

NORTON[®]

High-Performance Films

A Saint-Gobain Brand



Norton[®]

Chemfilm[®]

FluoroLam[®]

FluoroLease[®]



Saint-Gobain Performance Plastics Specialty and High-Performance Films

		NORTON® HIGH-PERFORMANCE EXTRUDED FILMS								
		Product Type	PFA	FEP	ECTFE	ETFE	PVDF	FluoroLease®	FluoroLam®	
		Film Grades	Gen.WF	FG,RF,WF				A, E	A	T
GENERAL PROPERTIES	Units	Test Method								
Specific Gravity		ASTM D792	2.15	2.15	1.68	1.70-1.76	1.78	1.42	1.57	1.55
Area Yield	ft ² /lb/mil		90	90	115	110	108	136	122	124
Flammability		UL-94	V-0	V-0	V-0	V-0	V-0	—	—	—
Water Absorption	%		<0.01	<0.01	<0.01	<0.03	<0.04	—	—	—
MECHANICAL PROPERTIES										
Tensile Strength	psi	ASTM D882	2,250	3,500	8,000	7,000	5,000	3,500	5,800	4,000
Elongation @ Break	%	ASTM D882	300	300	250	300	100-250	350	450	350
Tensile Modulus	psi	ASTM D882	70,000	70,000	200,000	140,000	360,000	20,000	—	—
Initial Tear Strength	g/mil	ASTM D1004	250	225-275	450	—	—	320	—	—
Propagation Tear Strength	g/mil	ASTM D1922	125-135	145-150	>1,200	295	—	—	—	—
THERMAL PROPERTIES										
Continuous Use Temperature (20,000 hrs)	°F (°C)	UL-746 B	500 (260)	400 (205)	340 (170)	330 (165)	265 (130)	375 (190)	265 (130)	265 (130)
Melt Point (typical)	°F (°C)	ASTM D3418	580 (305)	500 (260)	465 (240)	500 (260)	345 (174)	—	—	—
Coeff. Of Lin. Thermal Expansion	in/(in°F)	ASTM D696	5.5x10 ⁻⁵	5.5x10 ⁻⁵	9x10 ⁻⁵	4x10 ⁻⁵	7.0x10 ⁻⁵	5.5x10 ⁻⁵	—	—
ELECTRICAL PROPERTIES										
Dielectric Strength	volts / mil	ASTM D149	4,700	6,000	5,500	5,500	4,000	—	5,400	4,600
Dielectric Constant, 1 kHz		ASTM D150	2.1	2.1	2.6	2.6	8.2	—	—	—
Dissipation Factor, 1 kHz		ASTM D150	0.0005	0.0003	<0.005	<0.0008	0.005-0.02	—	—	—
Surface Resistivity	ohm/sq	ASTM D257	1x10 ¹⁵	1x10 ¹⁵	—	1x10 ¹⁴	1x10 ¹⁴	—	—	—
OPTICAL PROPERTIES										
Refractive Index		ASTM D542	1.35	1.35	1.4	1.4	1.4	—	—	—
Solar Transmission	%	ASTM E424	96	96	—	90	—	—	84	84
CHEMICAL RESISTANCE (RELATIVE, 1=HIGHEST)										
			1	1	2	3	3	1	3	3
PRODUCT OFFERING										
Width	inches		0.5–10 mil — 1"-60" 10–30 mil — .5"-48"					1"–60"	1"–60"	1"–60"
Thickness	mils		0.5–30	0.5–30	0.5–10	0.5–20	0.5–10	1–5	0.8–5	0.8–5
Standard Colors <small>(Custom colors available upon request, minimum order applies)</small>			Clear	Clear, White, Red	Natural, White, Blue	Clear, Blue	Natural	Red, Natural	Clear, White	Clear, White
SURFACE TREATMENTS AVAILABLE										
C-Treatment (cementable, 1 or 2 sides)			•	•	•	•	•	•	•	•
Corona Treatment (1 or 2 sides)										
Chemical Etching (1 or 2 sides)			•	•	•	•				
APPLICATIONS										
Aerospace/Release or Bagging Films			•	•	•	•		•		
Chemical Process			•	•	•	•	•		•	•
Electrical/Electronics			•	•	•	•	•	•	•	•
Medical			•	•		•				
Optical/Photovoltaics						•			•	•
Protective/Decorative			•	•		•	•		•	•

