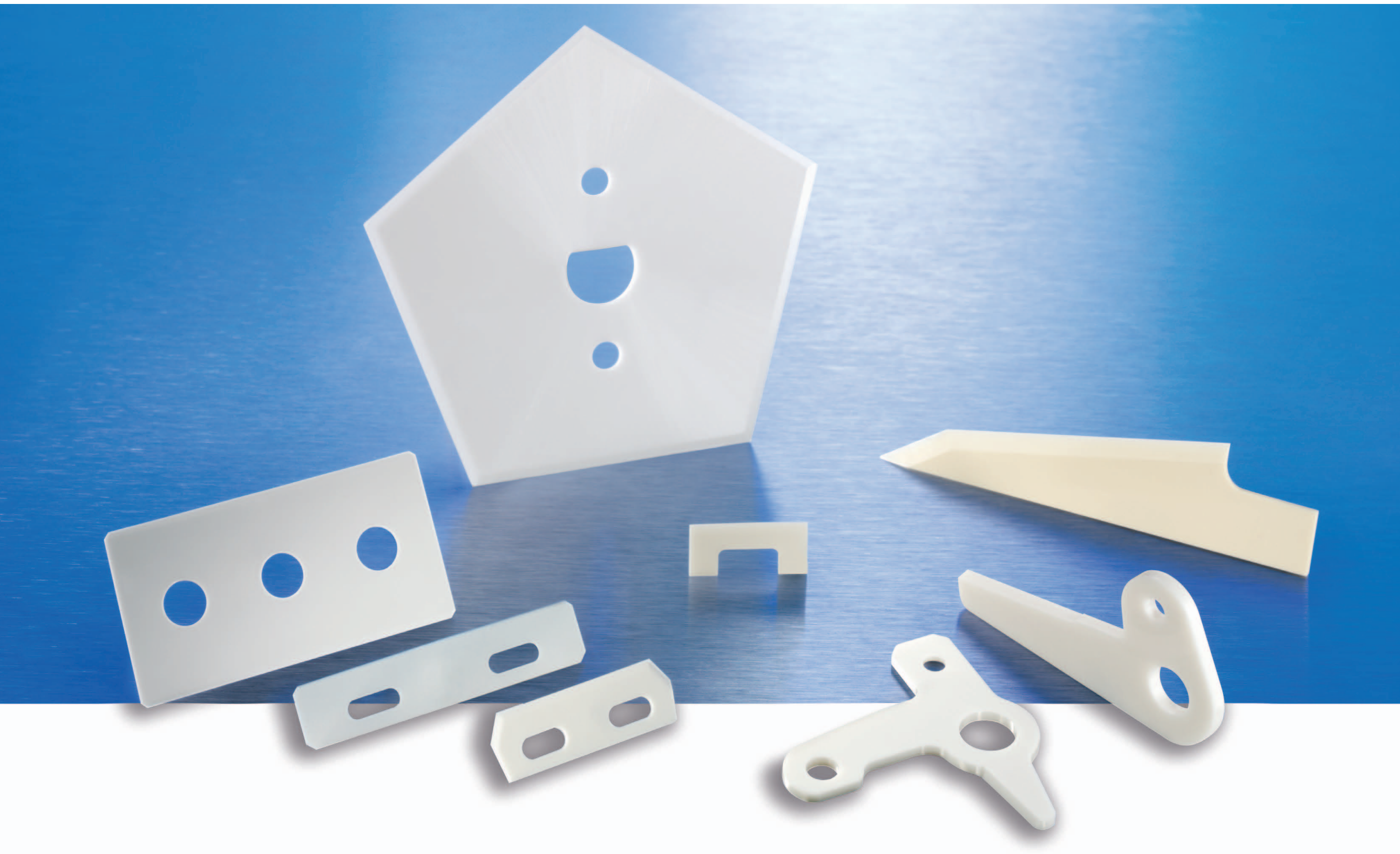
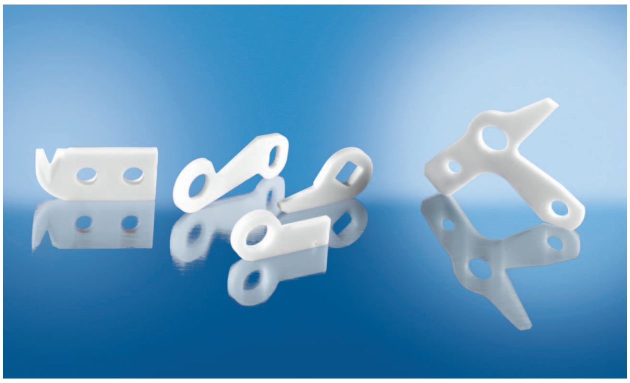


Advanced Ceramics for long lasting Cutting

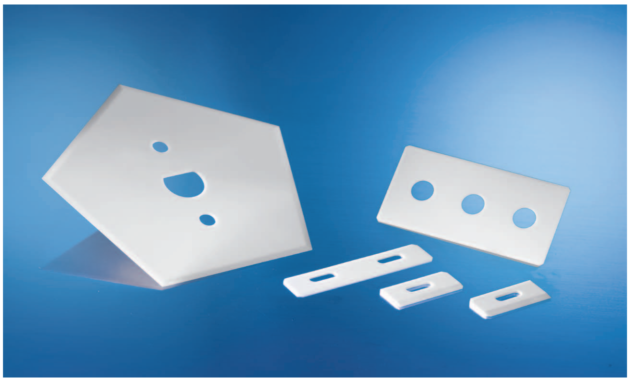
New dimensions with yttrium toughened zirconia

