# Properties of Ceresist Fitting Ceramics

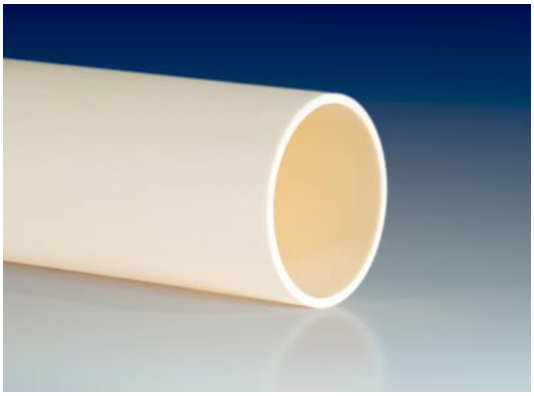
## Designed to Endure

Ceresist ceramic lined fittings are designed to outlast linings such as glass, rubber, basalt, hardfacings, coatings, trowelable linings, cure-in-place linings, and plastics that are commonly used to extend the life of piping systems. These materials are only a fraction of the hardness and wear resistance of our ceramics, and with the introduction of a corrosive into the process or high temperatures, most linings become severely incompatible and their use is extremely limited. Ceresist fittings feature ceramics that approach diamond in hardness, are chemically inert to almost all corrosives, and may be installed in services where temperatures exceed 1,100°F.

## High-Purity Alumina

Alumina ceramic is by far the most commonly used ceramic, and is commercially available in many different purities — from a porous 76% refractory material to a high-purity, inert 99.9%. However, important properties such as hardness and corrosion resistance are drastically reduced when installing low-purity alumina in harsh environments.

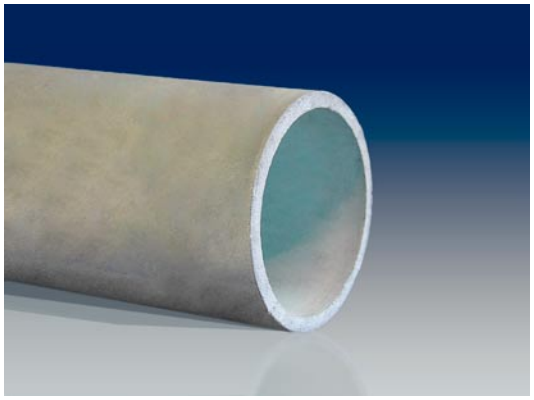
Ceresist fittings are available with high-purity 99.5% and 99.8% alumina ceramic. These grades are 42% harder than chrome carbide hardfacing, three times harder than glass, and nine times harder than carbon or stainless steel. Alumina also exhibits an extremely high level of corrosion resistance — even at high temperatures — and is the ideal material for high wear applications where corrosive and abrasive fluids are present. It is a very cost-effective material, and deliveries are quite rapid.



*High-Purity Alumina*

## Nitride-Bonded Silicon Carbide (NB SiC)

The nitride bonded silicon carbide ceramic consists of sintered silicon carbide particles fired in a silicon nitride ceramic matrix. It is nine times harder than carbon or stainless steel, exhibits superior chemical resistance to acids and alkalies, and furthermore possesses excellent high temperature and thermal shock resistance. NB SiC is cast into custom shapes, and may be fabricated in lengths up to 60” and diameters up to 46” — allowing for extremely cost-effective long runs of piping whilst minimizing the number of individual segments. It is slightly porous, which limits its use in cavitating environments, but is an excellent material for basic wear applications.



*Nitride-Bonded Silicon Carbide*

## Sintered Silicon Carbide

Whether submerged in corrosive environments, subjected to extreme wear and abrasive conditions, or exposed to temperatures in excess of 1,400°C (2,552°F), sintered silicon carbide will outperform other commercially available ceramics or metal alloys, including high-alumina, RB SiC, and superalloys.
Sintered silicon carbide is one of the hardest high-performance materials available, second only to diamond. Additionally, it weighs less than half as much as most metal alloys, 40 percent as much as steel and about the same as aluminum. The high density, low porosity and chemical inertness of sintered silicon carbide permit it to function in environments of hot gases and liquids, in oxidizing and corrosive atmospheres, and in strong acids and bases, even at extremely high temperatures. The high thermal conductivity of sintered silicon carbide, combined with its low thermal expansion, produces excellent thermal-shock resistance far better than tungsten carbide, aluminum oxide and reaction-bonded silicon nitride.
These properties make sintered silicon carbide the most wear– and corrosion–resistant ceramic we offer for use in the most agressive services.

