



Hi-Sil® and Silene® Reinforcing Silica Products For Mechanical Rubber Goods

Hi-Sil® and Silene® silicas are white, synthetic, amorphous silicon dioxide. Hi-Sil® is available in powder, pellet, and granular form. Silene® silica is available in powder form. PPG silica products are used as a reinforcing filler in black, non-black, colored, and translucent industrial rubber and silicone compounds.

Mechanical Rubber Goods

Silene® 732D and Hi-Sil® 532EP are used in colored hose cover, wire insulation, sporting goods, and cable jacketing applications are fast extrusion and calendaring, firmness of uncured stocks, smooth surfaces, flexibility, and resilience.

- **Fast, smooth extrusions, excellent flow**

Because of their lower surface area, Silene® 732D and Hi-Sil® 532EP do not exhibit an increase in stiffness and processing viscosity normally encountered with higher surface area silica products.

- **Faster curing**

Rubber compounds using Silene® 732D and Hi-Sil® 532EP exhibit cure rates much faster than those compounds using higher surface area silica products. Lower surface area silica is typically less reactive. This lower activity is less reactive to amines and zinc oxide that can reduce accelerator and activator effectiveness.

- **Improved dynamic properties**

Silene® 732D and Hi-Sil® 532EP have unique structures that give rubber products a high dynamic modulus with low stiffness, high resilience, low compression set, and low heat build up.

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

Hi-Sil® 315 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 products include Hi-Sil® 210, 233, and 243LD and are often used in white or colored rubber applications where tensile strength, tear resistance, and abrasion resistance are critical to final product performance. Superior heat age resistance and tear strength are added benefits when used with Carbon Black (example: N-347, N-358).

Hi-Sil® 255-M is an excellent, highly reinforcing silica powder with broad applicability. It delivers good dispersion quality in EPDM, NBR, SBR, CR, Butyl, Natural Rubber, and other elastomeric materials. Hi-Sil® 255-M is recommended for use in applications requiring very high dispersion, such as thin-wall articles or in mixes with low viscosity rubber. Hi-Sil® 255-M provides final compound properties with good to excellent tear and abrasion resistance, without drastically increasing processing viscosity or reducing compound flow.

Hi-Sil® 255G-M is a fast incorporating, highly reinforcing silica granule. This granular form helps in product handling, while reducing dust generation. Hi-Sil® 255G-M's granular form also provides easier incorporation of the silica into the polymer.

Hi-Sil® 180H-M is an excellent, highly reinforcing silica with broad applicability. It delivers good dispersion quality in Synthetic and Natural Rubber. Hi-Sil® 180H-M is recommended for use in applications requiring very high dispersion, such as thin-wall articles or in mixes with low viscosity rubber. Hi-Sil® 180H-M provides shoe sole final compound properties with good to excellent tear and abrasion resistance, without drastically increasing processing viscosity or reducing compound flow.

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

Rubber Processing Recommendations

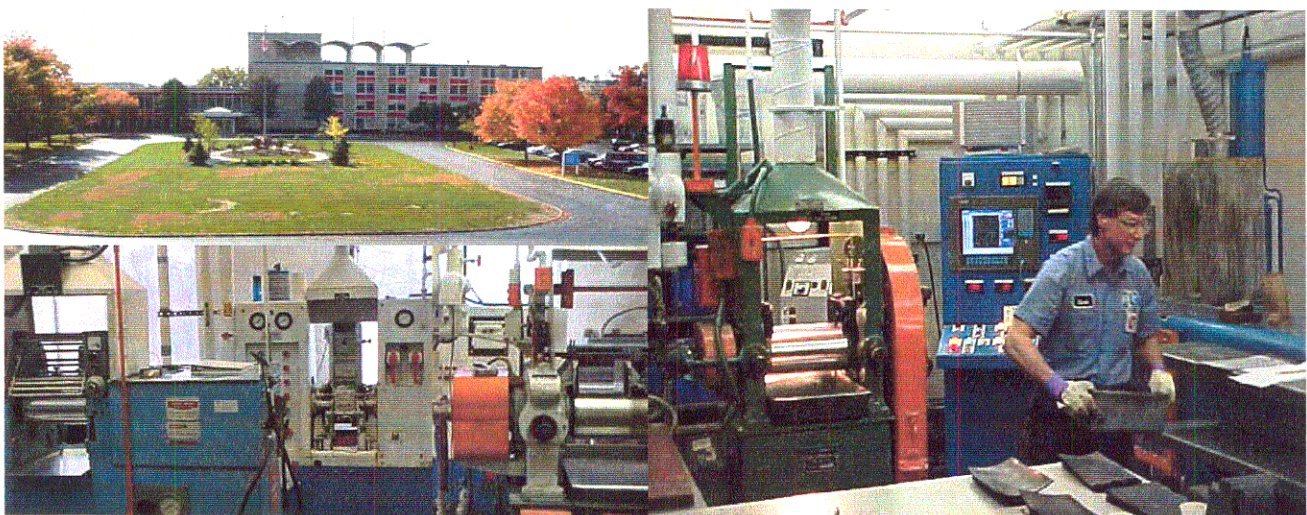
For all Hi-Sil® product forms, it is recommended that the silica be added as early as possible in the mixing schedule. Ideally, the silica should be added at the same time as the polymer(s) and before the addition of process oil to allow time for silica incorporation into the polymer(s). For high loadings of silica powders, split additions are recommended... first addition with the polymer(s) and the second with the process oil. For loadings of high density, low dust silica granules and micro-granules, a single addition can be made with the polymer/s and before 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.

