SAINT-GOBAIN PERFORMANCE CERAMICS & REFRACTORIES

ENGINEERED CERAMIC SEAL PRODUCTS

FOR ROTATING EQUIPMENT

SAINT-GOBAIN

SAINT-GOBAIN 2023

Derwent Top 100 Global Innovator 2023
Clarivate Analytics

top EMPLOYER GLOBAL 2024

1 IN 4
PRODUCTS
did not exist 5 years ago

160.000+
EMPLOYEES

47.9 BILLION
SALES IN 2023

REPRESENTED IN 76
COUNTRIES

CO_2 -34 %
CARBON EMISSIONS REDUCTION
(vs. 2017 on scope 1+2)

8
MAIN R&D CENTRES

OUR PURPOSE

MAKING THE WORLD A BETTER HOME.

OUR MISSION

Saint-Gobain designs, manufactures and distributes materials and solutions which are key ingredients in the well-being of each of us and the future of all.

WE ARE COMMITTED TO ACHIEVING NET ZERO CARBON EMISSIONS BY 2050

SAINT-GOBAIN

PERFORMANCE CERAMICS & REFRACTORIES

Saint-Gobain Performance Ceramics & Refractories is a global leader in supporting composite armor systems, offering unparalleled design flexibility with the most innovative and consistent ceramics on the market. Our high-performance, lightweight ceramic materials are designed for the utmost performance in modern ballistic protection.

Benefit from these advantages

- Custom engineering to customer specifications
- Co-development options
- Consistent high-quality manufacturing
- Extensive worldwide capacity
- Rapid prototyping
- Global R&D resources

PIONEERING CERAMIC SOLUTIONS FOR EXTREME INDUSTRIAL APPLICATIONS AND A GREENER WORLD.

MECHANICAL SEAL FACE SOLUTION

Saint-Gobain Performance Ceramics & Refractories' utilize materials expertise, innovative designs, creative engineering and precision manufacturing processes to deliver reliable solutions for rotating equipment to global OEM customers and machine shops.

APPLICATIONS

Saint Gobain Performance Ceramics & Refractories business offers a family of Hexoloy® sintered alpha silicon carbide and Noralide® silicon nitride materials for high performance seal face application in:

- Automotive water pumps
- Chemical processing pumps
- Gas seals for compressors
- Nuclear reactor coolant pumps
- Industrial pumps in Oil & Gas refining, mining, pulp & paper processing, power plants, water treatment plants, refrigeration

WHY HEXOLOY® SILICON CARBIDE?

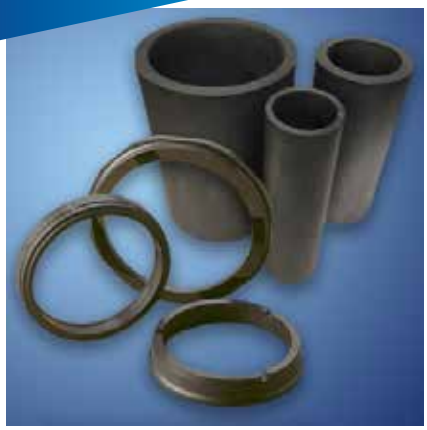
The outstanding properties of Hexoloy® Silicon Carbide (SiC) allow unmatched performance in corrosive environments, abrasive fluids, high temperature and pressures, or high speeds.

FEATURES

- **Exceptional wear resistance, hardness & low friction**
- **Excellent corrosion resistance**
- **Excellent mechanical strength**
- **High thermal shock resistance**

UNGROUND SEAL TUBES

MULTIPLE SHAPES AVAILABLE



HEXOLOY® SA • HEXOLOY® SG • HEXOLOY® SP

Sintered silicon carbide seal tubes are available in a wide range of OD and ID combinations. OD up to 16 inches (400 mm).
Typical length of the seal tube is 12", through 6" and 4" tubes are also available. Seal tubes are unground and sold with "as-fired" tolerances.

BENEFITS

- Best option for quick turn around
- Lead times, typically < 4 weeks
- Sold from a price list*

Hexoloy® SA is used in most applications
Hexoloy® SP retains lubrication

UNGROUND SEAL BLANKS

CUSTOM ENGINEERED

HEXOLOY® SA • HEXOLOY® SP

Low volume machined blanks

- Made to customer specified diameters and thickness, with a maximum diameter of 16 inches
- Tolerances can be + / - or + + / - -

High Volume Pressed Blanks

- Made to customer specified diameters up to 5"
- A minimum length to wall thickness ratio of 4 to 1 must be maintained
- OD, ID Tolerances can be + / - or + + / - -

Minimum order quantity (MOQ) of 1000 pcs
Tooling required

* Hexoloy® SA only

SEAL FACES

HEXOLOY® SA • HEXOLOY® ENHANCED SA • HEXOLOY® SG • HEXOLOY® SP • NORALIDE®

Ground seal faces are available in various Hexoloy® sintered silicon carbide grades and Noralide® hot pressed silicon nitride materials.

