

# DuPont™ Teflon® PTFE TE-3893

## FLUOROPOLYMER RESIN

### Product Information

## DuPont™ Teflon® PTFE TE-3893 Aqueous Dispersion

### Brand

Teflon® is a registered trademark of DuPont for its brand of fluoropolymer resins, which can only be licensed by DuPont for use in approved applications. Customers who wish to use the Teflon® trademark in connection with DuPont products under license from DuPont should either contact (800) 441-7515 in the US or the regional sales office listed at the back of this brochure. Without a license, customers may not identify their product as containing Teflon®, but may refer to the resin as PTFE fluoropolymer dispersion TE-3893.

### Description

DuPont™ Teflon® PTFE TE-3893 fluoropolymer resin is a negatively charged, hydrophobic colloid, containing typically 60% (by total weight) of 0.05 to 0.5 µm polytetrafluoroethylene (PTFE) resin particles suspended in water. Seen as a milky white liquid, it also contains approximately 6% (by weight of PTFE) of a nonionic wetting agent and stabilizer. Viscosity at room temperature is approximately 20 mPa.s (cP). Nominal pH is 10.5.

Compared with other grades of PTFE dispersions Teflon® PTFE TE3893 is a general-purpose product, often preferred for impregnating woven goods and for some coating processes. It imparts various of the unique properties of PTFE resin to porous structures, as well as to a base material when used as an additive.

When properly processed, the PTFE resin in Teflon® PTFE TE-3893 exhibits the superior properties typical of the fluoropolymer resins: retention of properties after service at 260°C (500°F), useful properties at -240°C (-400°F), chemical inertness to nearly all industrial chemicals and solvents, and low friction and antistick surfaces. Dielectric properties are outstanding and stable with frequency and temperature. Refer to Table 1 for typical property data.

### Typical End Products

Teflon® PTFE TE-3893 is used for coated glass fabric used in high-performance industrial or food conveyor belting and nonadhesive separator sheets for laminating or press blankets requiring high-quality surface finish; electrical insulation for wire, printed circuit boards, and rotating equipment; cast film for capacitors or chemical barriers; to impregnate packing made from braided fibers for severe chemical and thermal service; surface coatings for other substrates; and as an anti-drip additive for plastics.



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## FDA Compliance

Properly processed products (sintered at high temperatures common to the industry) made from Teflon® PTFE TE-3893 resin can qualify for use in contact with food in compliance with FDA Regulation 21 CFR 177.1550 and the German BGA. Products made from unsintered dispersion do not comply.

## Processing

PTFE resin cannot be processed by solvent or melt techniques. A dispersion of PTFE particles provides an alternate method for making coated or impregnated products.

Conventional dip or flow techniques can be used for coating or impregnating other products with Teflon® PTFE TE-3893. The resin particles can be consolidated by heat into a coherent matrix or coating or left as particles to influence the properties of a finished product.

A continuous PTFE resin coating on woven fabrics can be made by dip coating. Successive passes must be used to build up thickness slowly and without cracks. Teflon® PTFE TE-3893 fluoropolymer provides good rewetting on each pass and void-free buildup suitable for more demanding electrical and chemical service applications. Each coating layer is usually dried to remove water (typically at 120°C [250°F]), baked to remove the wetting agent (typically at 270°C [518°F]), sometimes calendered, and finally heated above the crystalline melting point of the resin particles (approximately 337°C [639°F]). Glass, PTFE, Nomex® aramid fiber, Kevlar® aramid fiber, or other high-temperature resistant fibers must be used.

Products utilizing entrained PTFE resin particles only for their lubricating or hydrophobic properties are dried and baked, but not heated above the crystalline melting point of the particles. For example, rope-like products, such as shaft packings, can be made from braided yarn in a variety of cross sections. The dispersion wets internal surfaces and promotes penetration of the extremely small particles. The unmelted particles are sheared and retained as an impregnant, even when compressed in service and exposed to steam or chemicals. Unmelted particles also can improve flexibility and flex life. High-temperature resistant fibers are not necessarily required in these applications.

Other solid or liquid ingredients can be added to Teflon® PTFE TE-3893 to provide specific processing or finished product behavior.

## Safety Precautions

### WARNING!

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

Before using Teflon® PTFE TE-3893, 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 or the "Safe handling of Fluoropolymer dispersions" published by the APME —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® PTFE TE-3893 fluoropolymer resin, may cause flu-like symptoms (chills, fever, sore throat) that may not occur until several hours after exposure and 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.

