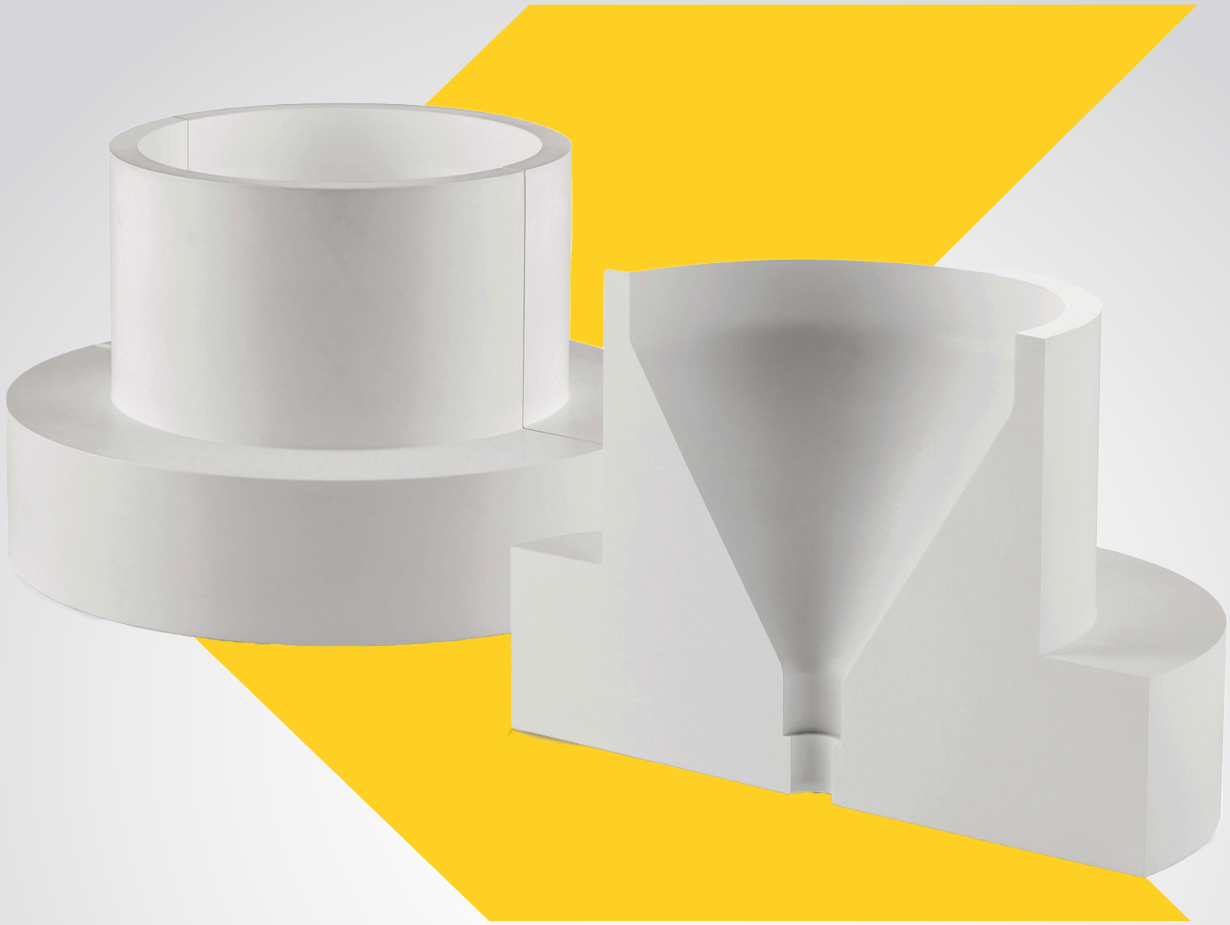
KENNAMETAL®

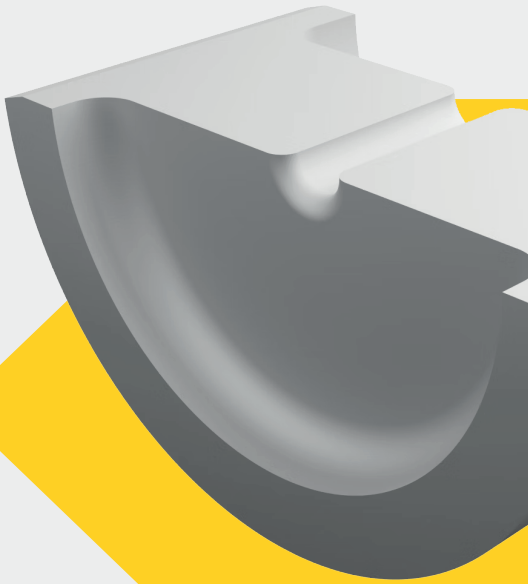


TECHNICAL DATA

BORON NITRIDE MACHINABLE CERAMICS

The Boron Nitride Advantage

Boron nitride is a high-temperature ceramic that has a structure similar to graphite. Our portfolio of hot-pressed solid materials includes pure hexagonal boron nitride as well as composites suitable for requiring excellent thermal properties, electrical isolation, better mechanical properties or a combination.

