

DuPont™ Teflon® PFA HP *Plus*

fluoropolymer resin

Extrusion and Molding Resin

Description

DuPont™ *Teflon*® PFA HP *Plus* fluoropolymer is a special purpose resin available in clear, 2.5-mm (0.1 in) pellets. This resin is similar to PFA HP with the additional benefits of improved flex life and chemical stress crack resistance. *Teflon*® PFA HP *Plus* meets the increasingly stringent requirements for ultra-reliable and non-contaminating parts, while retaining the same exceptional chemical resistance, high purity and protection against ionic contamination as PFA HP. The improved flex life and chemical resistance will reduce the cost of ownership of high purity fluid handling systems by reducing downtime caused by mechanical or chemical stresses. Parts molded with *Teflon*® PFA HP *Plus* have improved clarity and a smooth finish, which can further help prevent buildup of microbial contamination in water handling systems.

The exceptional purity of *Teflon*® PFA HP *Plus* makes it suitable for applications that require low extractable fluorides, and freedom from other foreign materials. This product contains no additives and is designed for hostile chemical environments where purity in the parts-per-billion range is needed. An example is in fluid handling systems for the manufacture of semiconductors. *Teflon*® PFA HP *Plus* is preferred when extended service is required in hostile environments involving chemical, thermal, and mechanical stress. **Table 1** shows the typical property data for *Teflon*® PFA HP *Plus*.

The excellent thermal stability of *Teflon*® PFA HP *Plus* results in better moldings and reduces metal pickup from processing equipment. *Teflon*® PFA HP

Plus combines the processing ease of conventional thermoplastics with the properties similar to those of polytetrafluoroethylene.

Properly processed products made from *Teflon*® PFA HP *Plus* resin provide the superior properties typical of fluoropolymer resins; retention of properties after service at 250°C (482°F), useful properties at -196°C (-320°F), and chemical inertness to nearly all industrial chemicals and solvents. Dielectric properties are excellent. Molded products have moderate stiffness and high ultimate elongation.

In a flame situation, products of *Teflon*® PFA HP *Plus* resist ignition and do not themselves promote flame spread. When ignited by flame from other sources, their contribution to heat is very small and added at a slow rate with very little smoke.

Typical End Products

Applications for *Teflon*® PFA HP *Plus* include tubing; pipe, fittings, valves, and other components for ultrapure fluid handling systems, either unsupported or for linings.

Brand

Teflon® is a registered trademark of DuPont for its brand of fluoropolymer resins, which can only be used when licensed by DuPont. Customers who wish to use the *Teflon*® trademark in connection with DuPont PFA products in approved applications should contact (800) 262-2745. Without a license, customers may not identify their product as containing *Teflon*®, but may refer to the resin as PFA HP *Plus*.



Processing

Teflon[®] PFA HP *Plus* can be processed by conventional melt extrusion and by injection, compression, and transfer and blow-molding processes. High melt strength and heat stability permit the use of relatively large die openings and high temperature draw-down techniques that increase production rates. Reciprocating screw injection molding machines are preferred. Corrosion-resistant metals should be used in contact with molten resin. Extruder barrel should be long, relative to diameter, to provide residence time for heating the resin to approximately 380°C (716°F).

Safety Precautions

WARNING!

Vapors can be liberated that may be hazardous if inhaled.

Before using *Teflon*[®] PFA HP *Plus*, read the Material Safety Data Sheet and the detailed information in the "Guide to the Safe Handling of Fluoropolymer Resins," latest edition, published by the Fluoropolymers Division of The Society of the Plastics Industry, available from DuPont.

Open and use containers only in well-ventilated areas using local exhaust ventilation (LEV). Vapors and fumes liberated during hot processing, or from smoking tobacco or cigarettes contaminated with *Teflon*[®] PFA HP *Plus*, may cause flu-like symptoms (chills, fever, sore throat) that may not occur until several hours after exposure and typically pass within about 24 hours. Vapors and fumes

liberated during hot processing should be exhausted completely from the work area; contamination of tobacco with polymers should be avoided.

Mixtures with some finely divided metals, such as magnesium or aluminum, can be flammable or explosive under some conditions.

