

# DuPont™ Tefzel® ETFE

## FLUOROPLASTIC FILM

### Properties Bulletin

#### Description

DuPont Tefzel® ETFE film is a transparent, thermoplastic film that can be heat sealed, thermoformed, vacuum formed, heat bonded, welded, metallized, laminated (combined with dozens of other materials), and used as an excellent hot-melt adhesive. This wide variety of fabrication possibilities combines with the following important properties to offer a unique balance of capabilities not available in other plastic films.

#### Chemical Compatibility

DuPont Tefzel® ETFE film is chemically inert and solvent resistant to virtually all chemicals, except molten alkali metals, gaseous fluorine, and certain complex halogenated compounds, such as chlorine trifluoride at elevated temperatures and pressures. It also has low permeability to liquids, gases, moisture, and organic vapors.

#### Electrical Reliability

- Superior reliability and retention of properties over large areas of film
- High dielectric strength, over 160 kV/mm for 0.025-mm film (4000 V/mil for 1-mil film)
- No electric tracking, nonwetable, and noncharring
- Very low power factor and dielectric constant

#### Wide Thermal Range

- Continuous service temperature: -100 to 150°C (-150 to 300°F)
- Melting range: 260 to 280°C (500 to 536°F)
- Heat sealable

#### Mechanical Toughness

- Superior anti-stick and low frictional properties
- High resistance to impact and tearing

#### Long Time Weatherability\*

- Inert to outdoor exposure
- High transmittance of ultraviolet and all but far infrared

#### Reliability

- ETFE film contains no plasticizers or other foreign materials.
- Conventional equipment and techniques can be used for processing; basic composition and properties will not be influenced.
- Rigid quality control by DuPont ensures uniform gauge, void-free film.

#### DuPont™ Tefzel® ETFE Film

The convenience of Tefzel® ETFE fluoroplastic in easy-to-use film facilitates the design and fabrication of this low friction thermoplastic for all sorts of high performance jobs. It is transparent and can be *heat sealed, thermoformed, welded, and heat bonded*. Superior anti-stick properties make it an ideal release film for many applications. A *cementable* type with an invisible surface treatment is available for bonding to one or both sides with adhesives. This versatility is augmented by the superior properties of a true melt-processible fluoroplastic and by the wide choice of product dimensions available from DuPont.

\* Type C film not recommended for outdoor use.

**Table 1: Types and Gauges of DuPont™ Tefzel® ETFE Fluoroplastic Film**

Gauge	50	100	200	500
Thickness, mil	0.5	1	2	5
Thickness, µm	12.5	25	50	125
Approx. area factor, ft <sup>2</sup> /lb	200	100	50	20
Approx. area factor, m <sup>2</sup> /kg	40	20	10	4
<b>Availability</b>				
<b>Type LZ</b> - ETFE, general-purpose	X	X	X	X
<b>Type CLZ</b> - ETFE, one side cementable	—	X	X	X
<b>Type CLZ-20</b> - ETFE, both sides cementable	—	X	X	—

**Note:** Each roll of DuPont film is clearly identified as to resin type, film thickness, and film type.

<b>ETFE</b>	<b>200</b>	<b>CLZ</b>
Resin type	Film thickness, 200 gauge, 2 mil	Film type, cementable one side



The miracles of science™

**Table 2: Typical Properties of DuPont™ Tefzel® ETFE Fluoroplastic Film**

Property	Test Method <sup>1</sup>	Typical Value*	
		SI Units	English Units
<b>Mechanical</b>			
Tensile Strength at Break	D 882	41 MPa	6000 psi
Elongation at Break	D 882	300 %	
Flex Modulus	D 882	830 MPa	120,000 psi
Folding Endurance (MIT)	D 2176	50,000 cycles	
Tear Strength—Initial (Graves)	D 1004	4.90 N	500 g
Tear Strength—Propagating (Elmendorf)	D 1922	0.74 N	75 g
<b>Thermal</b>			
Melt Point	D 3418	260–280°C	500–536°F
Thermal Conductivity	Cenco-Fitch	0.24 W/(m.K)	1.65 BTU.in/(h.ft <sup>2</sup> .°F)
Specific Heat	—	1172 J/(kg.K)	0.28 BTU/(lb. °F)
Dimensional Stability	30 min at 150°C (302°F)	MD = 1% shrinkage TD = 5% shrinkage	
Oxygen Index	D 2863	30%	
<b>Electrical</b>			
Dielectric Strength, short-time, in air at 23°C (73°F), 6.35 mm (1/4 in) diameter electrode, 0.79 mm (1/32 in) radius, 60 Hz, 500 V/s rate of rise: 0.025 mm (1 mil) film	D 149 Method A	160 kV/mm	4000 V/mil
Dielectric Constant, 25°C (77°F), 1 KHz	D 150	2.6	
Dissipation Factor, 25°C (77°F), 1 KHz	D 150	0.0007	
Volume Resistivity, 170°C (338°F)	D 257	>1 x 10 <sup>17</sup> ohm.cm	
<b>Chemical</b>			
Moisture Absorption	—	<0.02%	
Permeability, Gas: Carbon Dioxide Nitrogen Oxygen	D 1434	cm <sup>3</sup> /(m <sup>2</sup> .24 h.atm)** 3.9 x 10 <sup>3</sup> 0.5 x 10 <sup>3</sup> 1.6 x 10 <sup>3</sup>	
Permeability, Vapors: Water	E 96	g/(m <sup>2</sup> .d) 7.8	g/(100 in <sup>2</sup> .24 h) 0.5
<b>General</b>			
Density	D 1505	1700 kg/m <sup>3</sup>	106 lb/ft <sup>3</sup>
Coefficient of Friction Kinetic (Film-to-Steel)	D 1894	0.2–0.3	
Refractive Index	D 542	1.4	
Solar Transmission	E 424	90%	

**Notes:** 1) ASTM method unless otherwise specified

\* For 0.050-mm (2-mil) film at 25°C (77°F), unless otherwise specified

\*\* To convert to cm<sup>3</sup>/(100 in<sup>2</sup>.24 h.atm), multiply by 0.0645

#### HOW TO USE THE DUPONT™ TEFZEL® BRAND NAME WITH YOUR PRODUCT

Tefzel® is a registered trademark of DuPont for our brand of ETFE fluoroplastic resins. Customer use of the Tefzel® brand name must be licensed by DuPont in association with approved applications. Without a license, customers may not identify their product with the DuPont™ Tefzel® brand name.

Unlicensed customers may refer to the DuPont product offering when used as an ingredient in their products by the DuPont product code number and generic descriptor. In this instance, when the product offering is to be sold and used without a license, the customer may refer to the ingredient as **DUPONT™ ETFE film**.

If you are interested in applying for a trademark licensing agreement for the DuPont™ Tefzel® brand, please contact us at (800) 207-0756 in the US or (302) 996-7906 (outside of the US).

This product is manufactured with technology that meets the goals of the U.S. Environmental Protection Agency (EPA) 2010/15 PFOA stewardship program. See [www.fluoropolymers.dupont.com](http://www.fluoropolymers.dupont.com) for more details.

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