



High Performance Bearings

Hexoloy® Silicon Carbide
Noralide® Silicon Nitride
Ceramic Materials



Clean room/semiconductor applications



Food Processing



Hexoloy® SiC – A Superior Bearing Material For the Most Difficult Applications

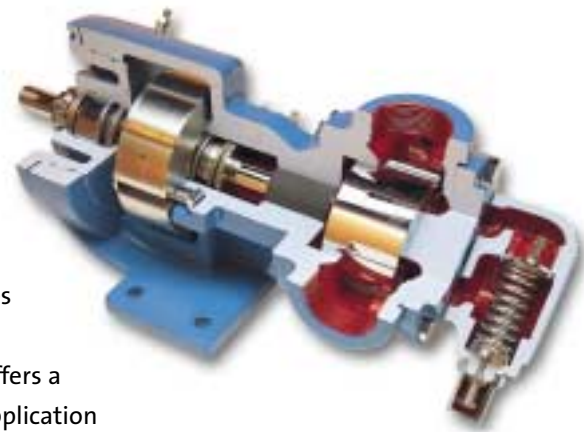
- Extreme Hardness and High Strength
- High Abrasion and Wear Resistance
- Excellent Corrosion Resistance
- Superior Thermal Shock Resistance

Saint-Gobain Ceramics offers a family of Hexoloy® sintered alpha silicon carbide grades, providing high performance materials that have proven successful in a wide variety of applications and pump design types including:

- Gear Pumps
- Magnetically-driven Pumps
- Canned Motor Pumps
- Multi-stage Pumps
- Vertical Pumps
- Down Hole Pumps

The advantages of Hexoloy SiC

- As one of the hardest commercially available materials, it provides wear resistant, long service life.
- Its universal corrosion resistance offers a bearing material with unlimited application potential.
- Low friction and high strength characteristics result in superior high PV performance.
- It has high thermal conductivity for excellent thermal shock resistance.
- Net shape manufacturing capabilities eliminate costly machining operations.
- Hexoloy SP's unique spherical pore based lubrication provides the ability to survive marginal operating or upset conditions.



Internal Gear Pumps – Hexoloy SiC bearings deliver reliable performance in pumps used in tank car unloading and other continuous service applications

There's a Hexoloy® SiC Material for your bearing application

Hexoloy SA Silicon Carbide

Hexoloy SA SiC is a pressureless, sintered form of alpha silicon carbide, with a density greater than 98 percent theoretical. It has a very fine grain structure (less than 10µm) for excellent wear resistance and contains no free silicon, which makes it highly chemically resistant in both oxidizing and reducing environments. These abilities coupled with excellent surface finish characteristics make it ideally suited to product lubricated bearing applications.



Hexoloy SP Silicon Carbide

Hexoloy SP SiC is a sintered alpha silicon carbide material designed specifically for optimum performance in sliding contact applications such as product lubricated bearings. This material improves upon the exceptional corrosion and erosion resisting properties of Hexoloy SA SiC through the addition of unique spherical pores. These discrete, evenly dispersed pores act as fluid or lubricant reservoirs helping to promote the retention of a fluid film at the interface of sliding component surfaces.



Metering Pumps – Hexoloy SiC provides the low wear required to maintain critical clearances

Design Assistance

Our application engineers can help you with design recommendations that allow for cost-effective Hexoloy SiC bearing solutions for your applications. Please contact us to discuss how Hexoloy SiC can benefit your bearing needs.

Features of Hexoloy SiC Bearings

Wear Resistance

In thrust and journal bearings, wear can occur due to upset conditions, abrasive fluids, shaft deflections and general abuse, ultimately causing a complete failure of the bearing. Hexoloy SiC is an extremely hard and wear resistant material. It can be used up to a PV limit of 500,000 psi ft/min when self-mated.

Corrosion Resistance

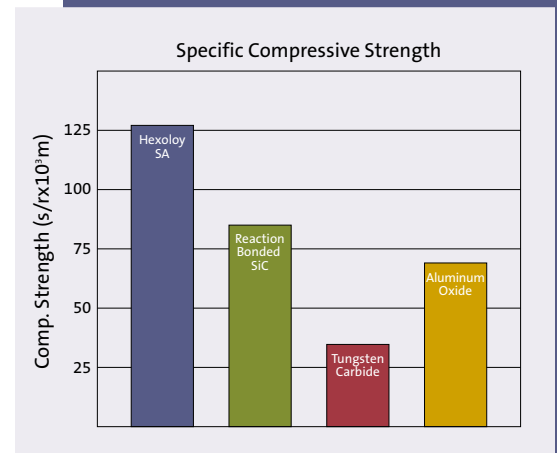
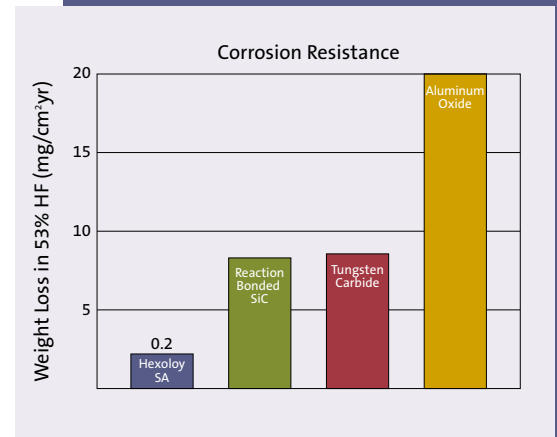
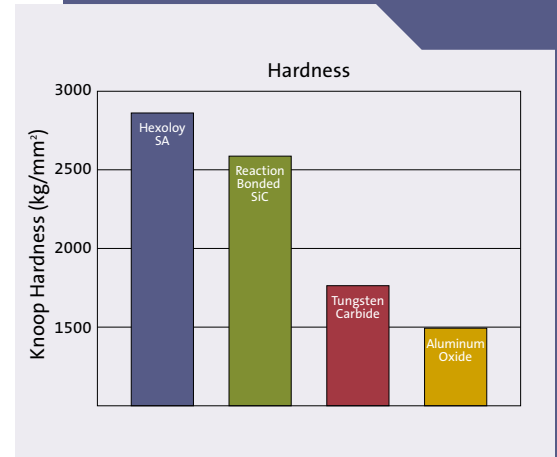
Hexoloy SiC exhibits excellent corrosion resistance over a broad range of pH values. It is chemically inert to strong oxidizers unlike tungsten carbide or reaction bonded silicon carbide. Hexoloy SiC outperforms tungsten carbide and aluminum oxide in all chemical categories.

