



Hexoloy® Silicon Carbide
Ceramic Materials

- Water Pump Seal Faces
- Engine/Vehicle Components

High Performance Engine & Transportation Applications



Automotive cooling systems



Diesel locomotives



Heavy Equipment

Hexoloy® SiC – a superior seal face material for automotive water pumps.

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

Today's automotive companies are placing ever-increasing demands on the components that go into their products - from improved performance to longer service life. Hexoloy® SiC seal faces for water pump and other transportation applications are proven superior in meeting the requirements of vehicles around the world.

Saint-Gobain Ceramics currently supplies over 25 million seal faces for use by U.S. and European automakers, replacing seal faces now made of materials such as aluminum oxide, carbon graphite and bronze. Several automakers and truck engine manufacturers have converted 100% of their production to seal assemblies using sintered silicon carbide as one or both of the seal faces. The following information demonstrates the distinct benefits Hexoloy® SiC offers for your application.

The Right Properties.

New automotive engines designed for longer warranties have led to increased operational demands on the cooling system. The use of engine coolants containing high concentrations of silicates and nitrates calls for seal face materials that are resistant to deposits and wear under adverse coolant conditions. Silicate gel formation on the sealing faces can cause damage to either the mating ring or seal ring and result in coolant leakage. Supplemental coolant additives and high operating temperatures can aggravate the gel formation problem, adversely affecting seal performance.

Outstanding Wear Resistance

- As the hardest commercially available seal face material, Hexoloy® SiC provides wear resistance and long service life.
- Low friction and high strength characteristics result in superior high PV performance.
- Overcomes the adverse effects of over-conditioned engine coolant in the field
- Superior performance under conditions of limited lubrication or dry running at the sliding pair interface

Universal Corrosion Resistance

- Hexoloy® SiC is chemically inert to strong oxidizers.
- Outperforms carbon-graphite, aluminum oxide and metals in all chemical categories.

High Thermal Conductivity

- Minimizes temperature build-up and provides excellent thermal shock resistance, eliminating the need for banding as employed with aluminum oxide
- Can minimize or prevent the crystallization of silica gel that causes seal face damage
- Lowers sealing gap temperatures by rapidly dissipating frictional heat produced.

Water Pump Failures Per 1,000 Cars

Hexoloy® SiC has the properties to withstand these conditions and eliminate the problems that can cause water pump failures.

Automaker improves warranty using Hexoloy® silicon carbide seal face material.

A Big 3 automaker changed seal face materials in one of their passenger car engine water pumps from aluminum oxide on phenolic to Hexoloy® SA silicon carbide on hard carbon. The company's 3-year/36,000 mile repairs per thousand (R/1000) number decreased 50% in one year after the change to the silicon carbide seal face material.

A Choice of Hexoloy® Materials

Hexoloy® SP Silicon Carbide

Hexoloy® SP SiC is a sintered alpha silicon carbide designed specifically for optimum performance in sliding contact applications. This material retains the universal corrosion resistance yet improves upon the exceptional wear resistance of Hexoloy® SA SiC through the addition of unique spherical pores. These discrete, evenly dispersed pores act as fluid reservoirs, promoting the retention of a fluid film at the interface of sliding component surfaces. Self-mated Hexoloy® SP is the material of choice for heavy-duty diesel applications and any application requiring cost-effective extended warranty operation.

Hexoloy® SA Silicon Carbide

Hexoloy SA SiC is a pressureless sintered form of alpha silicon carbide, with a density greater than 98 percent of 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. The combination of fine grain structure and universal corrosion resistance results in a hard face material with excellent performance.

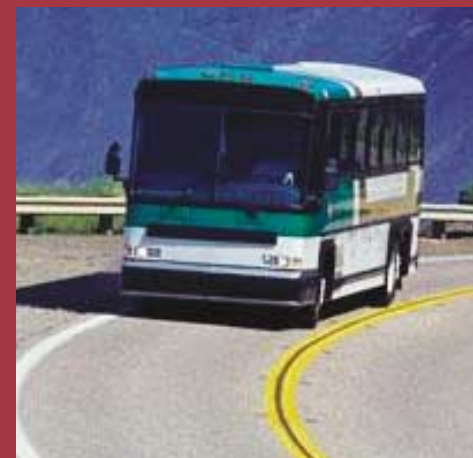
Finished seals to your specifications.

We can manufacture even the most intricate water pump seal faces, in the right material, to your most exacting specifications. Our applications engineering support team has the experience and talent to provide solutions to your product design and application challenges. Our manufacturing methods enable us to meet your high volume manufacturing requirements economically.

Hexoloy SA SiC

- Net-shape molding allows for cost-effective face designs
- Faces can be lapped or polished to a variety of finishes to best suit your application
- Let our application engineers work with you to find your custom Hexoloy SiC face seal solution.

Refrigerated truck compressors



Air-conditioning compressors for buses

Other Hexoloy® SiC transportation applications

The outstanding properties of Hexoloy® SiC have led to its use for components in a variety of other transportation applications such as air conditioning compressors in buses and refrigerated truck compressors. We can supply both Hexoloy® SA and Hexoloy® SP as:

- Finished components
- Unfinished tubes and machined blanks
- Pressed near net-shape blanks
- High volume pressed net-shape components
- Complex, highly machined parts

Typical Properties of Water Pump Seal Face Materials

Property	Units	Hexoloy®SA SiC	Hexoloy®SP SiC	Siliconized Graphite	Al ₂ O ₃ (96%)
Density	g/cm ³	3.10	3.04	1.95	3.72
Hardness (Knoop)*	kg/mm ²	2800	2800	<1000	1100
Flexural Strength 4 pt @ RT**	MPa	380	240	35	360
	x10 ³ lb/in ²	55	35		
Modulus of Elasticity @ RT	GPa	410	400	16	300
	x10 ⁶ lb/in ²	59	58		
Coefficient of Thermal Expansion RT to 700°C	x10 ⁻⁶ mm/mmK	4.02	4.2	4.5	8.2
	x10 ⁻⁶ in/in °F	2.20	2.3		
Thermal Conductivity @ RT	W/mK	125.6	110	50	24
	Btu/ft h °F	72.6	64		

*Knoop 0.1 kg load

**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

The information, recommendations and opinions set forth herein are offered solely for your consideration, inquiry, and verification and are not, in part or total, to be construed as constituting a warranty or representation for which we assume legal responsibility. Nothing contained herein is to be interpreted as authorization to practice a patented invention without a license.
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Form No. B-1042
10/03