



Tedlar® SP

polyvinyl fluoride film

Product and Properties Guide

General

Tedlar® SP polyvinyl fluoride film is designed to provide excellent conformability to substrates while maintaining the superb durability, color stability, chemical resistance, and ease of cleaning expected of PVF film. *Tedlar*® SP also offers custom color capability not previously available in PVF film.

Tedlar® SP is an unoriented film. It possesses high elongation and moderate yield stress. After lamination using conventional means, it can be easily embossed and will maintain high pattern definition. *Tedlar*® SP can also be subjected to high levels of forming without significant recovery stresses.

An outstanding feature of *Tedlar*® SP is its availability as a multilayer film without needing adhesives or heat sealing. The *Tedlar*® SP process allows a pigmented base layer to be covered with an integral clear top layer. The resulting film can be laminated, formed, embossed, or otherwise converted as though it were a monolayer film. The gloss level of the clear layer can be custom-tailored between low- and high-gloss levels to meet the specific needs of the application.

Tedlar® SP provides the same high degree of protection now available with other *Tedlar*® films. Unique properties of *Tedlar*® film include excellent resistance to weathering, outstanding mechanical properties, and inertness towards a wide variety of chemicals, solvents, and staining agents. The surface is easy to clean with normal cleaning agent or solvent. The clear top layer in multilayer films provides exceptional stain and mar resistance because the layer is virtually all polyvinyl fluoride polymer.

Tedlar® SP is uniquely suited to a broad variety of applications, including aircraft interiors, signs, awnings, body side moldings, wallcoverings, architectural panels, and thermoplastic laminates. *Tedlar*® SP can be made in a wide range of colors and thicknesses. Standard aircraft interior and graphic arts colors are available, and custom colors can be developed upon request.

Physical/Thermal Properties

Tedlar® SP film is strong, flexible, and fatigue-resistant. Its resistance to failure by flexing is outstanding. *Tedlar*® SP performs well in temperatures ranging from approximately -73 to 107°C (-100 to 225°F), with intermittent short-term peaking up to 204°C (400°F).

Chemical Properties

Tedlar® SP has excellent resistance to chemicals, solvents, and stains. It retains its strength even when exposed to strong acids and bases. At ordinary temperatures, *Tedlar*® SP is not affected by many classes of common solvents, including hydrocarbons and chlorinated solvents. It is resistant to greases and oils.

Electrical Properties

Properties of interest to the electrical industry include hydrolytic stability, high dielectric strength, and relatively low dielectric constant. The excellent thermal aging properties and chemical resistance of *Tedlar*® SP offer many functional contributions in a wide variety of applications.

Optical Properties

Transparent types of *Tedlar*[®] SP PVF film are essentially transparent to solar radiation in the near-ultraviolet, visible, and near-infrared regions of the spectrum. Ultraviolet-absorbing types of *Tedlar*[®] SP are available for protecting various substrates against ultraviolet light attack.

Weather Resistance

Accelerated weathering tests on *Tedlar*[®] SP have been conducted using a variety of test methods. The weather resistance, inertness, and toughness characteristics allow for broad use as a surface protection for metals, hardboards, felts, or plastics in architectural, decorative, or industrial applications. Pigmented *Tedlar*[®] SP, properly laminated to a variety of substrates, imparts a service life many times that of conventional finishes.

Formability

Tedlar[®] SP PVF film is a versatile industrial film that can be applied over a variety of substrates, including *Nomex*[®] aramid fiber, polycarbonate, vinyl fabric, and aluminum. Formable *Tedlar*[®] SP is manufactured in 0.5, 1.0, and 2.0 mil thicknesses. *Tedlar*[®] SP can be drawn over 3- to 4-in high irregular shapes when sharp edges on the mold surfaces are avoided. It is recommended that film thickness and surface temperature be optimized for the depth of draw and part size. Film-forming surface temperatures from 105 to 171°C (221 to 340°F) provide excellent form shapes. The elapsed time to reach this temperature window is not important. However, it is possible to overheat the film. To avoid part failure by overheating during forming and to minimize part cost, the film or laminate surface temperature should not exceed 171°C (340°F).