Teflon® PTFE TE-3893 contains additives in the aqueous phase that are irritants. Avoid contact with skin and eyes. In case of skin contact, flush with water immediately. In case of eye contact, flush with water immediately and get medical help.

## Storage and Handling

The dispersion particles in Teflon® PTFE TE-3893 will settle on prolonged standing or on heating above 65°C (150°F). They usually can be redispersed by mild agitation. Drums may be rolled or the product stirred gently just prior to use. The dispersion must be protected from freezing, which will cause irreversible settling.

Ammonium hydroxide is used by DuPont to set pH to 10 at the time of shipment. High ambient temperatures can deplete the ammonia level and reduce the pH. Declining pH eventually favors bacterial growth, which causes odor and scum. The pH should be measured and maintained between 9.5 and 10.5.

Both very high and very low temperatures may be detrimental. Dispersions must not be allowed to freeze. The optimum storage temperature range is 7–24°C (45–75°F), with temperatures low in the range preferred. Storage at 7–32°C (45–90°F) is acceptable within nominal shelf life for standard dispersions. If dispersions are to be stored for extended periods beyond their nominal shelf life, low-temperature storage is especially desirable because the particles are harder at lower temperatures and, therefore, are less likely to stick together as they settle.

High-speed stirring, pumping, or any other violent agitation must be avoided to minimize sheared particles or coagulation and to minimize foaming. Ideally, the dispersion should be conveyed by gravity from storage to processing stations.

Storage and handling areas should be clean. Keep dispersion drums closed and clean to avoid both contamination and coagulation by drying at the liquid surface. High processing temperatures will cause even very small foreign particles to become visible or to make defects in finished products. Good housekeeping and careful handling are -essential.

## Packaging

Teflon® PTFE TE-3893 is packaged in 19-, 30- and 114-L (5-, 8- and 30-gal) non-returnable drums and 1000-L (275-gal) recyclable containers. Contact the local DuPont sales office for package sizes available in your specific geographic area.

## Freight Classification

Teflon® PTFE TE-3893, when shipped by rail or express, is classified "Plastics, Synthetic, Liquid, NOIBN." Resin shipped by truck is classified "Plastics, Materials, Liquid, NOI."

**Table 1**  
**Typical Property Data for DuPont™ Teflon® PTFE Fluoropolymer Resin Dispersion Grade TE-3893**

<i>Typical Property Data for Teflon® TE3893</i>				
Property	Test method <sup>(1)</sup>		Unit	Typical value
<b>General</b>				
Solids content (% PTFE by weight)	ISO 12086	D 4441	%	60
Density of dispersion (at 60% solids)	ISO 8962	D 4441	g/cm <sup>3</sup>	1.50
Resin dry weight (at 60% solids)/liter dispersion		DuPont	g	900
Color				White
Dispersion particle size, average diameter	ISO 13321	DuPont	µm	0.210
pH of dispersion	ISO 976	E 70		10.0
Brookfield viscosity (at 25°C)	ISO 2555	D 2196	mPa·s (cP)	25 (25)
Standard specific gravity of sintered resin	ISO 12086			2.220
<b>Mechanical<sup>(2)</sup></b>				
Tensile strength	ISO 12086	D 882	MPa (psi)	24 (3500)
Ultimate elongation	ISO 12086	D 882	%	400
<b>Electrical<sup>(2)</sup></b>				
Relative permittivity (100 Hz to 60 MHz)	IEC 250	D 150		2.1
Dissipation factor, tg δ (1 kHz)	IEC 250	D 150		<0.0003
Dielectric strength (film thickness 0.05 mm)	IEC 243	D 149	kV/mm	>120
Volume resistivity	IEC 93	D 257	W·m	1013
<b>Thermal<sup>(2)</sup></b>				
Initial Melt, Peak Temperature		D4895	°C	337
Second Melt, Peak Temperature		D4895	°C	327
Brittleness temperature		D 746	°C	< -75
Continuous service temperature (max)			°C	260
<b>Other<sup>(2)</sup></b>				
Water absorption		D 570	%	< 0.01
Weather and chemical resistance				Excellent

**Note:** Teflon® TE-3893 meets the requirements of ASTM D 4441-04, type II, grade 6, class B.

Typical properties are not suitable for specification purposes.

Decimals are indicated by a period (.)

<sup>(1)</sup> ASTM unless otherwise specified.

<sup>(2)</sup> These results are based on tests made on thin cast films.

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**For more information call (302) 479-7731**

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**CAUTION:** Do not use in medical applications involving permanent implantation in the human body or contact with internal body fluids or tissues. For other medical applications, see "DuPont Medical Caution Statement," H-50102.

