



**HIGH-PERFORMANCE
FLUOROPOLYMER FILMS
PRODUCT LINE**



High-Performance Films

WIDEST RANGE OF HIGH-PERFORMANCE FLUOROPOLYMER FILMS IN THE INDUSTRY

As the fluoropolymer experts, TCI offers a vast knowledge of diverse fluoropolymer technologies and superior customer service. Our unrivaled expertise and willingness to provide custom solutions has made us a leading supplier of the highest quality fluoropolymer films. TCI manufactures cast and CrossFilm™ PTFE and melt extruded PFA, FEP, ETFE, PVDF, and ECTFE films. These films are used in industries that include composite molding, chemical processing, electrical, medical, architectural, and photovoltaic products.

Features of TCI's high-performance films include:

- **Extreme high & low temp capability: -425°F (-254°C) to 600°F (316°C)**
- **Chemical inertness**
- **Bio-compatibility**
- **Anti-stick / low energy surface**
- **Superb dielectric properties**
- **Excellent weatherability / UV resistant**
- **Non-flammability**
- **Low coefficient of friction**
- **High purity, no additives**
- **Heat Sealable / Thermoformability**
- **Custom thickness and color**

Extruded Fluoropolymer Films

- Broadest melt-processable fluoropolymer film product line on the market - FEP, PFA, ETFE, PVDF, ECTFE
- Premium grade (PG) films are produced with 100% virgin resins.
- Economical grades (WG) are available for heat sealing and welding applications
- Up to 60" (1,524 mm) width; custom slit widths down to ½" (12 mm) wide
- Precision rewind or single knife slitting and converting
- Thickness range from 0.0005" to 0.010" (12.5 µm - 250 µm)
- Thicknesses of ETFE, PFA & FEP HG – up to 0.020" (500 µm) available
- Plasma treated / chemically etched surfaces available for adhesive coating / lamination – 1 side or both sides

Cast PTFE Films - 100% Pure PTFE Multi-Layered Film

- Non-porous, pin-hole free structure
- Surface treatment on one side available for adhesive bonding / lamination to elastomers
- Thermally bondable surface on one side available for heat sealing
- Available un-pigmented (natural/clear) or pigmented forms in a broad variety of vivid colors
- Up to 60" (1,524 mm) width; custom slit widths down to ½" (12 mm) wide
- Thickness range from 0.0005" to 0.005" (12.5 µm - 125 µm)

CrossFilm™ - Mechanically - Capable 100% PTFE Film for Use in Extreme Environments

- Proprietary cross-lamination technology produces material with excellent 360° tear resistance and durability
- Superior flexing capabilities compared to all other PTFE products
- Unaffected by constant exposure to wet, chemical environments
- No reinforcement - eliminates concern for chemical attack
- Can be used in clean room, steam, food, cryogenic, and underwater environments
- Up to 60" (1,524 mm) width
- Thickness range from 0.002" to 0.060" (51 µm – 1500 µm)

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High-Performance Films

HIGH-PERFORMANCE FLUOROPOLYMER FILMS - INDUSTRIES & APPLICATIONS

Chemical Industry

Due to their excellent chemical resistance at elevated temperatures, TCI high-performance films are utilized in many critical chemical industry applications. Such applications include non-metallic expansion joints, roll covers, tank linings, roof seals, spray shields/flange covers, protective face shields, rupture disc and chemical pump diaphragms. High purity chemicals can also be stored and transported in sampling bags and flexible containers made from these films.

- CrossFilm™
- Extruded films - FEP, PFA, ETFE, PVDF, ECTFE

Composite Molding Process Materials

TCI MR (mold release) and VB (vacuum bagging) films are utilized in the high-temperature autoclave cure of high-performance composite materials for aerospace, automotive and other industries. Complemented by PTFE coated fiberglass release fabrics and PSA tapes, this product line offers a complete range of products for the high-end composite industry.

- Cast PTFE MR films
- Cast PTFE VB films
- FEP MR films
- ETFE MR films

Medical / Pharmaceutical Industry

The chemical and biological inertness of fluoropolymer films, combined with their bond ability, is invaluable for the pharmaceutical industry. They can have a variety of uses including in vial cap liners, septa and stopper applications, sampling bags, flexible culture bags, blood storage bags and storage or transportation containers for pharmaceuticals.

