



High Performance Films

DuPont PFA

fluorocarbon film

Types LP and CLP

Introduction

These specifications cover PFA fluorocarbon film sold by DuPont Films.

Where maximum and/or minimum tolerances are given, these represent limiting conditions approached by only a small portion of the film. A majority of the film will have properties falling within a range narrower than that specified.

Current product availability is shown in **Table 1**.

Manufacturing

Material

Copolymer of tetrafluoroethylene and perfluoroalkoxy resin in the form of a film.

Color

The color of the film is uniform and ranges from clear to translucent depending on the thickness.

Defects

The material shall be uniform in appearance and shall be sufficiently free of contamination, wrinkles, holes, scratches, and other imperfections so as to be functionally acceptable.

Cores

Shall be of sufficient strength to prevent collapsing on handling. Sizes 3 in (76.2 mm) or 6 in (152.4 mm) I.D. should be specified on orders.

Order Tolerance

The tolerance for under or overrun on windup is $\pm 10\%$.

Splices

Description

Splices for all gauges are butt type and are made with yellow pressure-sensitive tape. One strip is applied to

each side of the splice and shall be 2 in (50.8 mm) wide for 200 gauge and above and 1 in (25.4 mm) wide for below 200 gauge.

Thickness and Coverage

The average thickness is determined by measurement of the average weight of the film. The average unit weight will meet the specifications as shown in **Table 2**, Section A. In addition, no single point will fall outside the minimum and maximum thickness as shown in **Table 2**, Section B. Point thickness is determined through at least ten measurements across the width of the film in accordance with ASTM D-374 Method A or C.

Frequency

See **Table 3**.

Width

The maximum variation in film width from that required on the order varies with the gauge and width of film and is shown in **Table 4**.

General

Packaging

PFA film is wound on 3 in (76.2 mm) or 6 in (152.4 mm) cores and is overwrapped in polyethylene. The film is then boxed to prevent loss of contents or damage during shipment. Each container is labeled with DuPont and customer's name, purchase order number, film thickness, type, mill roll number, and shipping date. A label containing similar information is also affixed to the core for roll widths $2\frac{1}{8}$ in (54 mm) and above; for rolls less than $2\frac{1}{8}$ in (54 mm) wide, the core label is in the package.

Assurance

Statistical sampling techniques are used to ensure specified properties in the following tables are met.

Table 1
Availability of DuPont PFA Fluorocarbon Film

Type	Gauge										
	50	100	200	500	750	1000	2000	3000	6000	9000	12500
LP	*	*	*	*	*	*	*	*	*	*	*
CLP	—	*	*	—	—	—	—	—	—	—	—

*Available

Note: Specifications apply to gauges and type available as indicated.

Table 2
Maximum Allowable Splices/Roll
Types: LP and CLP

Gauge	Put-Up						
	O.D., in						
	3-in Cores				6-in Cores		
	6	<7½	7½	9½	<9½	9½	11
50	—	—	—	—	3	4	7
100	2	2	3	4	2	3	4
200	1	1	2	3	1	2	3
500	1	1	2	3	1	2	3
750	1	1	2	3	1	1	3
1000	—	—	—	—	1	1	3
2000	—	—	—	—	1	1	2
3000	—	—	—	—	1	1	2
6000	—	—	—	—	1	1	2
9000	—	—	—	—	1	1	2
12500	—	—	—	—	1	1	2

Table 4
Roll Width Tolerance, in

Gauge	Web Width, in
	All Standard Web Widths, in
50 through 2000	± ¹ / ₁₆
Over 2000	± ¹ / ₈

Note: Variation in film width shall not exceed these limits.

Note: Minimum distance between the end of the splice and the end or start of a slit roll shall not be less than 100 ft for film 500 gauge and under, 60 ft for 1000LP, 50 ft for 2000LP and 3000LP, 30 ft for 6000LP, and 14 ft for 9000LP.