CHEMFILM® FLUOROPOLYMER CAST FILMS									SKIVED FILMS AND SHEET	
Polyimide	PMP	MR	VB	DF100/C&CD	DF1100	DF1400&DF1471	DF1700&DF1900	DF2919/DF2929	PTFE T-100	UHMW PE
TH-025						Conductive		Polyimide Core	Virgin Film	
1.46	0.835	2.15	2.15	2.15	2.15	2.15	2.15	1.7 / 1.6	2.15	0.93–1.00
136	230	90	90	90	90	90	90	54 / 39	90	200
V-0	HB	V-0	V-0	V-0	V-0	V-0	V-0	V-0	V-0	N/A
<2.8	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.25	<0.01	<0.05
34,000	3,200	4,500	4,300	4,300	4,300	4,000	4,300	18,000/21,000	3,000–4,000	5,500
85	180	400	550	400	400	400	400	100	200–300	200–300
425,000	150,000	55,000	55,000	60,000	60,000	60,000	60,000	250,000/350,000	80,000	—
—	—	500	—	—	—	—	—	1,000/1,300	—	—
—	—	—	—	—	—	—	—	—	—	—
455 (235)	320 (160)	500 (260)	500 (260)	500 (260)	500 (260)	500 (260)	500 (260)	500 (260)	500 (260)	200 (93)
716-770 Tg	464 (240)	620 (327)	620 (327)	620 (327)	620 (327)	620 (327)	N/A	N/A	620 (327)	275 (135)
2.5x10 ⁻⁵	6.5x10 ⁻⁵	5.5x10 ⁻⁵	5.5x10 ⁻⁵	5.5x10 ⁻⁵	—	—	—	—	5.0x10 ⁻⁵	11x10 ⁻⁵
7,000	5,000	N/A	N/A	4,200	4,200	4,200 (DF1400 only)	4,200	6,000/5,100	700–3,000	N/A
3.3 @ 1MHz	2.1	N/A	N/A	2.0	2.0	12.0	2.0	2.8	2.1	N/A
0.004 @ 1MHz	—	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.0002	N/A
>1x10 ¹⁶	—	N/A	N/A	9.0x10 ¹⁷	2.0x10 ¹⁷	Conductive	1.0x10 ¹⁸	3.8x10 ¹⁷	N/A	N/A
1.7	1.46	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
—	—	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	5	1	1	1	1	1	1	1	1	5
0.125"–61.8"	1"–60"	48"	50"	DF100 1/8"–38.5" C/CD up to 18"	1"–38.5"	1/8"–18"	1/8"–40"	1/8"–50"	1/4"–60"	1/2"–30"
0.5, 1, 2, 3, 5	1–5	1,2	3	DF100: 1–5 C/CD: 0.17–0.75	1–5	DF1400 2.5 DF1471 1–4	DF1700 0.5–5 DF1400 1–5	2 mil/3 mil	.5–125 mil	2–25 mil
Amber	Natural, Blue, Yellow	Red, White, Natural	Natural, Green	Natural	On Request	Black	On Request	Natural	Natural	On Request
•				•					•	
•	•	•	•						•	
•				•	•	•	•	•	•	
•				•	•				•	
•				•	•	•	•			•



NORTON® Extruded Films

- Based on melt-processable fluoropolymers
- Broadest fluoropolymer film product line on the market
- Up to 62" wide webs, thickness range from 0.0005" to 0.030"
- Manufactured and converted in class 100,000 clean room facility
- Cementable/bondable surface versions available

CHEMFILM® Fluoropolymer Cast Films

- Multi-layer construction
- Inherently void- and pinhole-free; superior dielectric performance
- Superior drape and conformability
- Laser markable
- Individual layers configurable with different polymers and polymer blends
- Up to 58" wide
- Cementable/bondable surface versions available

Skived PTFE and UHMW PE Films and Sheet

- Up to 60" wide webs, thickness range from 0.0005" to 0.125"
- Superior flatness
- Cementable/bondable surface versions available
- Tightest tolerances in the industry

ZITEX® Porous PTFE Membranes

- For venting, diffusion, filtering, and sealing
- 100% PTFE
- High vent rates
- Self-supporting membrane
- Hydrophobic

OPTILINER® and SUPRALINER® Coated Films

- Optical quality coatings
- Silicone, non-silicone and fluorosilicone technologies
- U.V., thermal and 100% solids processing
- Multiple film bases and thicknesses
- Custom formulations
- Manufactured and converted in class 10,000 clean room facility

Saint-Gobain Performance Plastics offers the broadest line of specialty high-performance polymeric films to allow our customers to select the right film for their application requirements. We utilize a full range of polymers — including FEP, PFA, PTFE, ETFE, ECTFE, PVDF and PMP — to deliver the right combination of temperature, chemical and dielectric performance in a variety of key applications.