- Cast PTFE films with bondable surface
- ETFE & FEP films
- Plasma-treated surfaces for bonding / lamination

Electrical / Electronics

TCI fluoropolymer films possess a combination of excellent dielectric properties, temperature resistance, chemical resistance and weldability. These properties make them invaluable for circuit board laminates and high-temperature insulation tapes for wire wrapping. Cast PTFE films are excellent for multilayer circuit boards requiring low loss, low dielectric constant (Dk), and stable electrical and mechanical properties to achieve consistency for 5G applications. ETFE films are also broadly used as cushioning / release media in Film Assisted Molding (FAM) processes of semiconductors and integrated circuits.

- FEP and PFA films
- Cast PTFE Thermobondable films
- ETFE films

Architectural and Greenhouses

TCI ETFE and high clarity ECTFE films possess a unique combination of excellent mechanical properties, toughness, high light transmission, low haze, U-V resistance, and outdoor durability that make them invaluable materials for architectural roofing, tension membranes, and greenhouses.

- TCI Reveal™ ETFE films
- TCI Reveal™ ECTFE High Clarity grade films

Photovoltaic / Solar

The combination of excellent solar light transmission, U-V resistance and outdoor durability makes TCI extruded films the materials of choice for front and back sheets of flexible PV panels and glazing of solar collectors.

- ETFE and PVDF films
- Plasma-treated surfaces for bonding / lamination



High-Performance Extruded Films - FEP

			FEP PG	FEP WG	FEP MR	FEP HG	FEP HG Thick
General Properties							
Specific Gravity		ASTM D792	2.15				
Area Yield	ft ² /lb/mil (m ² /kg/25µm)		90 (18.4)				
Flammability		UL-94	V-0				
Water Absorption	%		<0.01				
Mechanical Properties							
Tensile Strength	psi	ASTM D882	3,500			5,000	5,000
Elongation at Break	%	ASTM D882	300			350	350
Tensile Modulus	psi	ASTM D882	70,000			70,000	70,000
Initial Tear Strength (2 mil film)	g	ASTM D1004	550			550	550
Propagation Tear Strength (2 mil film)	g	ASTM D1922	250			250	250
Folding Endurance (MIT)	cycles, ave.	ASTM D2176	10,000			250,000	250,000
Thermal Properties							
Continuous Use Temp	°F (°C)	UL-746 B	400 (205)			400 (205)	400 (205)
Melt Point	°F (°C)	ASTM D3418	500 (260)			520 (270)	520 (270)
Coeff. of Lin. Thermal Expansion	in/in °F	ASTM D696	5.5x10 ⁻⁵			5.5x10 ⁻⁵	5.5x10 ⁻⁵
Electrical Properties							
Dielectric Strength (1mil film)	volts / mil (kV/mm)	ASTM D149	6,500 (260)	n/a		6,500 (260)	
Dielectric Contant 1kHz		ASTM D150	2.0	n/a		2.0	2.0
Dissipation Factor, 1kHz		ASTM D150	0.0003	n/a		0.0003	0.0003
Surface Resistivity	ohm/sq	ASTM D257	1x10 ¹⁵	n/a		1x10 ¹⁵	1x10 ¹⁵
Optical Properties							
Refractive Index		ASTM D542	1.34	n/a		1.34	1.34
Solar Transmission	%	ASTM E424	96	n/a		96	96
Haze (2 mil (50 µm) film)	%		n/a	n/a		n/a	n/a
Product Offering							
Width	inches (mm)		0.5 mil -Up to 56" (1,473), 1mil - 10mil - Up to 60" (1,524)			up to 60" (1,524)	49.0" (1,250)
Thickness	mils (µm)		0.5 - 10 (12.5 - 250)			5 -10 (125 - 250)	20 (500), 30 (750)
Standard Colors			Clear	Clear Tinted	Clear, White, Red, Violet, Orange	Clear	Clear
Surface Treatments Available							
Chemical Etching			•			•	•
Plasma Treatment			•			•	
Applications, Markets							
Composite Molding Process: Release Films					•		
Chemical Process / Equipment			•	•		•	•
Heat Sealing / Welding / Melt Adhesive				•			
Electrical / Electronics			•				
Medical			•			•	•
Optical /Photovoltaics			•				
Protective/Decorative			•				