Surface Aesthetics

Designers will appreciate the wide range of color and gloss options available with *Tedlar*[®] SP. *Tedlar*[®] SP can be used alone or in accented texture color styling. Low-luster *Tedlar*[®] SP multi-layer film offers specular gloss in the 10–15 range at 85° Gardner scale, offering an excellent surface for silk-screen printing. Medium gloss *Tedlar*[®] SP offers specular gloss in the 30–35 range and is ideally suited to fabric laminates and automotive trim. High gloss *Tedlar*[®] SP ranges from 80–85 and is intended for stripping, lettering, and plastic laminates.

Transparent *Tedlar*[®] SP is also available in high-, medium-, and low-gloss versions. These products can be laminated as a protective cap sheet over printed or silk-screened graphics to lock in their beauty.

Adhesion

Tedlar[®] SP is supplied with different surface characteristics. Films are available as one-side adherable (A), two-side adherable (B), or strippable (S). Adherable surfaces are used with adhesives for bonding to a wide variety of substrates. These surfaces have excellent compatibility with many classes of adhesives, including acrylics, polyesters, epoxies, rubbers, and pressure-sensitive masses. The strippable surface has excellent release properties for use as a mold release agent for epoxies, phenolics, rubbers, and other plastic resins.

Ease of Cleaning

Tedlar[®] SP films exhibit superior stain resistance and ease of cleaning. Laboratory tests confirm that *Tedlar*[®] SP is resistant to staining agents and will not fade or streak even after heavy cleaning.

Abrasion Resistance

Comparative testing of aircraft laminate materials clearly demonstrates superior abrasion resistance of *Tedlar*[®] SP over other commonly used surface materials. This exceptional abrasion resistance makes it possible to replace heavyweight components in many interior applications.

Figure 1. Tedlar® SP Film Shrinkage (30 min at Temperature)

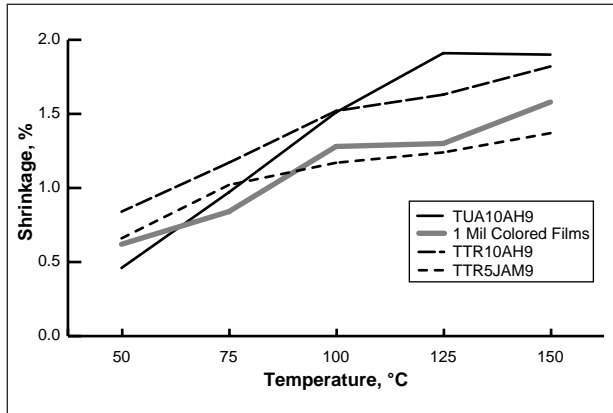


Figure 2. Tedlar® SP Elongation (Clear Films)

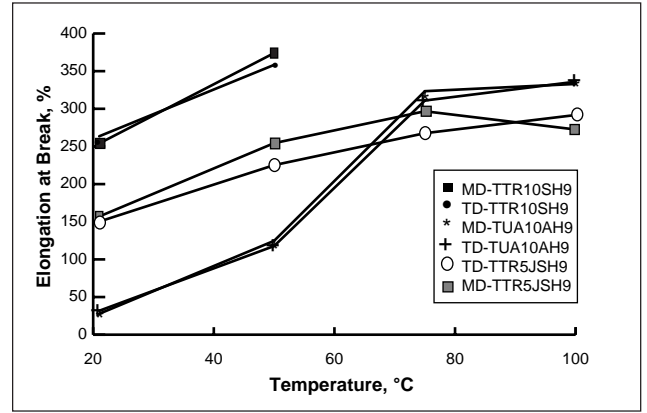


Figure 3. Tedlar® SP Tensile Strength (Clear Films)