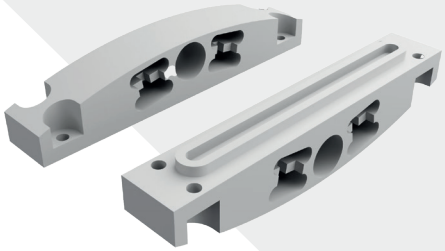


Why Choose Kennametal Sintec?

- **Reliability:** Precision-engineered for superior performance
- **Innovation:** Cutting-edge solutions tailored to industry needs
- **Expertise:** Decades of experience serving global industries

Pure Boron Nitride

Visit website:



The Pure Boron Nitride line consists of high-purity hexagonal boron nitride (hBN) materials, known for their exceptional thermal and chemical stability, electrical insulation properties, and ability to perform in extreme environments. These materials are ideal for high-temperature applications and are commonly used in industries requiring advanced refractory components, electrical insulators, and semiconductor equipment. The line's versatility allows it to meet diverse industry needs, ensuring superior thermal shockresistance, chemical inertness, and performance in custom shapes for applications like molten metal handling, Hall Effect Thrusters, PVD target insulators and crucibles.

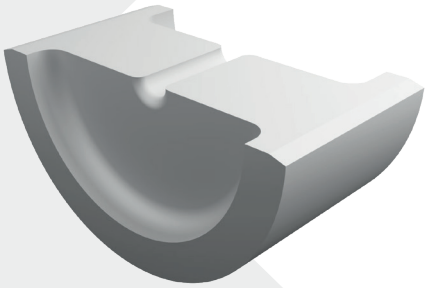
Material Type	Pure Boron Nitride		
Grade	**BN6000**	**BN8000**	**BN9000**
Composition	hBN	hBN	hBN
Maximum Service Temperature, °C	850 Air, 2000 Inert	850 Air, 1700 Inert	850 Air, 1900 Inert
Density, g/cm³	2.0	1.3	1.6
Flexural Strength(RT), MPa	32.3II /49.9 ⊥	40 II /40 ⊥	21 II /21 ⊥
Compressive Strength, MPa	32.3II/49.9 ⊥	20 II /20 ⊥	18 II /18 ⊥
C.T.E 20°C–1000°C x 10^6	2.2II/0.4 ⊥	1.6 II /1.2 ⊥	0.2 II /0.3 ⊥
Thermal Conductivity, W/mK	21 II /21 ⊥	30 II /30 ⊥	36 II /36 ⊥
Dielectric Strength, KV/mm	>70	-	-
Volume Resistivity, ohms*cm	$>10^{14}$	$>10^{15}$	$>10^{15}$
Applications	• Electrical insulators • Crucibles and rollers for molten glass and metals • Aerospace applications • Channel and pump components for molten metals	• Insulators • Semiconductor equipment • Jigs for molding glass • Crucibles • Paving plates • Thermocouple protection tubes	• Insulators • Semiconductor equipment • Jigs for molding glass • Crucibles • Paving plates • Thermocouple protection tubes

Why Choose Boron Nitride ceramic?

- The excellent heat transfer of boron nitride can be used in electronics to dissipate the heat effectively
- **Chemical Resistance:** Remarkable resistance to various chemicals ensures durability in harsh environments
- **Electrical Insulation:** With a dielectric strength of up to 100 kV/mm, boron nitride is an outstanding insulator for high-voltage uses
- **Low Friction:** Functions effectively as a dry lubricant, reducing friction in metalworking processes
- **Thermal Shock Resistance:** Low thermal expansion allows it to withstand rapid temperature changes without cracking

Boron Nitride Composites

Visit website:



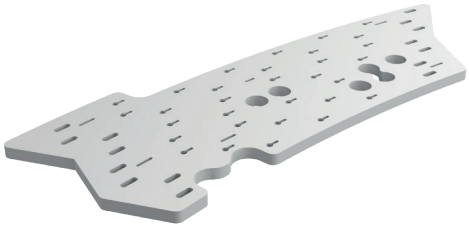
The Boron Nitride Composites line features advanced hybrid materials that combine hexagonal boron nitride (hBN) with specific ceramic additives, resulting in composites that maintain easy machinability while offering enhanced thermal, mechanical, and electrical properties. These materials are engineered for high-performance applications in extreme environments, such as vacuum furnaces, aerospace, and semiconductor manufacturing. With superior resistance to thermal shock corrosion, and wear, they provide reliable solutions for demanding industries that require materials capable of withstanding high temperatures, moisture, and corrosive conditions.

