



Teflon®

Nonstick & Industrial Coatings

Teflon® ETFE Coatings 532-6200 White

Description

Ethylene tetrafluoroethylene (ETFE) is a thermoplastic copolymer derived from the polymerization of ethylene and tetrafluoroethylene monomers. This resin is an extremely tough and abrasion-resistant material having excellent chemical resistance and continuous operating temperatures up to 150°C (300°F). ETFE is also an excellent electrical insulator and has good nonstick and low friction properties.

Teflon® ETFE 532-6200 is a white pigmented version of 532-6210, the clear topcoat and thin-film ETFE powder coating, and is suitable for coatings of 130-250 µm (5–10 mil) thick. The recommended primer is 699-123, the same primer that is recommended for other *Teflon®* ETFE powders.

FDA Status

Teflon® ETFE coating systems consisting of 699-123 primer and 532-6200 or 532-6210 topcoats comply with FDA regulations governing components of coatings for direct food contact.

**Table 1
Physical Properties**

Product Code	Teflon® ETFE 532-6200
Color	White
Specific Gravity	1.73
Coverage, m ² /kg at 25 µm (ft ² /lb at 1 mil)	22 (108)
Average Particle Size, µm	20–30
Melting Range, °C (°F)	255–275 (491–524)

Metal Surface Preparation

Best adhesion is obtained by thoroughly cleaning and then roughening the substrate.

Cleaning is preferably done using a commercially available hot alkaline solution. Commercial solvent degreasing is an acceptable alternative, as long as appropriate health and safety precautions are taken. Solvent cleaning by hand is not recommended. It is also the general consensus in the industry that a high-temperature burn-off prior to grit blasting provides improved performance of the final coating system.

Roughening is preferably done by grit blasting with aluminum oxide. New grit will give the best profile because it creates sharper peaks and valleys than can be obtained with old, rounded grit. The blast profile (surface roughness depth) should be at least 10–20 µm (0.5 mil)

Primer Application

Teflon[®] ETFE has inherently superior adhesion to most other fluoropolymers and has been used without primer in a variety of applications. However, a *Teflon*[®] primer will approximately double the adhesive strength of the bond.

The 699-123 Liquid Primer is recommended and should be applied at a DFT of 7–10 μm (0.3–0.4 mil). After air drying, the primer should visually appear to be slightly rough with a dull, mottled look. Small white specs (ETFE particles) may be visible, which is normal.

Carbon steel substrates are sensitive to rusting; the 699-123 is formulated with antirust additives. Preheating to 50°C (120°F) will minimize this problem, especially during humid weather or cool, damp early morning start-ups.

The powder topcoat can be applied directly over the wet, air-dried, or force-dried (66°C [150°F]) primer. Do not fully pre-bake the primer.

Topcoat Application

Teflon[®] ETFE 532-6200 should be applied to a final thickness of 100–150 μm (4–6 mil), including primer, to ensure a uniform white coating. (A minimum coating thickness of 100 μm (4 mil) is required to achieve complete hiding over the primer. Thicknesses of greater than 150 μm (6 mil) of 532-6200 may result in yellowing of the final color.) If a greater total build is desired, the balance of the coating should be with 532-6210, which is a clear version using the same polymer. These products have a high melt flow value and will provide smooth films. *Teflon*[®] ETFE Powder can be applied using any commercially available powder coating equipment. The powder is given an electrostatic charge, which results in an attraction to the grounded metal part. Use the maximum charging voltage that provides good electrostatic attraction without repulsion. This voltage is usually in the 20–30 kV range, but varies with the specific equipment used. (Commercial equipment may operate at significantly higher voltages—60 kV has been observed.) Adjust delivery air pressure to produce a *cloud* of powder that does not excessively blow past the part.

After the first coat is applied, the part becomes electrically insulated and subsequent coats are poorly attracted, leading to thin films per coat. Thus, after the first coat, the hot flocking method (applying the powder to a hot part immediately after it is removed from the baking oven) is combined with the electrostatic application. The resulting film builds will vary, depending on the temperature of the part and its mass (ability to hold heat), but spraying a hot part will always yield thicker films per coat than spraying a cold part. Triboelectric spray equipment may provide better results. The powder particles are only weakly charged, but sufficiently to adhere to a previously coated part more effectively than powder sprayed from standard electrostatic equipment.

CAUTION: Hot flocking procedures may result in overexposure to decomposition fumes. Adequate ventilation is an absolute necessity.

Baking

Teflon[®] ETFE can be cured within a range of bake temperatures (metal temperatures) as shown in Table 2.

Table 2
***Teflon*[®] ETFE Bake Temperatures**

	Metal Temperature*	Time at Metal Temperature
Recommended	290°C (550°F)	15 minutes
Minimum	285°C (540°F)	15 minutes
Maximum	305°C (570°F)	10 minutes

* Oven temperatures may need to be slightly higher.

Adherence to the recommended bake schedules is crucial to final performance. Prolonged exposure at or above the maximum bake temperature can cause brown discoloration.

Safety

Follow normal industry safety procedures for handling and applying *Teflon*[®] products. Industrial experience has clearly shown *Teflon*[®] ETFE coatings can be processed and used at elevated temperatures without hazard providing adequate ventilation is used. Oven ventilation should be available at baking temperatures of 275°C (525°F) and above. Spray booth ventilation should be sufficient to capture all the overspray from powders or liquids.

CAUTION: Hot flocking procedures may result in overexposure to decomposition fumes. Adequate ventilation is an absolute necessity.

When handling powders, care should be taken to avoid powder inhalation. Facemasks capable of

excluding 0.3 µm (0.001 in.) particles are recommended, such as the Custom-Cumfo (Mine Safety Appliance Co.) #10-86430 with a Type Ultra-Filter #76876 cartridge. Care should be exercised to avoid contamination of cigarettes and other forms of smoking tobacco. This is especially important when handling powders. Wash hands before smoking or eating.

Storage and Stability

Teflon[®] ETFE powder coatings should be stored in their original plastic bags to avoid moisture pickup or contamination. These powders are stable indefinitely and are not sensitive to typical room temperature variations.

For more information on Teflon® coatings:

DuPont
Teflon® Nonstick & Industrial Coatings
Chestnut Run Plaza
P.O. Box 80702
Wilmington, DE 19880-0702

(800) 441-7515
Fax: (302) 366-8602

Europe

DuPont de Nemours (Belgium)
A. Spinostraat 6
B-2800 Mechelen
Belgium
Tel.: 33-15-441188
Fax: 33-15-441160

Pacific

DuPont Australia, Ltd.
254 Canterbury Road
Bayswater, Victoria 3153
Australia
Tel.: 61-3-9721-5617
Fax: 61-3-9721-5690

Japan

DuPont K. K. (Teflon® Finishes)
4th Floor, Chiyoda Honsha Building
5-18 Sarugaku-cho, 1-chome
Chiyoda-ku, Tokyo, 101 Japan
Tel.: 81-3-5281-5888
Fax: 81-3-5281-5899

Asia

DuPont China, Ltd.
Room 1122,
New World Office Building
(East Wing)
Salisbury Road
Kowloon, Hong Kong
Tel.: 852-2734-5459
Fax: 852-2368-3512

DuPont Korea
4/5th Floor Asia Tower
#726 Yeoksam-dong, Kangnam-ku
Seoul, Korea
Tel.: 82-2-2222-5385
Fax: 82-2-2222-5478

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