



# Teflon™ PFA 440HPA

## Molding and Extrusion Resin

## Product Information

For inventory control purposes, product name may be followed by an X.

Products labeled PFA 440HPA and PFA 440HPA X are equivalent, and all information in this document is applicable to both.

### Typical Applications

Applications for Teflon™ PFA 440HPA include fluid handling components for critical, high-purity processes, like semiconductor, pharmaceutical, and biotechnology, as well as applications where purity in the parts-per-billion range is needed. Teflon™ PFA 440HPA offers a slightly higher melt flow rate than Teflon™ PFA 440HPB, providing greater processing ease.

### Description

Teflon™ PFA 440HPA is a special purpose fluoropolymer resin available in pellet form. This resin is a chemically modified form of Teflon™ PFA 340 that combines many of the benefits of the parent resin (a relatively high typical melt flow rate of 16) with several additional benefits including enhanced purity, improved thermal stability while processing, and chemical inertness, for example, to ozonated fluids. **Table 1** shows the typical property data for Teflon™ PFA 440HPA.

Teflon™ PFA 440HPA is a premium resin with the lowest level of extractables designed to meet ultra-high purity requirements. Teflon™ PFA 440HPA has a relatively high melt flow rate (typical MFR of 16) for injection molding and extrusion processes, and the highest level of inertness due to stable end group polymer structure. The enhanced purity of Teflon™ PFA 440HPA makes it suitable for applications that require improved color, lower 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. Examples are in semiconductor manufacture, fluid handling systems for industry or life sciences, and instrumentation for precise measurements of fluid systems. Compared to other fluoropolymers, the high melt strength and thermal stability of Teflon™ PFA 440HPA can be used to improve processing rates, combining the processing ease of conventional fluoropolymers with many properties similar to those of polytetrafluoroethylene.

Properly processed products made from neat Teflon™ PFA 440HPA resin provide the superior properties characteristic of fluoropolymer resins: chemical inertness, exceptional dielectric properties, heat resistance, toughness and flexibility, low coefficient of friction, non-stick characteristics, negligible moisture absorption, low flammability, performance at temperature extremes, and excellent weather resistance.

In a flame situation, products of Teflon™ PFA 440HPA resist ignition and do not promote flame spread. When ignited by flame from other sources, their contribution of heat is very small and added at a slow rate with very little smoke.

### Processing

Teflon™ PFA 440HPA can be processed by conventional melt extrusion, and by injection, compression, and transfer 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 fluoropolymer resin. Extruder barrel should be long, relative to diameter, to provide residence time for heating the resin to approximately 390 °C (730 °F). For more detailed processing information, including recommended draw-down ratios, consult your Chemours representative.

### Safety Precautions

**WARNING! VAPORS CAN BE LIBERATED THAT MAY BE HAZARDOUS IF INHALED.**

Before using Teflon™ PFA 440HPA resin, refer to the Safety Data Sheet and the latest edition of "The Guide to the Safe Handling of Fluoropolymer Resins," published by the Plastics Industry Association ([www.plasticsindustry.org](http://www.plasticsindustry.org)) or PlasticsEurope ([www.plasticseurope.org](http://www.plasticseurope.org)). Open and use containers only in well-ventilated areas using local exhaust ventilation (LEV). Vapors and fumes liberated during hot processing of Teflon™ PFA 440HPA should be exhausted completely from the work area. Contamination of tobacco with these polymers must be avoided. Vapors and fumes liberated during hot processing that are not properly exhausted, or from smoking tobacco or cigarettes contaminated with Teflon™ PFA 440HPA, may cause flu-like symptoms, such as chills, fever, and sore throat. This may not occur until several hours after exposure and will typically pass within about 24 hours. Mixtures with some finely divided metals, such as magnesium or aluminum, can be flammable or explosive under some conditions.

### Food Contact Compliance

Properly processed products made from Teflon™ PFA 440HPA resin can qualify for use in contact with food in compliance with FDA 21 CFR 177.1550 and European Regulation (EU) No. 10/2011. For details and information, please contact your Chemours representative.

### Storage and Handling

Special product isolation and packaging procedures are used by Chemours to eliminate external contamination of Teflon™ PFA 440HPA resin. Processors also must avoid contamination for successful production of high purity products. The properties of Teflon™ PFA 440HPA resin are not 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 Classifications

Teflon™ PFA 440HPA resin is classified as "Plastics, Materials, Pellets"

### Packaging

Teflon™ PFA 440HPA is supplied as pellets and is available in 25-kg multilayer bags with an integral polyethylene liner.

**Table 1: Typical Property Data for Teflon™ PFA 440HPA**

Property	Test Method		Unit	Typical Value
<b>GENERAL</b>				
Melt Flow Rate	ISO 20568	ASTM D3307	g/10 min	16
Melting Point	—	ASTM D4591	°C (°F)	305 (581)
Specific Gravity	—	ASTM D792	—	2.15
Critical Shear Rate, 372 °C (702 °F)	—	—	1/sec	56
<b>MECHANICAL</b>				
Tensile Strength	ISO 12086 <sup>a</sup>	ASTM D3307	MPa (psi)	
23 °C (73 °F)				25 (3,600)
250 °C (482 °F)				14 (1,800)
Ultimate Elongation	ISO 12086 <sup>a</sup>	ASTM D3307	%	
23 °C (73 °F)				300
250 °C (482 °F)				480
Flexural Modulus	ISO 178	ASTM D790	MPa (psi)	
23 °C (73 °F)				590 (85,000)
250 °C (482 °F)				55 (8,000)
MIT Folding Endurance (0.20 mm, 8 mil film)	—	ASTM D2176 <sup>b</sup>	Cycles	20,000 <sup>c</sup>
Hardness Durometer	ISO 868	ASTM D2240	—	D55
<b>ELECTRICAL</b>				
Dielectric Strength, Short Time, 0.25 mm (0.010 in)	IEC 243	ASTM D149	kV/mm (V/mil)	80 (2,000)
Dielectric Constant, 1 MHz (10 <sup>6</sup> Hz)	IEC 250	ASTM D150	—	2.03
Dissipation Factor, 1 MHz (10 <sup>6</sup> Hz)	IEC 250	ASTM D150	—	<0.0002
Volume Resistivity	ISO 1325	ASTM D257	ohm-cm	10 <sup>18</sup>
<b>OTHER</b>				
Water Absorption, 24 hr	—	ASTM D570	%	<0.03
Weather and Chemical Resistance	—	—	—	Outstanding
Limiting Oxygen Index	ISO 4589	ASTM D2863	%	>95
Continuous Service Temperature <sup>d</sup>	—	—	°C (°F)	260 (500)
Flammability Classification <sup>e</sup>	—	UL 94	—	V-0

<sup>a</sup> ISO 12086 is a retired standard.

<sup>b</sup> Depending on fabrication conditions.

<sup>c</sup> Historical standard

<sup>d</sup> Definition of continuous service temperature: The continuous service temperature is based on accelerated heat-aging tests, and represents the temperature at which tensile strength and ultimate elongation retain 50% of the original values after 20,000 hr thermal aging. Continuous service temperature above 260 °C (500 °F) may be feasible, depending on such factors as chemical exposure, support from the substrate, etc. When considering uses of Teflon™ PFA 440HPA above 260 °C (500 °F), preliminary testing should be done to verify suitability.

<sup>e</sup> These results are based on laboratory tests under controlled conditions and do not reflect performance under actual fire conditions; current rating is a typical theoretical value.

Note: Teflon™ PFA 440HPA meets the requirements of ASTM D3307, Type I

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.

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