*Sintered Silicon Carbide*

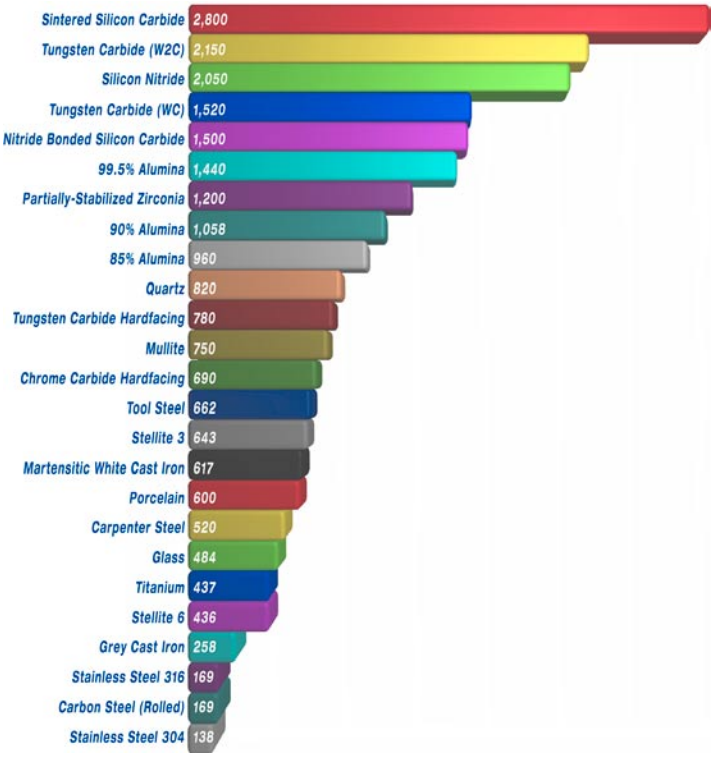
## Housing Materials

In addition to our standard carbon steel housing, stainless steel 316 or 304, FRP, and vinyl ester wrapping, other custom housing materials may be supplied. For added protection, a corrosion and abrasion–resistant epoxy coating is applied to carbon steel housings to offer durability from harsh environments as well.

Ceresist

# Technical Data

## Knoop Hardness Comparison




## Select Physical Properties

| Property | High Purity Alumina | Sintered Silicon Carbide | Nitride Bonded Silicon Carbide |
|---|---|---|---|
| Maximum Length (Solid Ceramic) | 36" | 36" | 60" |
| Maximum Length (Fitted Ceramics) | Unlimited | Unlimited | Unlimited |
| Maximum Ceramic OD | 15" | 15" | 46" |
| Minimum Wall Thickness | 0.10" | 0.10" | 0.20" |
| Maximum Wall Thickness | 2" | 2" | 3" |
| Wear Resistance | Very Good | Best | Very Good |
| Corrosion Resistance | Very Good | Best | Very Good |
| Cavitation Resistance | Best | Best | Good |

## Chemical Resistance Comparison

| | 20% HCl | | 90% $H_2SO_4$ | | 60% $H_3PO_4$ | | 10% 46% HF | | 60% $HNO_3$ | | 30% NaOH | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60°C | 95°C | 60°C | 95°C | 60°C | 95°C | 60°C | 95°C | 60°C | 95°C | 60°C | 95°C |
| **Sintered Silicon Carbide** | A | A | A | A | A | A | A | A | A | A | A | A |
| **99.8% Alumina** | A | A | A | A | A | A | B | C | A | A | A | A |
| **99.5% Alumina** | A | A | A | A | A | A | B | C | A | B | B | B |
| **Nitride-Bonded Silicon Carbide** | A | A | A | A | B | B | C | C | B | B | C | C |
| **99.0% Alumina** | A | B | B | B | B | B | C | C | B | C | C | C |
| **Zirconia** | A | A | A | A | A | A | C | C | A | A | A | B |
| **Silicon Nitride** | B | C | A | B | C | C | A | C | C | C | B | C |
| **Stainless Steel 304** | C | Ø | C | C | C | C | C | Ø | A | B | A | A |
| **Stainless Steel 316** | C | Ø | C | C | C | C | C | Ø | A | B | A | B |
| **Hastelloy-C 276** | B | C | B | C | A | A | B | C | C | C | A | A |
| **Hastelloy B** | C | C | C | C | C | C | C | C | C | C | B | B |
| **Stellite 6** | C | C | B | Ø | B | C | C | Ø | A | B | C | Ø |
| **Stellite 12** | C | C | C | Ø | A | C | C | Ø | A | C | A | B |
| **Tantalum** | A | A | A | A | A | A | C | C | A | A | C | C |
| **Zirconium** | A | B | C | C | C | C | C | C | A | B | A | A |

A — Little or no corrosion, and material is considered fully-compatible with the fluid, (<0.1 mmg/cm²/day).
B — Slight corrosion, and material is safe to use with annual inspection, (0.1~0.3 mmg/cm²/day).
C — Significant corrosion, and not recommended for use, (>0.3 mmg/cm²/day).
Ø — Test not completed due to violent corrosion. Material is incompatible.

Note: The data on this page was obtained under controlled test conditions. Actual site performance may differ.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