



PPG Silica Products

Hi-Sil™, Ciptane™ and Silene™ Reinforcing Fillers

INDUSTRIAL RUBBER

PPG Silica Products offers a product line of synthetic amorphous precipitated silicas for use as reinforcing fillers in black, non-black, colored and translucent industrial rubber and silicone compounds. They cover a wide range of physical and performance properties, providing strength and durability in a variety of applications, including but not limited to sporting goods, conveyor belts, belting, engine mounts and tire treads.

Hi-Sil™ 532EP and Silene™ 732D silicas are semi-reinforcing silica powders with unique structures that provide for rubber products with improved dynamic properties — including high dynamic modulus with low stiffness, high resilience, low compression-set, and low heat build-up. Because of their lower surface area, these silicas do not exhibit an increase in stiffness and processing viscosity normally encountered with higher surface area silica products, providing fast smooth extrusions and excellent flow. Rubber compounds using these silicas exhibit faster cure rates than compounds using higher surface area silica products. These lower surface area silicas are typically less reactive to amines and zinc oxides, so accelerator and activator effectiveness is maintained. *Hi-Sil 532EP* and *Silene 732D* are used in colored hose cover, wire insulation, sporting goods and cable-jacketing applications.

Hi-Sil 315 silica, available as either a powder or a granule, provides higher reinforcement than *Silene 732D* or *Hi-Sil 532EP* silica due to its higher surface area. It is used in dynamic applications such as NR and EPDM motor mounts to achieve low heat build-up, low compression-set and high resilience. For internal mixer applications, *Hi-Sil 315G-D* (granulated) silica exhibits fast incorporation into the polymer(s) and excellent dispersion can be obtained even at mix times as short as two minutes. *Hi-Sil 315* silica...



Potential Applications

- Sporting Goods
- Wire and Cable Coatings
- Conveyor Belts
- Engine Mounts
- Tire Treads



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can be used in all polymer types (either oil or non-oil extended). *Hi-Sil 315 silica* is used in non-tire automotive applications such as engine mounts, transmission belts and colored hose covers. Other applications include footwear and soling (transparent or colored), flooring for high hardness and abrasion resistance, mats, wire and cable coverings, specialty gloves and automotive tire applications.

Hi-Sil 200 series products, including Hi-Sil 210, 233 and 243LD silica, are often used in white or colored rubber applications where tensile strength, tear resistance and abrasion resistance are critical to product performance. Good heat age resistance and hot tear strength are added benefits when used with carbon black (example: N-347, N-358). *Hi-Sil 200 series products* contain chloride-based residual salt (NaCl).

Hi-Sil 900 silica has the same reinforcing qualities as *Hi-Sil 233*, but with sulfate-based residual salt (Na_2SO_4).

Hi-Sil 135 silica is a highly-reinforcing powder used in black, colored and industrial rubber. It is recommended for thin-walled applications like elastic bands, gloves and printing rolls.

Hi-Sil EZ 160G-D silica is a highly-reinforcing micro-granule that is dispersible in most polymers and polymer blends. This silica is used in many types of rubber goods such as conveyor belt covers, belting and treads for off-the-road equipment (agricultural, construction, etc.) and passenger tires.

Hi-Sil HDP-320G silica is a highly-reinforcing micro-granule dispersible in most polymers and polymer blends. This silica product is used in many types of rubber goods such as conveyor belt covers, flooring and molding, belting, and treads for off-the-road equipment (agricultural, construction, etc.) and passenger tires.

Hi-Sil 134G silica is a highly-reinforcing micro-granule used in black, colored and industrial rubber and highly filled tire tread formulations. It provides high tensile strength and tear and abrasion resistance.

Hi-Sil 132 silica is a highly-reinforcing powder used in black, colored and industrial rubber. It is recommended for thin-walled applications like elastic bands, gloves and printing rolls.

Hi-Sil 190G silica is a highly-reinforcing granule ideal for compounds designed for wear resistance such as footwear outsoles. Other possible applications for *Hi-Sil 190G silica* will involve a requirement for high tear resistance and include many industrial rubber products such as conveyor belts, wire and cable, hose covers, oil well specialties and others.

Hi-Sil 915 silica is a high-purity, highly-reinforcing powder that is well-suited for silicone applications as a result of its very low residual salt content.

Ciptane™ I and Ciptane LP silicas are mercapto-silane treated precipitated silicas that provide greater rubber reinforcement compared to untreated silica fillers, eliminating the reinforcement gap which has existed between silica and carbon black. Rubber compounds based on *Ciptane silica* exhibit improved abrasion resistance, tensile strength and modulus, as well as low heat build-up, low rolling resistance and low viscosity. Since *Ciptane silica* has already been reacted with a silane coupling agent, the processing costs and production variability associated with adding silane separately are eliminated. *Ciptane I silica* is treated with 3 percent by weight mercapto-silane and is in low dusting pellet form and *Ciptane LP silica* is treated with 2.5 percent by weight mercapto-silane and is in bead form.



Rubber Processing Recommendations

Hi-Sil, *Ciptane* and *Silene* silica products should be added as early as possible in the mixing schedule. Ideally, the silica should be added at the same time as the polymer(s) and before the addition of process oil to allow time for silica incorporation into the polymer(s). For high loadings of silica, split additions are recommended; the first addition with the polymer(s) and the second addition with the process oil. For loadings of high density, low dust silica granules, the silica can be added with the polymer/s just before the process oil addition. Split oil additions are recommended to maintain a high viscosity as increased shear aids in silica dispersion. Granules and pellets tend to need slightly more mixing time to disperse than milled powders.