Both of these materials are fine-grained and produced to near theoretical density, ensuring excellent wear resistance required for seal face products.
Both materials possess outstanding resistance to corrosion from chemicals with a wide range of pH values. Seal faces are produced to custom drawings with high quality surface finishes.

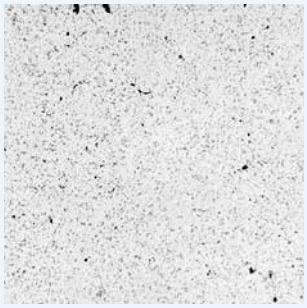
FEATURES

- Exceptional hardness
- Chemically inert to a broad range of chemicals
- Ground and lapped
- Made to customer specified drawing
- Strict quality control and inspection

CUSTOM-MADE MATERIALS & SOLUTIONS

HEXOLOY® SA SIC

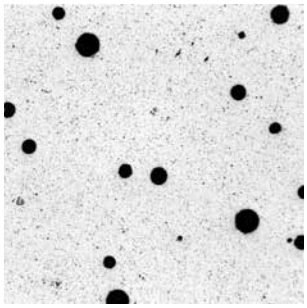
Hexoloy® SA SiC is a pressureless sintered form of alpha silicon carbide, with a density greater than 98% theoretical. It has a very fine grain structure (<10 micron) for excellent wear resistance and contains no free silicon, which makes it highly chemically resistant in both oxidizing and reducing environments.



Photomicrograph of Hexoloy® SA SiC (200x)

FEATURES AND BENEFITS

- **Excellent wear resistance and hardness**
- **High elastic modulus: stiff**
- **Excellent corrosion resistance: Outperforms tungsten carbide, aluminum oxide and reaction bonded SiC in all chemical environments.**



Photomicrograph of Hexoloy® SP SiC (200x)

HEXOLOY® SP SIC

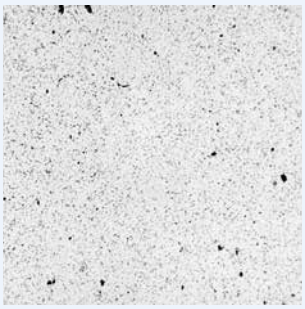
Hexoloy® SP SiC contains engineered spherical pores (~50 µm, 4 – 6% by volume) for optimum tribological performance. It is used in sliding contact applications such as pump seal faces and product lubricated bearings.

FEATURES AND BENEFITS

- **Excellent hard face vs. hard face performance**
- **Excellent for dry running conditions in pumps**

HEXOLOY® SG SIC

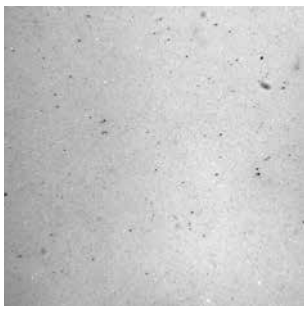
Hexoloy® SG silicon carbide is a unique electrically conductive version of sintered silicon carbide.



Photomicrograph of Hexoloy® SG SiC (200x)

FEATURES AND BENEFITS

- **Contains graphitic carbon (5%), no free silicon**
- **Higher electrical conductivity than Hexoloy® SA & SP**
- **Excellent thermal conductivity**
- **Machinable by EDM**



Photomicrograph of Noralide® SiC (100x)

NORALIDE® SILICON NITRIDE

Noralide Si3N4 is an ideal material for seal face applications where maximum fracture toughness and flexural strength are required.

FEATURES AND BENEFITS

- **Contains graphitic carbon (5%), no free silicon**
- **Excellent thermal conductivity**

