

**COORSTEK**  
Amazing Solutions.®



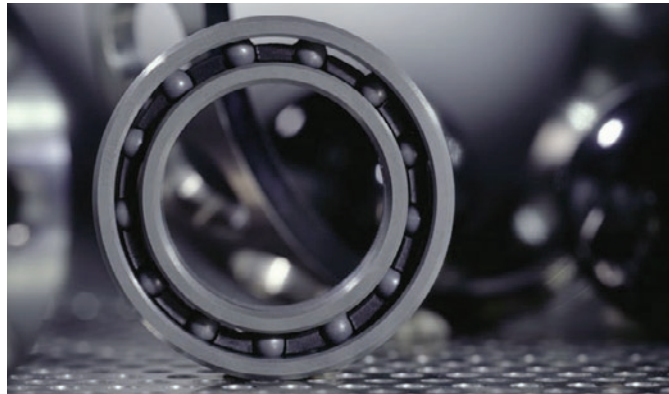
**Cerbec**®

Genuine Cerbec  
Ceramic Balls

# CERBEC® CERAMIC BALLS



- Decreased lube degradation & less wear → Longer bearing life
- Higher speed; harsh environments → Increased performance
- Reduce downtime; less maintenance → Higher reliability
- Expanded design possibilities → Solve problems
- ⇒ Lower total operating costs



## Cerbec Ball Processing

Raw material – High Purity

Milling preparation – Chemistry & particle size control

Spray drying – Flowability & packing density

Forming – Uniform compaction

Pre-firing – Binder removal

HIP densification – Proper microstructural development for hardness, toughness, and rolling contact fatigue

Lapping – Geometry, surface finish, surface quality

Final inspection – Assured quality

## Smoother surface, better geometry & inert material

- Decreased lube degradation
  - No cold welding/adhesive wear
  - Less friction
  - Reduced startup & running torque
  - Lower operating temperature
  - Less wear
  - Eliminates vibration - induced false brinelling
- » Less lube needed
  - » Simpler lube system (grease vs. oil)
  - » Greater reliability
  - » Reduced energy consumption
  - » Lower noise & vibration
  - » Higher speed
  - » Longer life

## Cerbec vs. S

- Bearing Impro
- » Payoff to Bear

## Lighter weight

- Decreased centrifugal force
  - Decreased gyroscopic movement
  - Reduced ball skidding
  - Less friction
  - Lower operating temperature
  - Reduced start-up & running torque
  - Lower raceway stress
  - Less wear
- » Higher speed
  - » Longer life
  - » Expanded design possibilities

For expert assistance with your next project, please call:  
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and  
+33.1.64.13.61.26  
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# MAKE BEARINGS BETTER

## Lower thermal expansion

- Reduced contact angle change
- Stable running pre-load
- Minimal ball deformation
- Lower operating temperature
  - » Higher speed

## Corrosion & electrical resistance

- Less wear
- No electrical arcing thru balls
- Harsh environment durability
- No ball degradation
- Reduced raceway, pitting / degradation
  - » Longer life
  - » Greater reliability
  - » Expanded design possibilities



Steel  
Improvements  
Benefiting User

## Harder & stiffer

- Reduced ball / race contact area
- Minimum ball deformation
- Reduced ball skidding
- Less friction
- Lower operating temperature
- Resists hard particle contamination
- Less wear
- More rigid
  - » Higher speed
  - » Longer life
  - » Lower noise & vibration
  - » More accurate machines

## Why Cerbec Ceramic Balls?

Property	Typical Steel	Cerbec Si <sub>3</sub> N <sub>4</sub>	Cerbec Difference
Density [g/cc]	7.6	3.2	-58% Lighter
Hardness [Vickers]	700	1550	+121% Harder
Elastic Modulus [GPa]	190	320	+68% Stiffer
Thermal Expansion Coefficient 1 X 10 <sup>-6</sup> / °C [RT to 1000°C]	12.3	2.9	-76%
Max Use Temp [°C]	320	1000	+680°C
Surface Finish Grade 5 [micron]	0.02	0.005	+75% Smoother

## ASTM F2094 Si<sub>3</sub>N<sub>4</sub> Ball Specification

Grade	Allowable Ball Diameter Variation	Allowable Deviation from Spherical Form	Maximum Surface Roughness Ra	Allowable Lot Diameter Variation	Basic Diameter Tolerance
3C	0.08 (3)	0.08 (3)	0.004 (0.15)	0.13 (5)	+/- 0.51 (+/- 20)
5C	0.13 (5)	0.13 (5)	0.005 (0.20)	0.25 (10)	+/- 0.76 (+/- 30)
5 Steel For Comparison	0.13 (5)	0.13 (5)	0.02 (0.8)	0.25 (10)	+/- 1.0 (+/- 40)

Units of measure = micron (micro-inch)

## Cerbec Silicon Nitride Typical Properties

NBD-200 typical for balls 3.175mm (.125") diameter or smaller.  
SN-101C typical for balls greater than 3.175mm (.125") diameter.

Material	NBD-200	SN-101C
Sintering Aid	MgO	Y <sub>2</sub> O <sub>3</sub> ; Al <sub>2</sub> O <sub>3</sub>
Density [g/cm <sup>3</sup> ] (% Theoretical)	3.16 [ > 99.9% ]	3.21 [ > 99.9% ]
RT Flexural STrength [MPa]	>900	>1000
Weibull Modulus	15	15
Elastic Modulus [GPa]	320	310
Poisson's Ratio	0.26	0.27
Vicker's Hardness HV10	1550	1550
Fracture Toughness [MPa m <sup>1/2</sup> ]	6	6.5
Thermal Expansion Coefficient 1 X 10 <sup>-6</sup> / °C [RT to 1000°C]	2.9	3.7
Thermal Conductivity [W/m K] @ 25°C	29	34
Electrical Resistivity [ohm-cm]	10 <sup>14</sup>	10 <sup>14</sup>
Dielectric Constant @ 1MHz	8.0	8.0
Corrosion 5% HF Solution, 500 Hours Weight Loss/Surface Area [g/cm <sup>2</sup> ]	0.68	0.10
Corrosion 5% HCL Solution, 500 Hours Weight Loss/Surface Area [g/cm <sup>2</sup> ]	0.0002	0.0036



Ceramic balls are lighter, more durable, more precise, and more stable. Better for your bearings in every way.

## CERBEC CERAMIC BALLS FOR SUPERIOR PERFORMANCE

<b>High speed</b> 		<b>Extreme temperatures</b> 	<b>Electrical resistance</b> 
Machine tool spindles	Dental handpieces	Space satellites	Electric motors
<b>Low friction</b> 		<b>Extremely low lube</b> 	<b>Lightweight</b> 
Bicycles, in-line skates	Wheel, clutch, transmission bearings	Turbomolecular pumps	Wing flap ballscrew actuator

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