



Hi-Sil™ 233-D and 233G-D

Reinforcing Silica for Rubber

Hi-Sil™ 233-D and Hi-Sil™ 233G-D are synthetic, white, amorphous silicon dioxide in powder and granular form. Both forms are used in black and non-black rubber compounds as moderately high reinforcing fillers.

Typical Properties and Characteristics

| Hi-Sil™ | Surface Area, BET-5 | pH | Na ₂ SO ₄ , wt. % | Physical Form |
|---------|-----------------------|-----|---|--|
| 233-D | 150 m ² /g | 6.9 | 2 Max | Easy dispersing powder |
| 233G-D | 150 m ² /g | 6.9 | 2 Max | Highly density, easy handling granules |

Registration Number

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

Mechanical Rubber Goods

Hi-Sil™ 233-D and Hi-Sil™ 233G-D provide similar rubber properties to those obtained with commercial precipitated silica in the Nitrogen BET-5 surface area range of 150m²/g. Rubber properties obtained by using Hi-Sil™ 233-D are similar to those using Hi-Sil™ 233 from the US. Both products are 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).

In footwear, Hi-Sil™ 233-D allows for good transparency and color for translucent soling and is used to reinforce a wide range of heel and sole compounds.

Other reinforced rubber applications where both forms of Hi-Sil™ 233-D are used in are mats, wire and cable coverings, specialty gloves, and sporting equipment grips.

Rubber Processing Recommendations

For all 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, 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.

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Packaging

Hi-Sil™ 233-D powder is packaged in 20 Kg (44 pound) paper bags. The bags are palletized in a 10X3 pattern with 30 bags per pallet (600 Kg or 1,322 pounds).

Hi-Sil™ 233G-D granule is packaged in 25 Kg (55 pound) paper bags. The bags are palletized in a 10X3 pattern with 30 bags per pallet (750 Kg or 1,653 pounds). Hi-Sil™ 233G-D granule is also available in 20 Kg (44 pound) polyethylene bags, the bags are palletized in a 11X3 pattern with 33 bags per pallet. Hi-Sil™ 233G-D granule is available in FIBC's (600 Kg or 1,322 pounds).

Pallets containing paper and polyethylene bags are stretch wrapped in plastic film to protect against moisture pick up and shifting during transporting and storage.

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.

Samples and Service

PPG's Technical Service specialists are available for consulting on the use, handling and storage of Hi-Sil™ 233-D and 233G-D Silica products.

Gallon containers and bag-size samples are available upon request from Technical Service.



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