Tefzel™ ETFE

Fluoroplastic Film

Properties Bulletin

Description

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

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, non-wettable, and non-charring
- 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

- Tefzel™ 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 Chemours ensures uniform gauge, void-free film.

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 the wide choice of product dimensions available from Chemours.

* Type C film not recommended for outdoor use.

Chemours™

Table 1: Typical Properties of Tefzel™ ETFE Fluoroplastic Film

Property	Test Method*	Typical Value**	
		SI Units	English Units
Mechanical			
Tensile Strength at Break	D882	41 MPa	6000 psi
Elongation at Break	D882	300%	
Flex Modulus	D882	830 MPa	120,000 psi
Folding Endurance (MIT)	D2176	50,000 cycles	
Tear Strength—Initial (Graves)	D1004	4.90 N	500 g
Tear Strength—Propagating (Elmendorf)	D1922	0.74 N	75 g
Thermal			
Melt Point	D3418	260–280 °C	500–536 °F
Thermal Conductivity	Cenco-Fitch	0.24 W/(m·K)	1.65 Btu·in/(hr·ft^2·°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	D2863	30%	
Electrical			
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	D149 Method A	160 kV/mm	4000 V/mil
Dielectric Constant, 25 °C (77 °F), 1 KHz	D150	2.6	
Dissipation Factor, 25 °C (77 °F), 1 KHz	D150	0.0007	
Volume Resistivity, 170 °C (338 °F)	D257	>1 x 10^{17} ohm·cm	
Chemical			
Moisture Absorption	—	<0.02%	
Permeability, Gas: Carbon Dioxide Nitrogen Oxygen	D1434	cm^3/(m^2·24 hr·atm)*** 3.9 x 10^3 0.5 x 10^3 1.6 x 10^3	
Permeability, Vapor: Water	E96	g/(m^2·d) 7.8	g/(100 in^2·24 hr) 0.5
General			
Density	D1505	1700 kg/m^3	106 lb/ft^3
Coefficient of Friction Kinetic (Film-to-Steel)	D1894	0.2–0.3	
Refractive Index	D542	1.4	
Solar Transmission	E424	90%	

*ASTM method, unless otherwise specified
**For 0.050-mm (2-mil) film at 25 °C (77 °F), unless otherwise specified
***To convert to cm^3/(100 in^2·24 hr·atm), multiply by 0.0645

Table 2: Types and Gauges of 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^2/lb	200	100	50	20
Approx. area factor, m^2/kg	40	20	10	4
Availability				
Type LZ – ETFE, general-purpose	X	X	X	X
Type CLZ – ETFE, one side cementable	—	X	X	X
Type CLZ-20 – ETFE, both sides cementable	—	X	X	—

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

ETFE	200	CLZ
Resin type	Film thickness, 200 gauge, 2 mil	Film type, cementable one side

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