

## Shapal™ Hi-M Soft

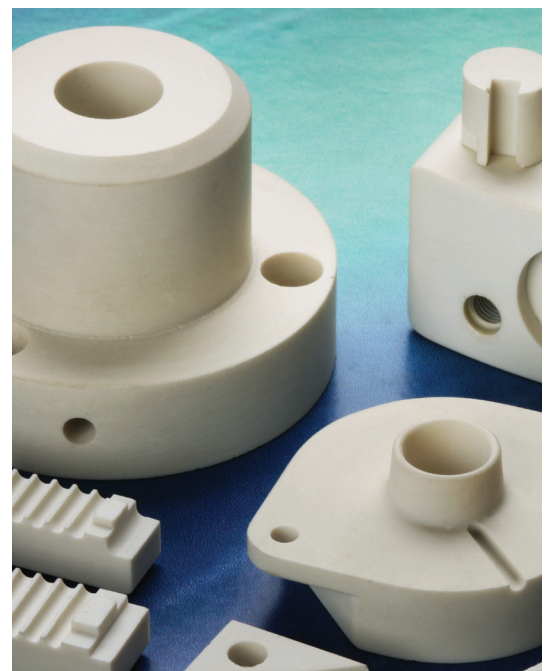
*A high performance, ultra-pure and easily machinable technical ceramic with excellent thermal conductivity and sealing ability to vacuum*

Shapal Hi-M Soft is a new hybrid composite material consisting of aluminium nitride and boron nitride, blended and sintered together to form a dense ceramic body. It has both high thermal conductivity and mechanical strength and can be easily machined into complex shapes while still keeping many of the advantages of aluminium nitride.

Shapal Hi-M Soft also has a very low co-efficient of thermal expansion which makes the material very attractive for harsh environments. It is regularly used by the European Space Agency and other industries taking advantage of its unique properties ...

- Excellent Machinability - Shapal Hi-M Soft can be machined by a broad range of methods such as drilling, turning, milling to form high precision complex shapes
- Excellent sealing ability to vacuum
- High thermal conductivity - approximately ten times as much thermal conductivity as that of alumina (aluminium oxide)
- High mechanical and bending strength of 30kg/mm<sup>2</sup>, comparable to that of alumina
- Transparency – allows visible infra-red light to pass through easily
- Excellent electric insulation

- Low thermal expansion, close to that of silicon
- High ability heat resistance
- Low dielectric loss
- High corrosion resistance – non-wetted by molten metals
- Ultra high purity – does not contaminate molten metal even at high temperatures



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Advanced Technical Ceramic Solutions



### PRECISION CERAMICS

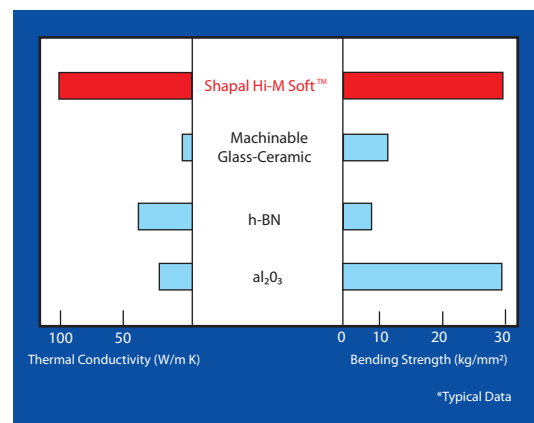
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**Technical Characteristics**

