Summary of Properties

General

Unique properties of DuPont™ Tedlar® polyvinyl fluoride (PVF) biaxially oriented film include excellent resistance to weathering, outstanding mechanical properties, and inertness towards a wide variety of chemicals, solvents, and staining agents. General properties are summarized in Table 1.

Tedlar® contains no plasticizers; hence, it has good aging properties and remains tough and flexible over a broad temperature range.

Type 5 Tedlar® film has been developed for applications where deep draw and texturing are required. The proven characteristics of cleanability, durability, color stability, and color reproducibility are retained with this film type. The film can also be printed on and laminated to a variety of substrates.

Type 5 Tedlar® applications exist where formed parts require surface protection, such as aircraft cabin interior surfaces containing complex curves. The high degree of formability of this film is obtained by extending both the elongation and ultimate tensile strength over a very broad range. Ultimate elongation is almost twice that of standard Type 3 film.

Tedlar® is supplied with different surface characteristics. “A” (one side adherable) and “B” (two side 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 mastics.

The “S” surface has excellent anti-stick properties for use as a mold release agent for epoxies, phenolics, rubbers, and other plastic resins. It is especially suited as a release sheet for printed circuit board and composite part fabrication.

Outdoor weathering tests on Tedlar® pigmented films have been conducted for more than 20 years. The weather resistance, inertness and strength characteristics suggest broad use as a finish for metals, hardboards, felts, or plastics in architectural, decorative, or industrial uses.

Properties of interest to the electrical industry include excellent hydrolytic stability and high dielectric strength and dielectric constant.

Tedlar® PVF film is generally available in thicknesses from 1.0 to 2.0 mil.
### General Properties of DuPont™ Tedlar® PVF Films

