

PPG HI-SIL[®] and PPG SILENE[™] Reinforcing Fillers

INDUSTRIAL RUBBER



PPG 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.

PPG HI-SIL[®] 532EP silica and PPG SILENE[™] 732D silica 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 silica and *Silene* 732D silica are used in colored hose cover, wire insulation, sporting goods and cable-jacketing applications.

Hi-Sil EZ90G-D silica provides higher reinforcement than *Hi-Sil* 532EP and *Silene* 732D silicas, while still maintaining most of the benefits of a low surface area silica. *Hi-Sil* EZ90G-D silica is used in dynamic applications where both flexibility and wear resistance is required.



Potential Applications

- Conveyor Belts
- Wire and Cable Coatings
- Hoses
- Engine Mounts
- Seals and Gaskets
- Sporting Goods





Hi-Sil 315 silica, available as either a powder or 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 polymer(s) and excellent dispersion can be obtained even at mix times as short as two minutes. *Hi-Sil 315* silica 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 soiling (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 silica products, including *Hi-Sil 210*, *233* and *243LD* silicas, 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* silica, but with sodium sulfate 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 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 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 134 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.

Hi-Sil EZ200G silica is uniquely designed with microporosity to impart a good balance in hysteresis and wear resistance in dynamic applications. It is a highly reinforcing granule, ideal for compounds designed for wear resistance, tear resistance and overall toughness, yet mixes like a relatively lower surface area silica.



Rubber Processing Recommendations

Hi-Sil 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.

Typical Properties					
Product	N ₂ Surface Area, BET-5 (m ² /g)	pH	Residual Salt Type	Physical Form	Reinforcement
<i>Silene</i> 732D	33	8.5	Na ₂ SO ₄	Powder	Semi-Reinforcing
<i>Hi-Sil</i> 532EP	55	8	Na ₂ SO ₄	Powder	Semi-Reinforcing
<i>Hi-Sil</i> EZ90G-D	90	6.5	Na ₂ SO ₄	Granule	Reinforcing
<i>Hi-Sil</i> 315-D	125	7	Na ₂ SO ₄	Powder	Reinforcing
<i>Hi-Sil</i> 315G-D	125	7	Na ₂ SO ₄	Granule	Reinforcing
<i>Hi-Sil</i> 210	135	7	NaCl	Pellet	Reinforcing
<i>Hi-Sil</i> 233	135	7	NaCl	Powder	Reinforcing
<i>Hi-Sil</i> 243LD	135	7	NaCl	Granule	Reinforcing
<i>Hi-Sil</i> 900	135	7	Na ₂ SO ₄	Powder	Reinforcing
<i>Hi-Sil</i> 135	150	7	Na ₂ SO ₄	Powder	Highly Reinforcing
<i>Hi-Sil</i> 233-D	150	7	Na ₂ SO ₄	Powder	Reinforcing
<i>Hi-Sil</i> EZ160G-D	160	7	Na ₂ SO ₄	Granule	Highly Reinforcing
<i>Hi-Sil</i> HDP-320G	160	7	Na ₂ SO ₄	Granule	Highly Reinforcing
<i>Hi-Sil</i> 255C-D	175	6.3	Na ₂ SO ₄	Powder	Highly Reinforcing
<i>Hi-Sil</i> 255CG-D	175	6.3	Na ₂ SO ₄	Granule	Highly Reinforcing
<i>Hi-Sil</i> 134G	180	7	Na ₂ SO ₄	Granule	Highly Reinforcing
<i>Hi-Sil</i> 134	180	7	Na ₂ SO ₄	Powder	Highly Reinforcing
<i>Hi-Sil</i> 190G	195	6.5	Na ₂ SO ₄	Granule	Highly Reinforcing
<i>Hi-Sil</i> 915	195	7	Low Na ₂ SO ₄	Powder	Highly Reinforcing
<i>Hi-Sil</i> EZ200G	300	7	Na ₂ SO ₄	Granule	Highly Reinforcing



Packaging

Standard packaging as follows:

Product	Net Weight		Bag Construction
	lb	kg	
<i>Silene</i> 732D	44	20	Multi-Wall Paper
<i>Hi-Sil</i> 532EP	44	20	Multi-Wall Paper
<i>Hi-Sil</i> EZ90G-D	55	25	Multi-Wall Paper
<i>Hi-Sil</i> 315-D	44	20	Multi-Wall Paper
<i>Hi-Sil</i> 315G-D	55	25	Multi-Wall Paper
<i>Hi-Sil</i> 210	44/50	20/22.7	Polyethylene
<i>Hi-Sil</i> 233	44	20	Multi-Wall Paper
<i>Hi-Sil</i> 243LD	44/50	20/22.7	Polyethylene
<i>Hi-Sil</i> 900	30	13.6	Multi-Wall Paper
<i>Hi-Sil</i> 135	44	20	Multi-Wall Paper
<i>Hi-Sil</i> 233D	44	20	Multi-Wall Paper
<i>Hi-Sil</i> EZ160G-D	55	25	Multi-Wall Paper
<i>Hi-Sil</i> HDP-320G	50	22.7	Polyethylene
<i>Hi-Sil</i> 255C-D	44	20	Multi-Wall Paper
<i>Hi-Sil</i> 255CG-D	55	25	Multi-Wall Paper
<i>Hi-Sil</i> 134G	55	25	Polyethylene
<i>Hi-Sil</i> 134	44	20	Multi-Wall Paper
<i>Hi-Sil</i> 190G	50	22.7	Polyethylene
<i>Hi-Sil</i> 915	25	11.3	Multi-Wall Paper
<i>Hi-Sil</i> EZ200G	25/50	11.3/22.7	Polyethylene

Product Safety and Regulatory Information

For the latest product safety and regulatory information, please reference the Safety Data Sheets at www.ppgsilica.com.

Samples

Samples are available upon request from Customer Service.

Storage

To ensure product integrity, we recommend that silica products be stored under dry, clean conditions and protected against exposure to other substances, and used within 12 months of the date of manufacture.

Safety and Health Effects

We recommend 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 with our customer service department or your sales representative regarding additional packaging options, including custom package sizes and bulk shipments in Flexible Intermediate Bulk Container (FIBC), truckload, or railcar units.



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