Storage and Handling

Special product isolation and packaging procedures are used by DuPont to eliminate external contamination of *Teflon*[®] PFA HP *Plus* resin. Processors also must avoid contamination for successful production of high-purity products.

The properties of *Teflon*[®] PFA HP *Plus* resins are affected by storage time. Ambient storage conditions should be designed to avoid airborne contamination and water condensation on the resin when it is removed from containers.

Freight Classification

Teflon[®] PFA HP *Plus*, when shipped by rail or express, is classified "Plastics, Synthetic, O.T.L., NOIBN." Resin shipped by truck is classified "Plastics, Materials O.T.F.C.E. or S. Granules."

Packaging

Teflon[®] PFA HP *Plus* resin is packaged in 45.4-kg (100-lb) drums, each containing two 22.7-kg (50-lb) polyethylene bags. Bulk containers of 726 kg (1,600 lb) will be considered on special request. Special packages containing 2.3 kg (5 lb) and 11.3 kg (25 lb) are also available.

Table 1
Typical Property Data for DuPont™ Teflon® PFA Fluoropolymer Resin Grade HP Plus

Property	ASTM Test Method	Unit	Grade 940 Nominal Value	Grade 950 Nominal Value
Thermal				
Nominal Melting Point	D3418	°C (°F)	285–300 (545–572)	285–300 (545–572)
Flow Rate	D3307	g/10 min	14–19	1.7–3.0
Coefficient of Linear Thermal Expansion	E831			
0 to 100°C (32 to 212°F)		mm/mm/°C (in/in/°F)	15 x 10 ⁻⁵ (8.3 x 10 ⁻⁵)	15 x 10 ⁻⁵ (8.3 x 10 ⁻⁵)
100 to 150°C (212 to 302°F)		mm/mm/°C (in/in/°F)	23 x 10 ⁻⁵ (13 x 10 ⁻⁵)	23 x 10 ⁻⁵ (13 x 10 ⁻⁵)
150 to 200°C (302 to 392°F)		mm/mm/°C (in/in/°F)	29 x 10 ⁻⁵ (16 x 10 ⁻⁵)	29 x 10 ⁻⁵ (16 x 10 ⁻⁵)
Mechanical				
Tensile Strength, 23°C (73°F)	D3307	MPa (psi)	28 (4,100)	28 (4,100)
200°C (392°F)		MPa (psi)	11 (1,600)	15 (2,200)
Specific Gravity	D792		2.12–2.17	2.12–2.17
Tensile Yield Strength, 23°C (73°F)	D3307	MPa (psi)	14 (2,000)	14 (2,000)
Ultimate Elongation, 23°C (73°F)	D3307	%	310	260
200°C (392°F)		%	450	450
Flexural Modulus, 23°C (73°F)	D790	MPa (psi)	650 (94,000)	600 (87,000)
200°C (392°F)		MPa (psi)	60 (8,700)	50 (7,300)
Hardness Durometer	D2240	Shore D	55	55
MIT Folding Endurance 0.5 mm (0.020 in.)	D2176	Cycles	130,000	1,800,000
Electrical				
Dielectric Strength, 0.25 mm (0.010 in.)	D149	kV/mm (V/mil)	80 (2,000)	80 (2,000)
Dielectric Constant, 10 ² –10 ⁷ Hz	D150		2.02–2.08	2.02–2.08
Dissipation Factor, 10 ² –10 ⁷ Hz	D150		<0.0003	<0.0003
Volume Resistivity	D257	Ohm*cm	10 ¹⁸	10 ¹⁸
General				
Water Absorption, 24 hr	D570	%	<0.05	<0.05
Limiting Oxygen Index	D2863	%	>95	>95
Factory Mutual Flammability	FM4910	—	Pass	Pass

Note: Teflon® PFA 940 HP Plus and Teflon® PFA 950 HP Plus are ASTM D3307, Types IV and V respectively.

Typical properties are not suitable for specification purposes.

Statements, or data, regarding behavior in a flame situation are not intended to reflect hazards presented by this or any other material when under actual fire conditions.

* Depending on equipment and conditions used.

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CAUTION: Do not use in medical applications involving permanent implantation in the human body. For other medical applications, see "DuPont Medical Caution Statement," H-50102.