Mechanical and Physical Properties

Hexoloy SiC offers the optimal combination of mechanical and physical properties. The high strength and modulus of elasticity are complemented by low coefficient of thermal expansion and high thermal conductivity. This combination of properties allows the designer to build rigid, high load bearings while maintaining design clearances across a wide range of operating temperatures.



Sealless Magnetic Centrifugal Pumps – Hexoloy SiC bearings withstand highly corrosive, high temperature chemicals handled by magnetic drive pumps



Material Properties – Typical Values

Property	Units	Hexoloy SA SiC	Hexoloy SP SiC	Enhanced Hexoloy®SA	Noralide® NBD-200 Si ₃ N ₄
Composition*	–	SiC	SiC	SSiC	Si-N
Grain Size	µm	4-10	4-10	4-10	<2
Density	g/cm ³	3.10	3.04	3.13	3.18
Hardness(Knoop 0.1 kg load)	kg/mm ²	2800	2800	2800	N/A
Hardness(Vickers 10 kg load)	GPa	N/A	N/A	N/A	16
Flexural Strength 4 pt @ RT**	MPa x10 ³ lb/in ²	380 55	240 35	428 62	800 –
Compressive Strength @ RT	MPa x10 ³ lb/in ²	3900 560	N/A	3900 560	3500 –
Modulus of Elasticity @RT	GPa x10 ⁶ lb/in ²	410 59	400 58	410 59	320 –
Weibull Modulus (2 parameters)		8	19	12	N/A
Poisson Ratio		0.14	0.14	0.14	N/A
Fracture Toughness @RT Double Torsion & SENB	MPa x m ^{1/2} x10 ³ lb/in ² x in ^{1/2}	4.60 4.20	4.3 3.9	4.60 4.20	– –
Fracture Toughness @ RT Indentation	MPa x m ^{1/2}	–	–	–	4.1
Coefficient of Thermal Expansion RT to 700°C	x10 ⁻⁶ mm/mmK x10 ⁻⁶ in/in°F	4.02 2.20	4.2 2.3	4.02 2.20	2.9**** –
Max. Service Temp. Air	°C °F	1900 3450	1900 3450	1900 3450	N/A
Mean Specific Heat @ RT	J/gmK	0.67	0.59	0.67	N/A
Thermal Conductivity @ RT	W/mK Btu/ft h°F	125.6 72.6	110 64	125.6 72.6	N/A 29
@ 100°C	W/mK Btu/ft h°F	N/A N/A	N/A	N/A	
@ 200°C	W/mK Btu/ft h°F	102.6 59.3	N/A	102.6 59.3	N/A
@ 400°C	W/mK Btu/ft h°F	77.5 44.8	N/A	77.5 44.8	N/A
Permeability @ RT to 1000°C		Impervious to gases over 31 MPa			
Electrical Resistivity @ RT**** @ 1000°C	ohm-cm ohm-cm	10 ² -10 ⁸ 0.01-0.2	N/A	10 ² -10 ⁸ 0.01-0.2	>10 ¹²
Emissivity		0.9	0.9	0.9	N/A
Pore Volume Fraction	%	N/A	4.0-6.0	N/A	N/A
Pore Size	µm	N/A	50	N/A	N/A

*Composition code: Si = free silicon metal;
C = free graphite; SiC = silicon carbide;
N = nitrogen; Si₃N₄ = silicon nitride

***RT to 1000°C

****Dependent upon dopants in Hexoloy® SA
SiC which will decrease electrical resistivity

**Test Bar Size: 3 x 4 x 45 mm
(0.118" x 0.157" x 1.772")

Your Source for Hexoloy® SiC Seal Faces...Worldwide.

Saint-Gobain Ceramics offers vast resources to meet your needs for silicon carbide products. With representation in Asia by Norton KK (a Saint-Gobain company) and locations in Europe, Australia and South America, we can deliver your solution when you need it, where need you need it, in virtually every corner of the world.

Contact Saint-Gobain Ceramics for more information

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Form No. B-1041
10/03