Technical Service

PPG Silica Products has rubber processing and testing labs located at our Technical Center in Monroeville, Pennsylvania USA. Technical service is available to assist Hi-Sil® and Silene® customers with their rubber compounding and testing needs. Material analysis support is also available.



Registration Numbers

CAS No. 112926-00-8	Synthetic Precipitated Amorphous Silica
CAS No. 7631-86-9	TSCA Chemical Substance Inventory (SiO ₂)
231-545-4	European EINECS

Hi-Sil® and Silene® Silica Grades and Typical Properties and Characteristics

PPG Silica Grades	N ₂ Surface Area, BET-5 (m ² /g)	N ₂ Surface Area, BET-1 (m ² /g)	pH	Residual Salt,	Physical Form	Applications	Reinforcing
Silene® 732D	33	35	8.5	Na ₂ SO ₄	Powder	Mechanical Rubber	Semi
Hi-Sil® 532EP	55	60	8	Na ₂ SO ₄	Powder	Mechanical & Silicone	Semi
Hi-Sil® 315-D	125	N/A	7	Na ₂ SO ₄	Powder & Granule	Mechanical & Silicone	Reinforcing
Hi-Sil® 210	135	150	7	NaCl	Pellet	Mechanical Rubber	Reinforcing
Hi-Sil® 243LD	135	150	7	NaCl	Granule	Mechanical Rubber	Reinforcing
Hi-Sil® 233	135	150	7	NaCl	Powder	Mechanical Rubber	Reinforcing
Hi-Sil® 900	135	150	7	Na ₂ SO ₄	Powder	Mechanical & Silicone	Reinforcing
Hi-Sil® 135	150	170	7	Na ₂ SO ₄	Powder	Mechanical & Silicone	Highly Reinforcing
Hi-Sil® 180H-M	150	180	7	Na ₂ SO ₄	Bead	Mechanical Rubber	Highly Reinforcing
Hi-Sil® 255-M	150	180	7	Na ₂ SO ₄	Powder & Granule	Mechanical Rubber	Highly Reinforcing
Hi-Sil® 132	180	200	7	Na ₂ SO ₄	Powder	Mechanical & Silicone	Highly Reinforcing
Hi-Sil® 915	195	215	7	Na ₂ SO ₄	Powder	Mechanical & Silicone	Ultra Reinforcing
Hi-Sil® 190G	195	215	7	Na ₂ SO ₄	Granule	Mechanical Rubber	Ultra Reinforcing

For more information please call Hi-Sil Silica Technical Service at 1-800-764-7360, option #1

MARKETED BY
**HARWICK STANDARD
 DISTRIBUTION CORPORATION**

60 S. Seiberling Street • Akron, Ohio 44305

Packaging

Hi-Sil® and Silene® products are packaged as follows:

<u>Product</u>	<u>Net weight</u>	<u>Bag Construction</u>
Silene® 732D	44 pounds (20Kg)	multi-wall paper bags
Hi-Sil® 532EP	44 pounds (20Kg)	multi-wall paper bags
Hi-Sil® 315-D	44 pounds (20Kg)	multi-wall paper bags
Hi-Sil® 315G-D	55 pounds (25Kg)	multi-wall paper bags
Hi-Sil® 210	44 pounds (20Kg)	polyethylene
Hi-Sil® 210	50 pounds (22.7Kg)	polyethylene
Hi-Sil® 243LD	44 pounds (20Kg)	polyethylene
Hi-Sil® 243LD	50 pounds (22.7Kg)	multi-wall paper bags
Hi-Sil® 233	44 pounds (20Kg)	multi-wall paper bags
Hi-Sil® 900	30 pounds (13.6Kg)	multi-wall paper bags
Hi-Sil® 135	44 pounds (20Kg)	multi-wall paper bags
Hi-Sil® 180H-M	44 pounds (20Kg)	multi-wall paper bags
Hi-Sil® 255-M	44 pounds (20Kg)	multi-wall paper bags
Hi-Sil® 255G-M	55 pounds (25Kg)	multi-wall paper bags
Hi-Sil® 132	44 pounds (20Kg)	multi-wall paper bags
Hi-Sil® 915	25 pounds (11.3Kg)	multi-wall paper bags
Hi-Sil® 190G	44 pounds (20Kg)	polyethylene

Bulk shipments can be made in various forms such as Flexible Intermediate Bulk Containers (FIBC), truckload or railcar. Please consult with your Silica Sales Specialist or Silica Customer Service regarding bulk shipments

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 more than one year, from 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.

Safety and Health Effects



PPG Industries Inc. is committed to the safe handling of chemicals at every step of the process, from manufacturing and distribution through education of the end user. Our participation in the American Chemistry Council's *Responsible Care*® Program is evidence of our commitment to the health, safety and welfare of our employees and the industry. PPG Industries Inc. recommends thoroughly reading and understanding the product labels, Material Safety Data Sheets, and other safety information about the product prior to use or handling. Product health and safety information should be made available to your employees and customers.

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Samples and Service

PPG's Technical Service Specialists are available for consulting on the use, handling and storage of Hi-Sil® Reinforcing Silica Products.

Gallon containers and bag-size samples are available upon request from Technical Service (USA) or Customer Service in Europe.



United States of America

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Statements and methods presented in this publication are based upon the best available information and practices known to PPG Industries at present, but are not representations or warranties of performance, result or comprehensiveness, nor do they imply any recommendations to infringe any patent or an offer of license under any patent.

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Revised 6/17/04