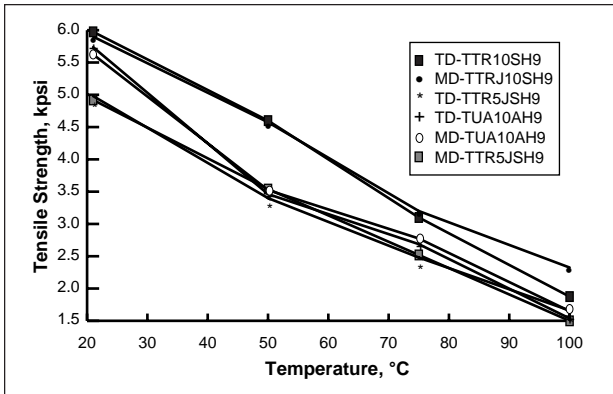


Figure 4. Tedlar® SP Elongation (Colored Films)

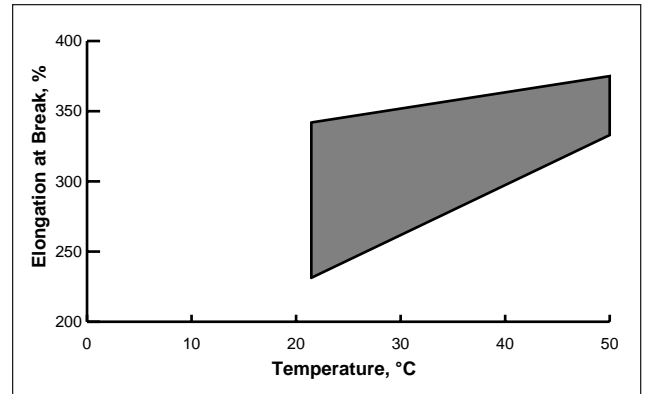


Figure 5. Tedlar® SP Tensile Strength (Colored Films)