Note: Silica incorporation time and dispersion in rubber will vary based on internal mixer type and rotor design.

Product	N ₂ Surface Area, BET-5 (m ² /g)	N ₂ Surface Area, BET-1 (m ² /g)	pH	Residual Salt Type	Physical Form	Reinforcement
<i>Silene</i> 732D	33	35	8.5	Na ₂ SO ₄	Powder	Semi-Reinforcing
<i>Hi-Sil</i> 532EP	55	60	8	Na ₂ SO ₄	Powder	Semi-Reinforcing
<i>Hi-Sil</i> 315-D	125	N/A	7	Na ₂ SO ₄	Powder	Reinforcing
<i>Hi-Sil</i> 315G-D	125	N/A	7	Na ₂ SO ₄	Granule	Reinforcing
<i>Hi-Sil</i> 210	135	150	7	NaCl	Pellet	Reinforcing
<i>Hi-Sil</i> 233	135	150	7	NaCl	Powder	Reinforcing
<i>Hi-Sil</i> 243LD	135	150	7	NaCl	Granule	Reinforcing
<i>Hi-Sil</i> 900	135	150	7	Na ₂ SO ₄	Powder	Reinforcing
<i>Hi-Sil</i> 135	150	170	7	Na ₂ SO ₄	Powder	Highly-Reinforcing
<i>Hi-Sil</i> EZ 160G-D	160	170	7	Na ₂ SO ₄	Micro-Granule	Highly-Reinforcing
<i>Hi-Sil</i> HDP-320G	160	N/A	7	Na ₂ SO ₄	Micro-Granule	Highly-Reinforcing
<i>Hi-Sil</i> 134G	180	200	7	Na ₂ SO ₄	Powder	Highly-Reinforcing
<i>Hi-Sil</i> 132	180	200	7	Na ₂ SO ₄	Micro-Granule	Highly-Reinforcing
<i>Hi-Sil</i> 190G	195	215	6.5	Na ₂ SO ₄	Powder	Highly-Reinforcing
<i>Hi-Sil</i> 915	195	215	7	Low Na ₂ SO ₄	Granule	Highly-Reinforcing
<i>Ciptane</i> I	135	150	7	Na ₂ SO ₄	Pellet	Reinforcing, 3% Mercapto-Silane
<i>Ciptane</i> LP	170	N/A	7	Na ₂ SO ₄	Bead	Reinforcing, 2.5% Mercapto-Silane

Packaging

Standard packaging as follows:

Product	Net weight		Bag Construction
	lb	kg	
<i>Silene 732D</i>	44	20	Multi-Wall Paper
<i>Hi-Sil 532EP</i>	44	20	Multi-Wall Paper
<i>Hi-Sil 315-D*</i>	44	20	Multi-Wall Paper
<i>Hi-Sil 315G-D*</i>	55	25	Multi-Wall Paper
<i>Hi-Sil 210</i>	44	20	Polyethylene
<i>Hi-Sil 210</i>	50	22.7	Polyethylene
<i>Hi-Sil 233</i>	44	20	Multi-Wall Paper
<i>Hi-Sil 243LD</i>	44	20	Polyethylene
<i>Hi-Sil 243LD</i>	50	22.7	Multi-Wall Paper
<i>Hi-Sil 900</i>	30	13.6	Multi-Wall Paper
<i>Hi-Sil 135</i>	44	20	Multi-Wall Paper
<i>Hi-Sil EZ 160G-D*</i>	1430	650	FIBC
<i>Hi-Sil HDP-320G</i>	50	22.7	Polyethylene
<i>Hi-Sil 134G</i>	55	25	Polyethylene
<i>Hi-Sil 132</i>	44	20	Multi-Wall Paper
<i>Hi-Sil 190G</i>	50	22.7	Polyethylene
<i>Hi-Sil 915</i>	25	11.3	Multi-Wall Paper
<i>Ciptane I</i>	44	20	Polyethylene
<i>Ciptane LP</i>	44	20	Multi-Wall Paper

Samples

Samples are available upon request from Customer Service.

Storage

To ensure product integrity, PPG recommends that our silica products be stored under dry, clean conditions and protected against exposure to other substances. Since silica may pick up moisture, we also recommend that products that are stored for more than one year from the date of manufacture be re-tested for moisture content. There is no shelf life limit when stretch-wrapped palletized units or bags are kept under the above stated conditions. Pallets should not be double-stacked.

Safety and Health Effects

PPG Industries recommends that, before use, anyone using or handling this product thoroughly read and understand the information and precautions on the label, as well as in other product safety publications such as the Material Safety Data Sheet. Any health hazard and safety information contained herein should be passed on to your customers or employees, as the case may be. The products mentioned herein can be hazardous if not used properly. Like all potentially hazardous materials, this product must be kept out of the reach of children.

* Please consult your local Silica Sales Representative regarding product availability in advance of requesting samples.

Please consult with Silica Customer Service or your Silica Sales Representative regarding additional packaging options, including custom package sizes and bulk shipments in Flexible Intermediate Bulk Container (FIBC), truckload, or railcar units.

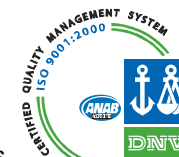
Visit www.ppgsilica.com for MSDS and product specifications.



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