



# Silicon Nitride PCSN1000

## General Properties

Silicon Nitride is a lightweight and tough material with good thermal shock properties and high hardness values. It is particularly suitable for any application needing a fracture tough, hard and light material that can be used at elevated temperatures.

Like most technical ceramics, silicon nitride shrinks when sintered and in most applications needs to be ground to remove the outer skin, but as most uses are for tight tolerance components, diamond grinding is usually required in any case.

Silicon Nitride is seen as part of a group of materials with good fracture toughness. Other materials such as Zirconia don't have the high temperature characteristics of silicon nitride.

See our interactive material comparison table for more information – [www.precision-ceramics.co.uk](http://www.precision-ceramics.co.uk).

## Typical Applications

- Aerospace Applications
- Bearing Applications
- Engine Wear Parts
- Foundry Applications
- Mechanical Engineering
- Medical Components

RT = Room Temperature

[1] Determination of density and porosity according to DIN 623-2

[2] Average value of 4-point bending strength at room temperature according to DIN EN 843-1

[3] Hardness according to DIN EN 843-4

[4] Calculated from crack length derived from Vickers hardness indentation, according to Niihara

[5] Critical temperature difference for an infinite high heat transfer (quenching)

[6] Thermal shock coefficient at finite constant heat transfer (slowly heating)

The material characteristics listed above are measured with testing samples. They cannot be transferred to components with different size, shape or surface properties. We reserve the right to alter properties within the scope of technical progress or new developments.

## Typical Properties

PCSN1000		
Process	Gas Over-Pressure Sintered	
Colour	Grey/Black	
Geometry	3-Dimensional Components	
Maximum Size	Ø 610mm, Length 1500mm	
General Properties		
Chemical Composition	Si <sub>3</sub> N <sub>4</sub>	
Sinter Additives	RE <sub>2</sub> O <sub>3</sub> / Al <sub>2</sub> O <sub>3</sub>	
Density ρ	[1] (%)	3.18 - 3.40
Residual Porosity	(%)	<1
Open Porosity	(%)	0
Grain Size (Length)	(µm)	1 - 15
Mechanical Properties		
Compressive Strength	(MPa)	3000
Bending Strength σ RT	[2] (MPa)	730
Weibull-Modulus m		18
Youngs Modulus E	(GPa)	300
Hardness HV	[3] (GPa)	15.0
Fracture Toughness K <sub>IC</sub>	[4] (MPam <sup>1/2</sup> )	7.0
Poissons Ratio ν		0.26
Thermal Properties		
Maximum Working Temperatures		
- Inert Atmosphere	(°C)	1400
- Oxidizing Atmosphere	(°C)	1200
Specific Heat Capacity	(J/kgK)	700
Thermal Conductivity λ (20°C)	(W/mK)	25
Coefficient of Thermal Expansion	RT-1000°C	(10 <sup>-6</sup> K <sup>-1</sup> ) 3.2
	RT- 250°C	(10 <sup>-6</sup> K <sup>-1</sup> ) 1.9
	RT ± 20°C	(10 <sup>-6</sup> K <sup>-1</sup> ) 1.4
Thermal Shock Parameter R <sub>1</sub>	[5] (K)	558
Thermal Shock Parameter R <sub>2</sub>	[6] (W/m)	13955
Electrical Properties		
Electrical Resistivity (RT)	Ωcm	10 <sup>14</sup>
Dielectric Constant (1 MHz)	-	8

[www.precision-ceramics.co.uk](http://www.precision-ceramics.co.uk)  
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