CeramTec
THE CERAMIC EXPERTS

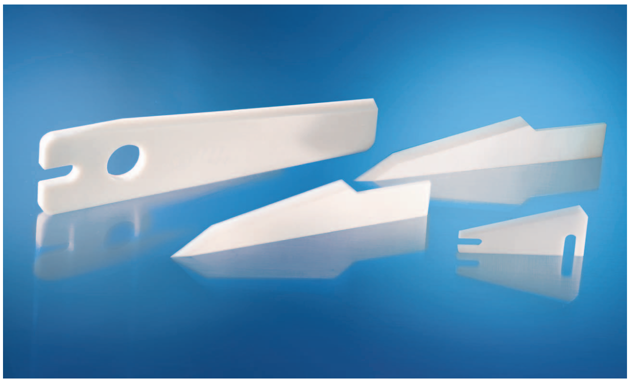
Cutters made from yttrium toughened zirconia



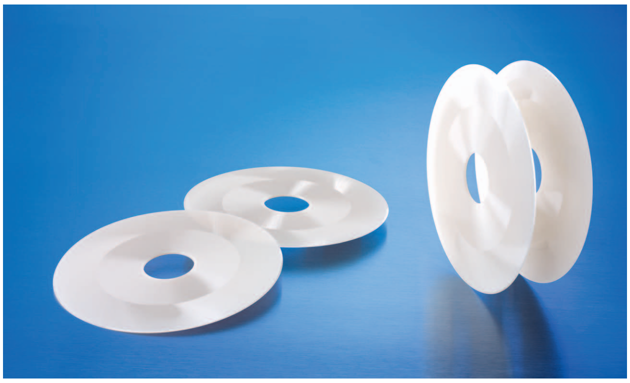
Scissors



Blades



Knives



Circular blades

Long lasting cutting with advanced ceramics

Long lifetime, consistently defined cuts, no fiber-squeezing or backlashing of fiber within the cutting angle zone of the shears – some of the many benefits of using advanced ceramics cutting blades in the production process.

For cutting purposes CeramTec has developed special yttrium toughened zirconia ceramics (3Y-TZP). They stand out from other materials with extremely high cutting edge strength and very good bending strength and toughness.

The use of 3Y-TZP cutting blades improves efficiency in cutting textile threads, and thus increases profitability.

The number of applications in the textile industry ranges from splicer, suction tube and residual tread shears for winding machines to final thread and side shears for looms. In many machines and applications, cutting blades made of 3Y-TZP are the material of choice and have set a standard.

A wide range of technical advantages

The effect of using 3Y-TZP cutting blades is an improvement in the efficiency of cutting textile threads, and thus increases profitability:

At a glance

- Faster cutting rates
- Consistently good cutting quality, e.g. improved strength of spliced connections
- No corrosion
- Smooth running
- Extended maintenance intervals
- Universal cleaning possibilities using acids, alkaline solutions and organic solvents

The range of applications for ceramic cutters is expanding rapidly. They are now used for textile applications as well as for medical purposes, and also in the food and automotive industry.

Materials data

Material characteristics	Unit	Test specification	Zirconia	
Material			**MZ 111**	**MZ 429**
Main constituent			ZrO_2-Y_2O_3	ZrO_2-Y_2O_3
General characteristics				
Bulk density	g/cm^3	DIN EN 623-2	6,08	6,05
Water absorption (open porosity)	%	DIN EN 623-2	0	0
Gas permeability	%		0	0
Mechanical properties				
Flexural strength 20 °C	MPa	DIN EN 843-1	1050	1050
Flexural strength 1000 °C	MPa	DIN EN 820-1		
Weibull modulus		DINV ENV 843-5	10	> 10
Compressive strength	MPa	DIN 51067T1	2200	2200
Fracture toughness K_{IC} (SEVNB)	MPa m$^{1/2}$	DIN CEN/TS 14425-1	6,7	6,5
Young's modulus	GPa	DINV ENV 843-2	210	210
Poisson's ratio		DINV ENV 843-2	0,30	0,30
Vickers hardness HV1		DINV ENV 843-4	1250	1250
R_a = Arithmetic mean roughness value	µm		< 0,06	< 0,06
Thermal and electrical properties				
Thermal conductivity 20 °C	W/mK	DIN EN 821-2	2,5	2,5
Thermal conductivity 1000 °C	W/mK	DIN EN 821-2		
Linear thermal expansion coefficient 20 – 100 °C	10^{-6} K^{-1}	DIN EN 821-1	11,1	11,1
20 – 400 °C	10^{-6} K^{-1}	DIN EN 821-1	11,2	11,2
20 – 600 °C	10^{-6} K^{-1}	DIN EN 821-1	11,6	11,6
20 – 1000 °C	10^{-6} K^{-1}	DIN EN 821-1	11,7	11,7
Specific heat c_p 20 °C	kJ/kgK	DINV ENV 821-3	0,4	0,4
Specific heat c_p 1000 °C	kJ/kgK	DINV ENV 821-3		
Resistivity 20 °C	Ω cm	IEC 672-1	$1 \cdot 10^{12}$	$1 \cdot 10^{12}$
Resistivity 400 °C	Ω cm	IEC 672-1		
Dielectric strength	kV/mm	IEC 672-1	19	17
Dielectric constant		IEC 672-1	29 (1 MHz)	29 (1 MHz)
Dielectric loss factor		IEC 672-1	$2 \cdot 10^{-3}$ (1 GHz)	$2 \cdot 10^{-3}$ (1 GHz)
Thermal stress resistance parameter R_1 $R_1 = \frac{\sigma_B (1-\mu)}{\alpha \cdot E}$	K	calculated	336	321
Maximum usage temperature – in oxidizing atmosphere	°C	experienced data	1000	1000
– in reducing or inert atmosphere	°C	experienced data	1000	1000

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