

DuPont™ Kapton® PST

POLYIMIDE FILM

INDUSTRY SPECIFICATIONS BULLETIN PST-00-1

Physical Properties of Kapton® 100 PST Film

Physical Property	Typical value at	
	23°C	200°C
Ultimate Tensile Strength, MPa (psi)	252 (36,500)	139 (20,000)
Yield Point at 3%, MPa (psi)	69 (10,000)	41 (6,000)
Ultimate Elongation, %	72	83
Tensile Modulus, GPa (psi)	2.5 (370,000)	2.0 (290,000)
Tear Strength—Propagating (Elmendorf), N (lbf)	0.07 (0.02)	
Tear Strength—Initial (Graves), N (lbf)	7.2 (1.6)	

Introduction

These specifications include the values and tolerances for Kapton® PST film properties and the characteristics known to be of significance to coaters, laminators and manufacturers of pressure sensitive adhesive tape.

Any aspects of the specifications that require further interpretation or clarification should be discussed with representatives of DuPont High Performance Materials.

Kapton® PST Film

Kapton® PST is a tough film that exhibits an excellent balance of physical, chemical and electrical properties over a wide temperature range, particularly at unusually high temperatures. The film is available in 50, 100, 200, 300 and 500 gages.

Manufacturing

Material

Kapton® PST film is synthesized by a polycondensation reaction between an aromatic dianhydride and an aromatic diamine.

Uniformity

Material shall be uniform in composition, free of visual continuous surface scratches, and free of defects such as wrinkles, MD ridges, stretched lanes, holes, and particulate contamination that would prevent the user from producing acceptable quality products. The material will be processed in machines equipped with static eliminators to assure that the material will have less than 5,000 volts static charge. Roll telescoping will not exceed 1/16" (1.6 mm).

Cores

Roll cores shall be of sufficient strength to prevent collapsing from handling. The standard core internal diameters are nominally 3" and 6" (76 and 152 mm) with the following specifications:

3" I.D.	= 3.032" ± 0.008" (77.01 ± 0.20 mm)
6" I.D.	= 6.028" ± 0.015" (153.11 ± 0.40 mm)

The standard core material will be fiber. Other core material options, such as plastic, are available on request.

Width Tolerance

The maximum variation in film width from that specified on the order shall be as follows:

Slit Width Range	Tolerance
1" (25 mm) or less	±15 mil (±0.40 mm)
1 1/16" to 4" (27 to 102 mm)	±30 mil (±0.80 mm)
4 1/16" (103 mm) and wider	±60 mil (±1.50 mm)



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Length Tolerance

The nominal roll length is specified in **Table 1**. The actual measured roll length will be supplied on the core label of rolls that are 9" (229 mm) or wider. Lengths ordered in footage will be supplied to a tolerance of -0, +7% of footage ordered.

Pad Put-Ups

Available film widths and roll diameters are specified in **Table 1**. Larger put-ups of 6" x 18" (152 x 457 mm) are available on request.

Pad Roll Specifications

1. Core width will be the film width -0, +1/8" (3.2 mm)
2. Core edges shall not project more than 1/16" (1.6 mm) beyond the roll face on either side.
3. Core shall not be recessed on either side.
4. The outside and starting ends of the film shall be fastened in a manner to prevent unwinding.
5. "Dishing" or "cupping" may not exceed 1/16" (1.6 mm), measured with a straight edge across the diameter of the roll.

Table 1.

Type	Film thickness, mil (µm)	Width Range		Size, I.D. x O.D. — in (mm)					Area Factor ft ² /lb (m ² /kg)
		in (mm)		3 x 6	3 x 9.5	6 x 9.5	6 x 11	6 x 14	
		Min.	Max.	(76 x 152)	(76 x 241)	(152 x 241)	(152 x 279)	(152 x 356)	
50PST	0.5 (13)	3/16 (5)	52 (1321)	3100 (945)	— 00	5800 (1768)	—	—	272 (55.6)
100PST	1.0 (25)	7/8 (22)	60 (1524)	—	5100 (1554)	—	5100 (1554)	—	136 (27.8)
200PST	2.0 (51)	7/8 (22)	60 (1524)	—	2550 (777)	—	2550 (777)	5000 (1524)	68 (13.9)
300PST	3.0 (76)	7/8 (22)	60 (1524)	—	1700 (518)	—	1700 (518)	3400 (1036)	45 (9.2)
500PST	5.0 (127)	7/8 (22)	60 (1524)	—	1000 (305)	—	1000 (305)	2020 (616)	27 (5.5)

Splices

Description

All film gauges are joined with a standard butt splice, with the butt edges covered on both sides with a Kapton® film based pressure sensitive adhesive tape. 2" wide splicing tape is used for all film gauges.

Splice Placement

Splice tape will be centered on the joint to 1/4" (+6 mm). It will be smooth and wrinkle-free to avoid distortion of the adjacent film layers in the roll.

Table 2 shows the maximum number of splices per roll. It also shows the minimum length between splices and from the beginning and the end of a roll.

Table 2.

