tape casting

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.

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

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

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


SIEMENS
SIMATIC HMI
TOUCH

Notice

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All information in catalogs, data sheets and website of KERAFOL® Keramische Folien GmbH is without guarantee. Technical changes are reserved.

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Customized solutions.

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!