FREEWILL MATERIAL TECHNICAL DATASHEET

Boron Nitride (BN)

Machinable, thermal-shock-resistant ceramic with non-wetting behavior against molten metals.

Best suited for: Molten metal handling, release applications, furnace parts, high-temperature insulation and easily machined custom parts.

Engineering Positioning

Boron Nitride is used when thermal shock, machinability and non-wetting behavior are more important than very high mechanical strength. It is especially useful in molten metal, furnace and high-temperature release applications.

Typical Material Properties

Property	Typical engineering reference
Service temperature in air	Often around 800-900 C, grade dependent
Service temperature inert/vacuum	Can be much higher, grade dependent
Thermal conductivity	Grade and direction dependent
Electrical behavior	Excellent electrical insulation
Machinability	Can be machined into complex shapes with comparatively low tooling difficulty
Key behavior	Thermal shock resistance, non-wetting to many molten metals and clean release

Values are typical reference ranges. Final data depends on grade, forming route, sintering process, geometry and test method.

Practical Application Scenarios

- Molten metal nozzles, break rings, casting components and transfer parts.
- Furnace insulators, spacers, supports and high-temperature fixtures.
- Release surfaces where metal adhesion or solder sticking creates downtime.
- Prototype ceramic parts requiring fast machining and design iteration.

Selection Notes for Engineers

- Confirm molten metal type, atmosphere, peak temperature and contact time.
- Use BN when non-wetting behavior and thermal shock resistance are key failure drivers.
- Do not select BN primarily for high mechanical load unless the grade and geometry are confirmed.

Boron Nitride (BN) - Cost and Application Review

The lowest unit price is not always the lowest operating cost. For severe-duty ceramic components, cost should be evaluated by service life, downtime, contamination risk, replacement labor and process stability.

Example Lifecycle Cost-Saving Model

Item	Illustrative scenario
Current solution	Graphite or conventional ceramic part requires 2 hours cleaning per shift due to metal adhesion
BN scenario	Cleaning reduced to 0.5 hour per shift with improved release behavior
Simple model	Labor and downtime value: USD 60/hour, 250 shifts/year
Estimated annual impact	USD 30,000 to USD 7,500, about 75% lower cleaning-related cost in this example

This model is illustrative, not a guaranteed saving. Actual savings depend on operating conditions, design, installation, maintenance behavior and process value per hour.

Recommended Information to Share for Quotation

- Drawing, sketch, sample photo or target geometry.
- Working temperature, thermal cycle rate and atmosphere.
- Chemical medium, abrasive particles, pressure, speed and load.
- Current material, failure mode and expected service life.
- Required tolerance, surface finish, purity, quantity and delivery target.

Why Work with Freewill Material

Material selection	Recommendation based on operating conditions, not only material names.
Custom manufacturing	Ceramic and refractory components from drawings, samples or application requirements.
Technical communication	Support for engineers and procurement teams during sample, testing and volume production.
Global customer focus	English technical content, downloadable datasheets and application-oriented inquiry support.

Contact

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Ask for an expert material recommendation and include your working condition details for faster review.