Material Type	Boron Nitride Composites	
Grade	BNP-2	BNP-6
Composition	AlN+BN	BN 43%, ZrO_2 4%, SiO_2 53%
Maximum Service Temperature, °C	1020 Air, 1900 Inert	1000+
Density, g/cm³	2.9	2.1
Flexural Strength(RT), MPa	70II/119 ⊥	93II/100 ⊥
Compressive Strength, MPa	220II/178 ⊥	365II/389 ⊥
C.T.E 20°C–1000°C x 10^6	5.3/5.3 ⊥	1.8II/1.3 ⊥
Thermal Conductivity, W/mK	93 II /93 ⊥	-
Dielectric Strength, KV/mm	-	-
Volume Resistivity, ohms*cm	-	-
Applications	• Vacuum furnace seals • Nuclear • Casting nozzles • High-temperature bearings	• Aerospace and satellite thrusters • Plasma • Extreme environments, • PVD: constraint of plasma arcs • Extreme corrosion and wear resistance

Material Type	IMC
Grade	IMC
Max. Use Temperature, ºC	1020 Air,1900 Inert
Young's Modulus at RT, GPa	34,1II/75,2⊥
Thermal Conductivity at 25ºC, W/m*K	120
Thermal Conductivity at 1200ºC, W/m*K	35
CTE, RT to 1500ºC, 10-6K-1	8II/6 ⊥
Flexural Strength, MPa at 25ºC	150
Flexural Strength, MPa at 1200ºC	30
Density, g/cm3	3.01
Ca, ppm	<100
Cr, ppm	<20
Mg, ppm	<20
Ni, ppm	<10
Fe, ppm	<50
Si, ppm	<15
P, ppm	<10
S, ppm	<10
Applications	• Metallization processes • Semiconductor manufacturing • High-temperature crucibles • Electron beam evaporation systems • Optical coating equipment

Boron Nitride Solutions for Complex Industrial Applications

Visit website:



At Kennametal, we offer professional consultancy and expertise in the grade selection of Boron Nitride. As a long-standing boron nitride supplier worldwide, we leverage our knowledge and extensive experience to provide semi-finished products and finished parts of boron nitride and boron nitride composites. With our knowledge and extensive experience, we provide semi-finished products and finished parts of boron nitride and boron nitride composites. Our capabilities allow us to handle orders from prototype development to mass production of the most complex ceramic components. With us, you can find solutions for the most demanding applications in aerospace, semiconductors, metal casting and many other industries. Discover the countless possibilities of Kennametal ceramic components.

Material Type	Boron Nitride Solutions for Complex Industrial Applications				
Grade	**BN4000**	**BN5000**	**BN7000**	**BNP-3**	**PBN**
Composition	hBN (B_2O_3 binder)	hBN (CaO + B_2O_3 binder)	hBN	BN 45%, ZrO_2 45%, SiO_2 10%	-
Maximum Service Temperature, °C	850 Air, 1200 Inert	850 Air, 1150 Inert	850 Air, 2000 Inert	850 Air, 1600 Inert	850 Air, 2000 Inert
Density, g/cm³	2.0	2.0	1.9	2.9	1.9 - 2.1
Flexural Strength(RT), MPa	94 ∥ /65 ⊥	59 ∥ /45 ⊥	22 ∥ /21 ⊥	144 ∥ /07 ⊥	115
Compressive Strength, MPa	143 ∥ /186 ⊥	97 ∥ /97 ⊥	25 ∥ /25 ⊥	218 ∥ /253 ⊥	-
C.T.E 20°C–1000°C x 10^6	1.9 ∥ /1.8 ⊥	1.5 ∥ /0.10 ⊥	1.6 ∥ /0.4 ⊥	0.5 ∥ /4.2 ⊥	15.5"c", 3.0"a", (-40-150°C)
Thermal Conductivity, W/mK	30 ∥ /34 ⊥	27 ∥ /29 ⊥	78 ∥ /130 ⊥	24 ∥ /34 ⊥	1.6 "c"
Dielectric Strength, KV/mm	88	>10	79	-	230 "c"
Volume Resistivity, ohms*cm	$>10^{13}$	$>10^{13}$	-	-	10^{15}
Applications	• High-temperature electrical insulators • Crucibles • Ion implantation systems • Setter plates	• Crucibles • Electrical insulators • Glass manufacturing rolls and support plates	• Thermocouple protection tubes • Insulators for high temperature vacuum furnaces • Crucibles for high purity metals and Refractories • High-temperature electrical insulators	• Molten metal side dams • Continuous casting break rings • Refractories • Crucible • Atomizing nozzles	• MBE crucibles • MBE furniture • Electrical insulators • Vacuum furnace insulation • LEC • VGF • Crucibles • Heating element supports

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