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High-Performance Extruded Films - PFA

			PFA PG	PFA WG	Thick PFA
General Properties	Units	Test Method			
Specific Gravity		ASTM D792	2.15		
Area Yield	ft ² /lb/mil (m ² /kg/25μm)		90 (18.4)		
Flammability		UL-94	V-0		
Water Absorption	%		<0.01		
Mechanical Properties					
Tensile Strength	psi (MPa)	ASTM D882	5,000 (35)		
Elongation at Break	%	ASTM D882	500		
Tensile Modulus	psi (MPa)	ASTM D882	70,000 (480)		
Initial Tear Strength (2 mil film)	g	ASTM D1004	500		
Propagation Tear Strength (2 mil film)	g	ASTM D1922	75		
Folding Endurance (MIT)	cycles, min.	ASTM D2176	100,000		
Thermal Properties					
Continuous Use Temp	°F (°C)	UL-746 B	500 (260)		
Melt Point	°F (°C)	ASTM D3418	575 - 590 (302 - 310)		
Coeff. of Lin. Thermal Expansion	in/(in °F) (mm/(mm°C))	ASTM D696	5.5x10 ⁻⁵ (9.9x10 ⁻⁵)		
Electrical Properties					
Dielectric Strength (1mil film)	volts / mil (kV/mm)	ASTM D149	6,500 (260)	n/a	6,500 (260)
Dielectric Contant 1kHz		ASTM D150	2.0	n/a	2.0
Dissipation Factor, 1kHz		ASTM D150	0.0002 - 0.0007	n/a	0.0002 - 0.0007
Optical Properties					
Refractive Index		ASTM D542	n/a	n/a	n/a
Solar Transmission	%	ASTM E424	n/a	n/a	n/a
Haze (2 mil (50 μm) film)	%		n/a	n/a	n/a
Product Offering					
Width	inches (mm)		Up to 60 (1,524)		50 (1270)
Thickness	mils (μm)		0.5 - 10 (12.5 - 250)		20 & 30 (500 & 750)
Standard Colors			Clear	Clear Tinted	Clear
Surface Treatments Available					
Chemical Etching			•		•
Plasma Treatment			•		
Applications, Markets					
Composite Molding Process: Release Films					
Chemical Process / Equipment			•		•
Heat Sealing / Welding / Melt Adhesive				•	
Electrical / Electronics			•		•
Medical			•		•
Optical /Photovoltaics					
Protective/Decorative					

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High-Performance Extruded Films - ETFE

			ETFE PG	ETFE MR
General Properties	Units	Test Method		
Specific Gravity		ASTM D792	1.74	
Area Yield	ft ² /lb/mil (m ² /kg/25μ)		110 (22.6)	
Flammability		UL-94	V-0	
Water Absorption	%		<0.03	
Mechanical Properties				
Tensile Strength	psi (MPa)	ASTM D882	7,000 (48)	
Elongation at Break	%	ASTM D882	300	
Tensile Modulus	psi (MPa)	ASTM D882	140,000 (965)	
Initial Tear Strength (2 mil film)	g	ASTM D1004	500	
Propagation Tear Strength (2 mil film)	g	ASTM D1922	75	
Folding Endurance (MIT)	cycles, ave.	ASTM D2176	>50,000	
Thermal Properties				
Continuous Use Temp	°F (°C)	UL-746 B	330 (165)	
Melt Point	°F (°C)	ASTM D3418	500 (260)	
Coeff. of Lin. Thermal Expansion	in/(in °F)	ASTM D696	4x10 ⁻⁵	
Electrical Properties				
Dielectric Strength (1mil film)	volts / mil (kV/mm)	ASTM D149	5,500 (215)	n/a
Dielectric Contant 1kHz		ASTM D150	2.6	n/a
Dissipation Factor, 1kHz		ASTM D150	<0.0008	n/a
Optical Properties				
Refractive Index		ASTM D542	1.4	n/a
Solar Transmission	%	ASTM E424	90	n/a
Product Offering				
Width	inches (mm)		Up to 62" (1,575)	
Thickness	mils (μm)		0.5 - 10 (12.5 - 250)	
Standard Colors			Clear	Blue, Red
Surface Treatments Available				
Chemical Etching			•	
Plasma Treatment			•	
Applications, Markets				
Composite Molding Process: Release Films				•
Chemical Process / Equipment			•	
Heat Sealing / Welding / Melt Adhesive			•	
Electrical / Electronics			•	
Medical			•	
Optical /Photovoltaics			•	
Protective/Decorative			•	