Chemical Industry

Our products are designed to fulfill many demanding chemical-related applications, such as tank linings, see-through windows, rupture discs, pump diaphragms, and thermoformed packaging.

- Extruded fluoropolymer films FEP, PFA, ETFE, ECTFE, PVDF
- Skived PTFE film and sheet T-100

Electrical/Electronics

A combination of excellent dielectric properties with outstanding temperature and chemical resistance, as well as weldability, make high-performance films perfect candidates for circuit board laminates, high temperature wire wrapping insulation tapes, and primary insulation material for motor coil windings.

- Norton polyimide film (TH Series), polyimide/FEP composites (FH Series) and polyimide/fluoropolymer composites (cast DF2000 series)
- Cast PTFE-based films DF100, DF1100 and 1200, DF1400, DF1700, DF1900
- Unsintered extruded PTFE tapes R128 and R129, and expanded PTFE R167 series

Release Films/Parting Materials

Covering the broadest range of service temperatures from 160°C (320°F) to 260°C (500°F), the family of release films fulfill all the processing requirements of structural composite components for the aerospace industry, as well as printed and flexible circuit board processing. Norton® polyimide film is used as a high temperature bagging film for autoclave processing of composites.

Available in thicknesses as low as 0.0005" and widths up to 60".

- Extruded FEP, ETFE, ECTFE and PMP release films
- Cast PTFE MR release film
- FluoroLease® A
- Norton® polyimide

Protective/Decorative

This complete line of fluoropolymer products offers the highest levels of UV and chemical protection. Utilizing various surface modification technologies, products are available in bondable (cementable) form that allows end users to laminate/bond films with a multitude of substrates to combine the high performance of fluoropolymers with virtually any material of their choice.

- Extruded FEP, PFA, ETFE, ECTFE and PVDF films

Emerging Technologies

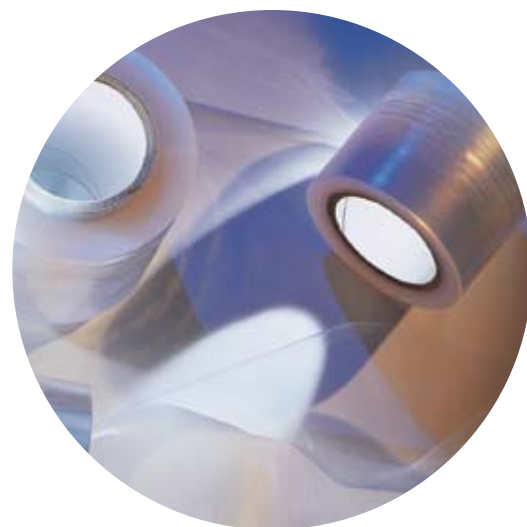
Saint-Gobain is the global pioneer in the development of multi-layer film technologies. Beginning with CHEMFILM®, the world's first multi-layer fluoropolymer product, our technologists have now achieved this accomplishment in melt-processable fluoropolymers. Our proprietary technology allows us to combine new groups of materials to achieve greater levels of performance. Our goal is simple—deliver the performance you need, where you need it, at a great value.

FluoroLease® Multi-Layer Release Film
FluoroLease® is the new multi-layer release film that matches the performance and release characteristics of FEP, while outperforming conventional

FEP in drapability and conformability, and providing 50% higher area yield (1-mil film). It is recommended for autoclave cures with all resin systems and cure cycles up to 375°F and has been demonstrated effective in cure temperatures to 232°C (450°F) and post cures to 260°C (500°F).

FluoroLam® Protective Film is a new product technology that meets the needs of protective/decorative applications. This product technology can offer outstanding chemical resistance, PSA-free adhesion, and long life weatherability for outdoor exposure, depending upon the needs of the application. The unique materials and processes employed in the manufacture of this product deliver state-of-the-art elongation for excellent thermoformability in emerging market applications.

Ask your SGPPL sales representative how our material expertise can help you unlock profits from your operation.





PERFORMANCE PLASTICS

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**NORTON[®] CHEMFILM[®] Fluoropolymer
Cast Film SKIVED PTFE and
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