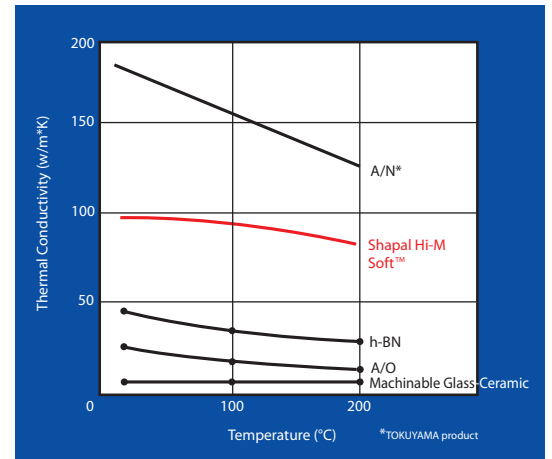
Properties	Test Conditions	Shapal Hi-M Soft™	Units
<b>General</b>			
Density	Corrected to 4°C	2.88	g/cm <sup>3</sup>
Porosity	25°C	0	%
<b>Electrical</b>			
Volume Resistivity	25°C	1.0 x 10 <sup>15</sup> Ω·cm	Ωcm
	500°C	3.2 x 10 <sup>10</sup> Ω·cm	Ωcm
	1000°C	4.6 x 10 <sup>5</sup> Ω·cm	Ωcm
Dissipation Factor (tan δ)	25°C, 1MHz	10 x 10 <sup>-4</sup>	
Dielectric Constant (ε)	25°C, 1MHz	6.8	
Dielectric Strength		65	kV/mm
<b>Thermal</b>			
Thermal Expansion Coefficient	RT to 400°C	4.8 x 10 <sup>-6</sup>	/°C
	RT to 600°C	4.9 x 10 <sup>-6</sup>	/°C
	RT to 800°C	5.0 x 10 <sup>-6</sup>	/°C
Thermal Conductivity	25°C	92	W/m·K
Maximum Use Temperature	in air	1000	°C
	in non oxidizing atmosphere	1900	°C
Thermal Shock Resistance ΔT	water quench	400	°C
<b>Mechanical</b>			
Bending Strength	25°C	300	MPa
Compressive Strength	25°C	100	kg/mm <sup>2</sup>
Young's Modulus	25°C	1.8 x 10 <sup>4</sup>	kg/mm <sup>2</sup>
Poisson's Ratio	25°C	0.31	
Vickers Hardness (Hv)	25°C, 300g	380	kg/mm <sup>2</sup>
<b>Chemical Durability</b>			
Resistance to Acid	10% HCl	0.2	mg/cm <sup>2</sup>
	24hrs, 25°C		wt.loss
Resistance to Base	10% NaOH	60	mg/cm <sup>2</sup>
	24hrs, 25°C		wt.loss
<b>Purity</b>			
O		0.9	wt%
Ca		1300	ppm
C		300	ppm
Cr		<1	ppm
Mg		1	ppm
Ni		<2	ppm
Fe		8	ppm
Si		40	ppm
Ti		20	ppm

The values presented are mean and typical of those resulted from test samples. They are provided as an indication only to serve as guidance in the design of ceramic components and are not guaranteed in any way. The actual values can vary according to the shape and size of the envisaged component.

**Material Characteristics**



**Thermal Conductivity & Purity**



Further technical information about Shapal Hi-M Soft can be found on our website – [www.precision-ceramics.co.uk](http://www.precision-ceramics.co.uk)

By using this information, both potential and existing users will have quicker and more efficient access to technical information about Shapal Hi-M Soft as well as being able to contact Precision Ceramics to discuss the best way forward for specific projects.

Typical applications for Shapal Hi-M Soft include ...

- Electronic components where electrical insulation and heat dissipation are required
- Components where low dielectric constant and dissipation factor are required
- Fixture parts where a low coefficient of thermal expansion is required
- Vacuum components
- Components where a low coefficient of thermal expansion required
- Heat sinks
- Crucibles for vacuum deposition
- Special refractory parts such as protective tubes

Shapal Hi-M Soft is manufactured by the Tokuyama Corporation in Tokyo, Japan. Throughout Europe, Precision Ceramics is the major distributor. Tokuyama Corporation has also appointed Precision Ceramics USA Inc sole distributorship rights throughout the whole of the USA.