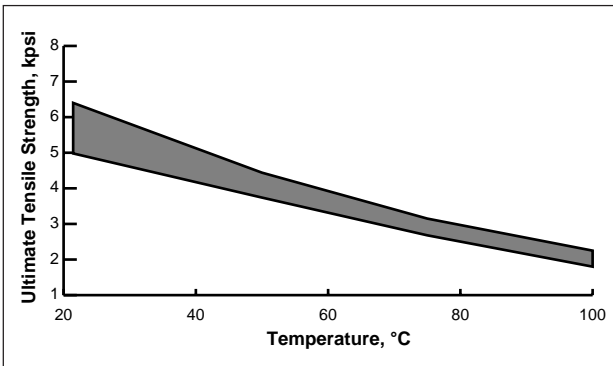


Figure 6. Tedlar® SP UV Screening Film

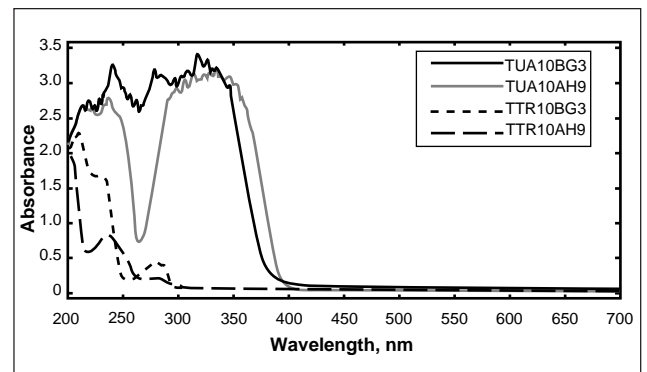


Table 1
Typical Properties of *Tedlar*® SP Polyvinyl Fluoride Film

		Test Method	Units S.I. (English)	0.5 mil Transparent Medium Gloss TTR5JAM9	1.0 mil Transparent High Gloss TTR10AH9	1.0 mil UV Screening High Gloss TUA10AH9	1.0 mil Colored High Gloss TXX10AH9
PHYSICAL	Tensile Strength	ASTM D882-80 Method A-100%	MPa (kpsi)	34 (5)	41 (6)	41 (6)	34 (5)
	Tensile Modulus	ASTM D882-80 Method A-10%	MPa (kpsi)	—	—	—	—
	Elongation—Ultimate	ASTM D882-80	%	175	200	200	100
	Tear Strength, MD	ASTM D1004, Graves	kN/m (g/mil)	550 (212)	550 (212)	550 (212)	550 (212)
	Tear Strength, TD	ASTM D1004, Graves	kN/m (g/mil)	550 (212)	550 (212)	550 (212)	550 (212)
	Unit Weight	ASTM D1505-68	g/m ²	17.5	35	42-46	34-43
	Coefficient of Friction Film/Metal	ASTM D1894		—	0.21	—	—
	Falling Sand Abrasion	ASTM D968	L	—	234	—	—
	Moisture Absorption	ASTM D570	%	—	0.5	—	—
	Moisture Vapor Transmission	ASTM E96E-80	g/m ² -d	—	30	—	—
	Refractive Index	ASTM D542-50		—	1.46	—	—
	Gloss 85°	Gardner		31	93	93	93
	Gloss 60°	Gardner		27	81	81	81
	Gloss 20°	Gardner		6	57	57	57
	Haze, Internal	Gardner		2	0.6	1.7	—
	Haze, Total	Gardner		33	2.6	1.4	—
THERMAL	Linear Coefficient of Expansion, MD	D696-79	m/m-°K	—	9 × 10 ⁻⁵	—	—
	Linear Coefficient of Expansion, TD	D696-79	m/m-°K	—	9 × 10 ⁻⁵	—	—
	Shrinkage, Max.	ASTM D1204-78	% at 170°C	2	2	2	2
	Specific Heat	DuPont 990	cal/g-°C kJ/kg-°K	—	0.24 1.01	—	—
	Temperature Range Continuous Use Short Cycle		°C °C	-72 to 107 Up to 175	-72 to 107 Up to 175	-72 to 107 Up to 175	-72 to 107 Up to 175
ELECTRICAL	Dielectric Constant	ASTM D151-81			7		
	Dielectric Strength	ASTM D151-81	(V/mil)		3000		
	Dissipation Factor	ASTM D151-81	%		0.2		
	Volume Resistivity	ASTM D257-78	ohm/cm		4 × 10 ¹³		
CHEMICAL RESISTANCE	Acids Bases	2 hr boiling Immersion			No Visible Effect No Visible Effect		
	Vapor Permeability	ASTM E96-80 Mod.	g/(100 m ²)(h)(mil)				
	Acetic Acid	ASTM E96-80 Mod.		—	45	—	—
	Acetone	ASTM E96-80 Mod.		—	10,000	—	—
	Benzene	ASTM E96-80 Mod.		—	90	—	—
	Carbon Tetrachloride	ASTM E96-80 Mod.		—	50	—	—
	Ethyl Acetate	ASTM E96-80 Mod.		—	1,000	—	—
	Ethyl Alcohol	ASTM E96-80 Mod.		—	35	—	—
	Hexane	ASTM E96-80 Mod.		—	55	—	—
	Water	ASTM E96-80 Mod.		—	22	—	—
Weatherability	Atlas Weatherometer			Excellent	Excellent	Excellent	

For more information on *Tedlar*® SP PVF Film:

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Note: We believe this information is the best currently available on the subject. It is offered as a possible helpful suggestion in experimentation you may care to undertake along these lines. It is subject to revision as additional knowledge and experience are gained. DuPont makes no guarantee of results and assumes no obligation or liability whatsoever in connection with this information. This publication is not license to operate under, or intended to suggest infringement of, any existing patents.

CAUTION: Do not use in medical applications involving permanent implantation in the human body. For other medical applications, see "DuPont Medical Caution Statement," H-50102.