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High-Performance Extruded Films - PVDF

			PVDF KF	PVDF 740
General Properties	Units	Test Method		
Specific Gravity		ASTM D792	1.78	1.78
Area Yield	ft ² /lb/mil		108	108
Area Yield	m ² /kg/25μm		22.2	22.2
Flammability		UL-94	V-0	V-0
Water Absorption	%		<0.04	0.01 - 0.03
Mechanical Properties				
Tensile Strength	psi (MPa)	ASTM D882	5000 - 7000 (35 - 48)	5000 - 8000 (35 - 55)
Elongation at Break	%	ASTM D882	250	20- 100
Tensile Modulus	psi (MPa)	ASTM D882	100,000 - 170,000 (689 - 1172)	200,000 - 335,000 (1400 - 2300)
Folding Endurance (MIT)	cycles, ave.	ASTM D2176	>25,000	>25,000
Thermal Properties				
Continuous Use Temp	°F (°C)	UL-746 B	300 (155)	300 (155)
Melt Point	°F (°C)	ASTM D3418	322—334 (161 - 168)	330-340 (165-170)
Coeff. of Lin. Thermal Expansion	in/(in °F)	ASTM D696	7x10 ⁻⁵	7x10 ⁻⁵
Electrical Properties				
Dielectric Strength (1mil film)	v/mil	ASTM D149	1,300 - 1,500	1,700
Dielectric Contant D150/100MHz- 100 Hz		ASTM D150	3.2 - 10.2	4.5 - 9.5
Optical Properties				
Refractive Index		ASTM D542	1.4	1.4
Solar Transmission	%	ASTM E424	90	90
Product Offering				
Width	inches (mm)		up to 60 (1,524)	up to 60 (1,524)
Thickness	mils (μm)		3 - 10 (75 - 250)	1 - 10 (25 - 250)
Standard Colors			Clear	Clear
Surface Treatments Available				
Chemical Etching			•	•
Plasma Treatment			•	•
Applications, Markets				
Chemical Process			•	•
Electrical / Electronics			•	•
Medical			•	•
Optical /Photovoltaics			•	•
Protective/Decorative			•	•

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High-Performance Extruded Films - ECTFE

			ECTFE 500 LC	ECTFE 700 HC
General Properties	Units	Test Method		
Specific Gravity		ASTM D792	1.68	1.70
Area Yield	ft ² /lb/mil (m ² /kg/25mμ)		115 (23.5)	114 (23.3)
Flammability		UL-94	V-0	
Water Absorption	%		<0.01	
Mechanical Properties				
Tensile Strength	psi	ASTM D882	6,500	5,800
Elongation at Break	%	ASTM D882	300	
Tensile Modulus	psi	ASTM D882	200,000	190,000
Initial Tear Strength (2 mil film)	g	ASTM D1004	500	420
Propagation Tear Strength (2 mil film)	g	ASTM D1922	1200	n/a
Folding Endurance (MIT)	cycles, ave.	ASTM D2176	>250,000	n/a
Thermal Properties				
Continuous Use Temp	°F (°C)	UL-746 B	330 (165)	300 (150)
Melt Point	°F (°C)	ASTM D3418	465 (240)	392 (200)
Coeff. of Lin. Thermal Expansion	in/(in °F)	ASTM D696	9x10 ⁻⁵	
Electrical Properties				
Dielectric Strength (1 mil film)	volts / mil (kV/mm)	ASTM D149	5,500 (215)	
Dielectric Contant 1kHz		ASTM D150	2.6	
Optical Properties				
Refractive Index		ASTM D542	1.4	n/a
Solar Transmission	%	ASTM E424	90	95
Haze (2 mil (50 μm) film)	%		4.0	0.9
Product Offering				
Width	inches (mm)		Up to 60" (1,524)	Up to 61" (1,550)
Thickness	mils (μm)		1- 10 (25 - 250)	5, 10 (250, 500)
Standard Colors			Clear	
Surface Treatments Available				
Chemical Etching			•	
Plasma Treatment			•	•
Applications, Markets				
Composite Molding Process: Release Films			•	
Chemical Process / Equipment			•	•
Medical			•	
Optical /Photovoltaics			•	•
Protective/Decorative			•	•