PROPERTIES OVERVIEW

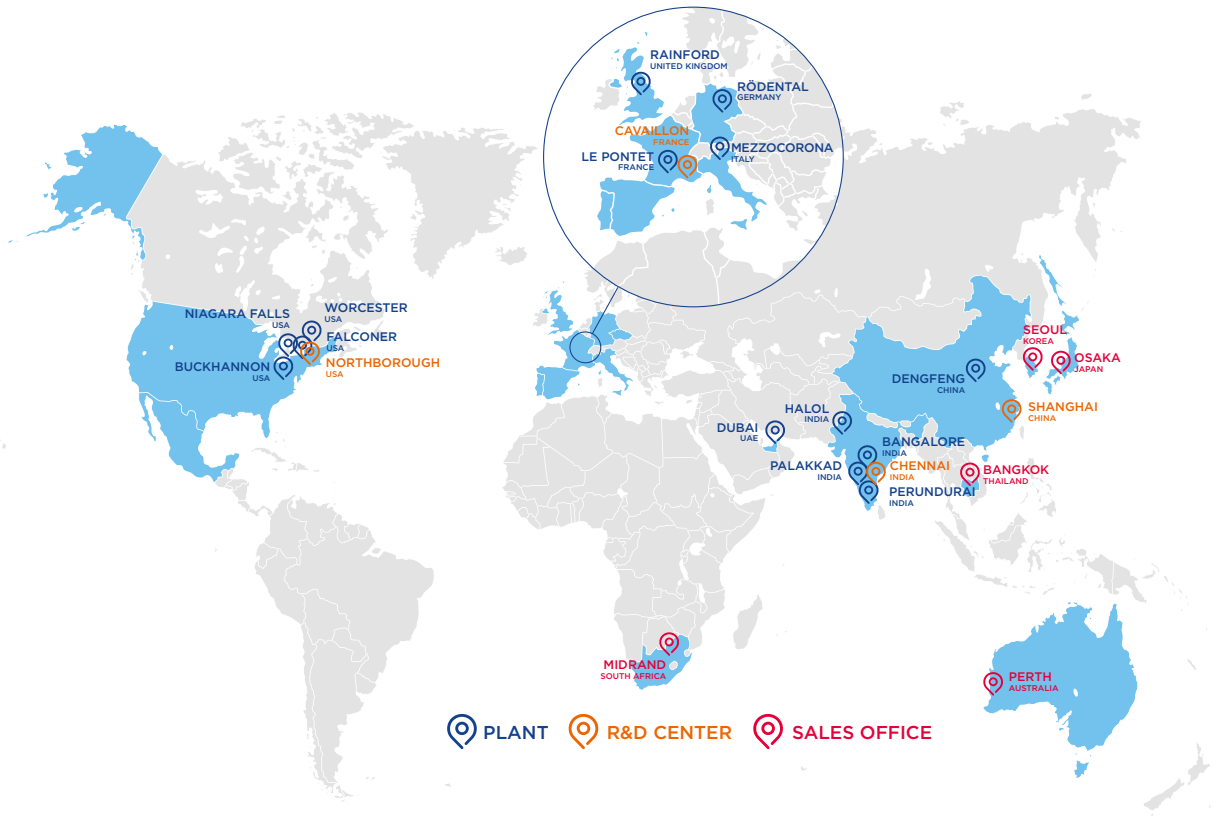
Saint-Gobain Performance Ceramics & Refractories' application engineers are available to assist you with your technical project in designing cost effective high performing products that will meet your need now and in the future.

Physical Poperties	UNITS	HEXOLOY® SA	HEXOLOY® SG	HEXOLOY® SP	NORALIDE®
Composition*	-	SiC	SiC	SiC	Si_3N_4
Density	g/cm³	3.10	3.00	3.04	3.18
Grain Size	µm	4-10	-	4-10	<2
Hardness (Knoop)**	kg/mm²	2,800	2,800	2,800	N/A
Flexural Strength 4pt @ RT	MPa x 10³ lb/in²	380 55	311 -	240 35	800 -
Compressive Strength @ RT	MPa x 10³ lb/in²	3900 560	-	-	3,500 -
Modulus of Elasticity @ RT	GPa x 10⁶ lb/in²	410 59	-	400 58	320 -
Weibull Modulus (2 parameter)	-	8	18	19	-
Fracture Toughness @ RT Double Torsion & SENB	MPa x m½ 10³lb /in² x in½	4.60 4.20	3.90 4.60	4.30 3.90	4.10*** -
Coefficient of Thermal Expansion RT to 700°C	x 10⁻⁶mm/mmK x 10⁻⁶ in/in°F	4.02 2.20	-	4.20 2.30	2.9 -
Max. Service Temp (air)	°C °F	1,900 3,450	-	1,900 3,450	-
Mean Specific Heat @ RT	J/gmK	0.67	0.65	0.59	-
Thermal Conductivity @ RT @ 200°C @ 400°C	W/mK	125.6 102.6 77.5	118 92 70	110 - -	-
Permeability RT to 1000°C	-	Impervious to gases over 31 MPa			
Electrical Resistivity @ RT** **@ 1000°C**	ohm-cm	10²-10⁸ 0.01-0.2	1.0-10.0	-	>10¹²

** Composition code: SiC = silicon carbide; Si_3N_4 = silicon nitride
** Knoop 100-gm load
*** Indentation
**** Dopants in Hexoloy® cause fluctuation in resistivity.

SAINT-GOBAIN PERFORMANCE CERAMICS & REFRACTORIES

OUR GLOBAL PRESENCE



CONTACT US

USA

Niagara Falls
+1 716 278 6233
Worcester
+1 508 795 5264
Falconer
+1 716 483 7222

MIDDLE EAST & AFRICA

Dubai (UAE)
+971 4 8011800

EUROPE

Rainford (United Kindom)
+44 1744 882 941
Rödental (Germany)
+49 9563 724 201

INDIA

Bangalore
+ 91 7228 950 887
Halol
+ 91 7228 950 886

PACIFIC

Perth (Australia)
+61 394 745 940

JAPAN

Osaka
+81 6 4707 1700

CHINA

Dengfeng
+86 4008880198
Shanghai
+86 4008880198

ASIA

Seoul (Korea)
+82 2370 693 34
Bangkok (Thailand)
+66 61 415 9204

For more information:
www.ceramicsrefractories.saint-gobain.com
ceramics.refractories@saint-gobain.com

Follow us on

SAINT-GOBAIN