Core I.D. in (mm)	Roll O.D. in (mm)	Maximum Number of Splices per Roll					Minimum Length Between Splices or the Beginning and End of a Roll—ft (m)				
		50PST	100PST	200PST	300PST	500PST	50PST	100PST	200PST	300PST	500PST
3 (76)	6 (152)	5	—	—	—	—	100 (30)	—	—	—	—
6 (152)	9.5 (241)	10	—	—	—	—	100 (30)	—	—	—	—
3 (76)	9.5 (241)	—	6	4	3	3	—	100 (30)	100 (30)	100 (30)	75 (23)
6 (152)	11 (279)	—	6	4	3	3	—	100 (30)	100 (30)	100 (30)	75 (23)
6 (152)	14 (356)	—	10	7	5	5	—	100 (30)	100 (30)	100 (30)	75 (23)

Packaging and Marking

Packaging

Material shall be adequately packed to prevent loss of contents or damage during shipment. All film will be wrapped with a non-fibrous material.

Extra Core Label

An extra core label with the actual roll length shall be placed on the outside of the shipping container for roll widths of 9" (229 mm) and wider.

Marking

Material is identified as shown in **Table 3** to allow complete traceability to the raw materials and processing conditions:

Table 3. Package Marking

	Shipping Container	Package	Core Label*
Scheduled Date	x	x	x
Customer Order Number	x	x	x***
DuPont Order Number	x	x	x
Gauge	x	x	x
Type	x	x	x
Width	x	x	x
Number of Rolls per Container	x	x	
Net Weight	x	x	
Actual Footage			x
Batch Number	x	x	x
I.D. and O.D.**	x	x	

* Affixed to the core on all cores 2.25" (57 mm) wide and over.
Included with the package on all cores less than 2.25" (57 mm) wide.

** Inside diameter of core and nominal outside diameter of roll.

*** Available for up to 12 characters.

Table 4. General Properties

Property	Film Type					Method
	50PST	100PST	200PST	300PST	500PST	
Average Thickness Unit Weight, gram/m ²						Weigh test specimens equal to the width of slit roll and not less than 0.5 meters long to the nearest 0.10 gram on a torsion balance. To confirm average thickness tolerances, obtain a sample consisting of a minimum of one specimen from each of several randomly selected slit rolls as follows: Slit Roll Width Under 6" (152 mm) Minimum No. of Slit Rolls to be Sampled 6" (152 mm) and over 25 ÷ s.r width (in inches) Four
Minimum	14.0	33.0	68.1	102.1	169.5	
Maximum	26.0	35.0	74.2	115.2	192.5	
Single Point Thickness, mil (µm)						Measure in accordance with ASTM D-374-79, Method A or C. Obtain the average of 10 randomly selected readings from a minimum area of 12 in ² (77 cm ²). Recheck before rejecting any slit roll. Abnormal readings may occasionally result from dust particles or spot surface imperfections. Discard such readings as they will adversely affect the accuracy of measurements designed to indicate general sheet thickness.
Minimum	0.35 (8.9)	0.90 (22.5)	1.85 (46.2)	2.72 (69.0)	4.65 (118.1)	
Maximum	0.65 (16.5)	1.05 (26.2)	2.15 (53.7)	3.28 (83.3)	5.35 (135.9)	

Table 5. Mechanical Properties

Property	Film Type					Method
	50PST	100PST	200PST	300PST	500PST	
Tensile Strength, psi (MPa), at 23°C. Machine Direction (MD) and Transverse Direction (TD) Minimum	26,000 (138)	30,000 (165)	30,000 (165)	30,000 (165)	30,000 (165)	ASTM D-882-81, Method A using an Instron Tensile Tester (specimen size: ½" x 6" [12.7 x 152 mm], jaw separation: 4" [102 mm], jaw speed: 2"/min [51 mm]). Calculate the average of 5 specimens based on original measured thickness.
Elongation, % MD and TD Minimum	50	60	60	65	65	Same as above.
Shrinkage, % MD and TD at 400°C Maximum	2.0	2.0	2.0	2.0	2.0	MIL-P-46112B (MR). The percent shrinkage is obtained for either the MD or TD by using the average of three measurements in either direction before and after conditioning. Prior to measurement the 8½" x 11" (216 x 279 mm) specimen is conditioned by freely suspending for 2 hr in an oven controlled to 400°C ± 2°C.
Moisture absorption, % Maximum	4.0	4.0	4.0	4.0	4.0	ASTM D-570-81, using 24 hr immersion at 23°C. Average of 3 specimens.

Table 6. Electrical Properties

Property	Film Type					Method
	50PST	100PST	200PST	300PST	500PST	
Dielectric Strength, AC volt/mil (kV/mm) Minimum	6,000 (118)	6,700 (236)	5,300 (197)	4,800 (177)	3,500 (118)	ASTM D-149-81. (Average of 10 specimens). Flat sheets in air placed between ½" (6 mm) diameter brass electrodes with 1/32" (0.8 mm) edge radius subjected to 60 cycles AC voltage at 500 volt/sec rate of rise to the breakdown voltage.
Volume Resistivity, Ω-cm at 200°C Minimum	10 ¹²	10 ¹²	10 ¹²	10 ¹²	10 ¹²	ASTM D-257-78.
Dielectric Constant at 1 kHz Maximum	4.0	3.9	3.9	3.9	3.9	ASTM D-150-81. Use conducting silver paint electrodes, two terminal system of measurement at standard conditions. Results are based on an average of 5 tests using measured thickness of specimens.
Dissipation Factor at 1 kHz Maximum	0.0050	0.0036	0.0036	0.0036	0.0036	Same as above.

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