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TCI

PTFE Cast Film

			PTFE Cast Film		PTFE Cast Film Thermobondable		PTFE MR		PTFE VB
			CF	CF LE Bondable	CF/P	CF/F	CF 100	CF 200	CF 300 LE
General Properties	Units	Test Method							
Specific Gravity		ASTM D792	2.15						
Area Yield	ft ² /lb/mil (m ² /kg)		90 (18.3)				45 (9.2)	30 (6.1)	
Flammability		UL-94	V-0						
Water Absorption	%		<0.01						
Mechanical Properties									
Tensile Strength	psi	ASTM D882	4,500	4,300	4,800		4,500		4,300
Elongation at Break	%	ASTM D882	400						
Tensile Modulus	psi	ASTM D882	55,000						
Initial Tear Strength (2 mil film)	g	ASTM D1004	500						
Thermal Properties									
Continuous Use Temp	°F (°C)	UL-746 B	600 (316)	500 (260)			600 (316)		500 (260)
Melt Point	°F (°C)	ASTM D3418	620 (327)						
Coeff. of Lin. Thermal Expansion	in/(in °F)	ASTM D696	5.5x10 ⁻⁵						
Electrical Properties									
Dielectric Strength (1mil film)	volts / mil	ASTM D149	4,200				n/a	n/a	n/a
Dielectric Contant 1kHz		ASTM D150	2.0				n/a	n/a	n/a
Surface Resistivity	ohm/sq	ASTM D257	1x10 ¹⁸				n/a	n/a	n/a
Product Offering									
Width	inches (mm)		1" - 60" (25 - 1524)						50" (1,270)
Thickness	mils (µm)		1 - 5 (25 - 125)				1 (25)	2 (50)	3 (75)
Standard Colors			Red, blue, white, yellow, tan				Red, blue, white		Yellow
Surface Treatments Available									
Chemical Etching			•						
Bondable Surface				•	•	•			•
Applications, Markets									
Aerospace / Release or Bagging Films							•	•	•
Chemical Process / Equipment			•	•	•	•			
Electrical / Electronics			•	•	•	•			
Medical			•	•	•	•			

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100% PTFE CrossFilm™

			CrossFilm™
General Properties	Units	Test Method	
Specific Gravity		ASTM D792	2.15
Flammability		UL-94	V-0
Water Absorption	%		<0.3
Mechanical Properties			
Tensile Strength	lbs/inch (N/50 mm)		12 (105) - 230 (2000)
Tear Strength	Lbs (N)		11 (49) - 175 (780)
Elongation at Break	%	ASTM D882	400
Thermal Properties			
Continuous Use Temp	°F (°C)	UL-746 B	600 (316)
Melt Point	°F (°C)	ASTM D3418	620 (327)
Electrical Properties			
Dielectric Constant 1kHz		ASTM D150	1.8 Nominal
Product Offering			
Width	inches (mm)		60" (1524)
Overall Weight	oz/yd ² (g/m ²)		4.0 (136) - 120 (4069)
Thickness	Inches (mm)		0.002 (0.05) - 0.060 (1.5)
Standard Colors			Black, Blue, Gray, Green, and Red
Applications, Markets			
Chemical Process			•
Fabric Expansion Joints			•
Insulation Jacketing			•
Floating Roof Seals & Wipers Seals			•
Flexible Ducting			•
Geomembranes & Tank			•
Belting, Conveying and Food Processing			•
Radome Covers			•

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