Table 3
DuPont PFA Fluorocarbon Film Thickness Tolerance
Types: LP and CLP

Nominal Gauge	Nominal Thickness, in	A				B		C		
		Average Thickness Unit Weight, g/m ²				Single Point Thickness*		Area Factor, ft ² /lb		
		Nom.	Min.	Max.	% Var.	Min.	Max.	Nom.	Min.	Max.
50	0.0005	27.28	24.55	30.01	±10	0.00035	0.00065	178.97	162.70	198.87
100	0.0010	54.56	49.10	60.02	±10	0.00070	0.00130	89.49	81.35	99.43
200	0.0020	109.12	98.20	120.03	±10	0.00150	0.00250	44.74	40.67	49.72
500	0.0050	272.80	245.52	300.08	±10	0.0040	0.0060	17.90	16.27	19.90
750	0.0075	409.20	400.40	418.00	±10	0.0055	0.0085	12.43	12.20	14.92
1000	0.0100	545.60	491.04	600.16	±10	0.0085	0.0115	8.95	8.13	9.94
2000	0.0200	1091.20	982.08	1200.32	±10	0.0170	0.0230	4.47	4.06	4.96
3000	0.0300	1636.80	1565.60	1710.00	±10	0.0260	0.0340	2.98	2.71	3.31
6000	0.0600	3273.60	2946.24	3600.24	±10	0.0540	0.0660	1.49	1.35	1.66
9000	0.0900	4910.40	4419.36	5401.44	±10	0.0810	0.0990	0.99	0.90	1.10
12500	0.1250	6820.00	6480.00	7160.00	±10	0.1350	0.1100	0.71	0.65	0.79

Note: Determined by using lowest and highest thickness readings of ten measurements across the film per ASTM D-374 Method A or C.

**Table 5
Property Value, Types LP and CLP**

Property	Film Gauge											Method
	50	100	200	500	750	1000	2000	3000	6000	9000	12500	
Dielectric Strength, V/mil, AC	3000	3000	2700	1800	1600	1400	1000	NS	NS	NS	NS	Average of ten samples tested per ASTM D-149 Method A. Flat sheets in air placed between 1/4 in diameter brass electrodes with 1/32 in edge radius and subjected to 60 Hz AC voltage rise at 500 V/sec to the breakdown voltage.
Dielectric Constant (at 25°C, 1000 Hz), Max.	2.15											ASTM D-150. Result is average of five tests using measured sample thickness.
Dissipation Factor (at 25°C, 1000 Hz), Max.	0.0005											ASTM D-150, same as above.
Volume Resistivity, ohm-cm at 23°C, Min.	1 × 10 ¹⁶											ASTM D-257.
Surface Resistivity, ohm (per sq.) at 23°C, 38% RH, Min.	1 × 10 ¹⁵											ASTM D-257.

NS = No Specification

**Table 6
Property Value, Types LP and CLP**

Property	Film Gauge											Method										
	50	100	200	500	750	1000	2000	3000	6000	9000	12500											
Tensile Strength, psi, 25°C, Min.	2000	2000	2200	2200	2200	2200	2500	2500	2500	2500	2500	ASTM D-882 for ≤10 mil thickness. ASTM D-638 for >10 mil thickness, 2 in/min testing speed.										
Elongation at Break, %, Min.	150	150	200	250	250	250	250	250	250	250	250	Same as above method.										
Shrinkage, %, Max. at 200°C	Average of five measurements on room temperature samples before and after each test. Each specimen, 4 in × 4 in freely suspended in an oven controlled to 200°C ±1°C. Exposure time 0.5 hr.																					
MD												±5	±5	±3	±3	±3	±2	±2	±2	±2	±2	±2
TD												±5	±5	±3	±3	±3	±2	±2	±2	±2	±2	±2
Tear Strength, g/mil, Min.	15	15	20	25	25	40	40	—	—	—	—	Elmendorf ASTM D-1922.										
Cementability (Type CLP film only), Min. peel strength in g/in of width	—	300	750	1500	—	—	—	—	—	—	—	Use DuPont adhesive #68040 on Aldine #1200 aluminum sheet (0.019 in thickness). Peel Test at 180° angle at peel rate 12 in/min.										
Melt Temperature, Melting Endotherm Peak, °C	300–310											ASTM D-3307 (DTA).										
Density, g/cm ³ , 23°C	2.12–2.18											ASTM D-1505.										

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