<table>
<thead>
<tr>
<th>Property</th>
<th>Typical Value</th>
<th>Test Method</th>
<th>Test Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PHYSICAL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bursting Strength</td>
<td>29–65 psi</td>
<td>Mullen, ASTM D-774</td>
<td>22°C (72°F)</td>
</tr>
<tr>
<td>Coefficient of Friction</td>
<td>0.18–0.21</td>
<td>ASTM D-1894</td>
<td>22°C (72°F)</td>
</tr>
<tr>
<td>Density</td>
<td>1.37–1.72 g/cc</td>
<td>ASTM D-1505</td>
<td>22°C (72°F)</td>
</tr>
<tr>
<td>Impact Strength</td>
<td>10–20 in lb/mil</td>
<td>Water immersion</td>
<td>22°C (72°F)</td>
</tr>
<tr>
<td>Moisture Absorption</td>
<td>&lt;0.5% for most types</td>
<td>ASTM E-96</td>
<td>39.5°C, 80% RH</td>
</tr>
<tr>
<td>Water Vapor Transmission</td>
<td>9–57 g/m²d</td>
<td>ASTM D-542 Abbe Refractometer</td>
<td>30°C (86°F)</td>
</tr>
<tr>
<td>Refractive Index</td>
<td>1.46 nD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tear Strength</td>
<td>15–60 g/mil</td>
<td>Elmendorf-ASTM D-1922</td>
<td>22°C (72°F)</td>
</tr>
<tr>
<td>Initial (Graves)</td>
<td>260–500 g/mil</td>
<td>ASTM D-1004</td>
<td>22°C (72°F)</td>
</tr>
<tr>
<td>Tensile Modulus</td>
<td>300–380 x 10³ psi</td>
<td>ASTM D-882</td>
<td>22°C (72°F)</td>
</tr>
<tr>
<td>Ultimate Tensile Strength</td>
<td>8–16 x 10³ psi</td>
<td>ASTM D-882</td>
<td>22°C (72°F)</td>
</tr>
<tr>
<td>Ultimate Elongation</td>
<td>90–250%</td>
<td>ASTM D-882</td>
<td>22°C (72°F)</td>
</tr>
<tr>
<td>Ultimate Yield</td>
<td>6000–4900 psi</td>
<td>ASTM D-882</td>
<td>22°C (72°F)</td>
</tr>
<tr>
<td><strong>CHEMICAL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical Resistance</td>
<td>No visible effect</td>
<td>1 yr immersion in Acids, Bases, Solvents</td>
<td>25°C (77°F)</td>
</tr>
<tr>
<td>Gas Permeability</td>
<td>Strength and appearance not affected</td>
<td>2 hr immersion in Acids, Bases, Solvents</td>
<td>Boiling</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td>11.1 cc/(100 in²)(24 hr)(atm)(mil)</td>
<td>ASTM D-1434</td>
<td>24°C (75°F)</td>
</tr>
<tr>
<td>Helium</td>
<td>150 cc/(100 in²)(24 hr)(atm)(mil)</td>
<td>ASTM D-1434</td>
<td>24°C (75°F)</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>58.1 cc/(100 in²)(24 hr)(atm)(mil)</td>
<td>ASTM D-1434</td>
<td>24°C (75°F)</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>0.25 cc/(100 in²)(24 hr)(atm)(mil)</td>
<td>ASTM D-1434</td>
<td>24°C (75°F)</td>
</tr>
<tr>
<td>Oxygen</td>
<td>3.2 cc/(100 in²)(24 hr)(atm)(mil)</td>
<td>ASTM D-3985</td>
<td>24°C (75°F)</td>
</tr>
<tr>
<td>Vapor Permeability (at part. press. or vapor at given temp.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acetic Acid</td>
<td>45 g/(100 m²)(hr)(mil)</td>
<td>ASTM E-96, modified</td>
<td>24°C (75°F)</td>
</tr>
<tr>
<td>Acetone</td>
<td>10,000 g/(100 m²)(hr)(mil)</td>
<td>ASTM E-96, modified</td>
<td>24°C (75°F)</td>
</tr>
<tr>
<td>Benzene</td>
<td>90 g/(100 m²)(hr)(mil)</td>
<td>ASTM E-96, modified</td>
<td>24°C (75°F)</td>
</tr>
<tr>
<td>Carbon Tetrachloride</td>
<td>50 g/(100 m²)(hr)(mil)</td>
<td>ASTM E-96, modified</td>
<td>24°C (75°F)</td>
</tr>
<tr>
<td>Ethyl Acetate</td>
<td>1000 g/(100 m²)(hr)(mil)</td>
<td>ASTM E-96, modified</td>
<td>24°C (75°F)</td>
</tr>
<tr>
<td>Ethyl Alcohol</td>
<td>35 g/(100 m²)(hr)(mil)</td>
<td>ASTM E-96, modified</td>
<td>24°C (75°F)</td>
</tr>
<tr>
<td>Hexane</td>
<td>55 g/(100 m²)(hr)(mil)</td>
<td>ASTM E-96, modified</td>
<td>24°C (75°F)</td>
</tr>
<tr>
<td>Weatherability</td>
<td>Excellent</td>
<td>Florida exposure</td>
<td>Facing South at 45° to horizontal</td>
</tr>
<tr>
<td><strong>THERMAL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aging</td>
<td>3000 hr</td>
<td>Circulating Air Oven</td>
<td>150°C (302°F)</td>
</tr>
<tr>
<td>Heat Sealability</td>
<td>Some varieties—see Heat Sealability Technical Bulletin</td>
<td>Air Oven, 30 min</td>
<td>150°C (302°F)</td>
</tr>
<tr>
<td>Linear Coefficient of Expansion</td>
<td>2.8 x 10⁻⁵ in/in/°F</td>
<td>Air Oven, 30 min</td>
<td>150°C (302°F)</td>
</tr>
<tr>
<td>Shrinkage (Type 2) MD and TD only</td>
<td>4% at 130°C (266°F)</td>
<td>Air Oven, 30 min</td>
<td>150°C (302°F)</td>
</tr>
<tr>
<td>(Type 3) TD only</td>
<td>4% at 170°C (338°F)</td>
<td>Air Oven, 30 min</td>
<td>150°C (302°F)</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>-72 to 107°C (-98 to 225°F)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous Use</td>
<td>up to 175°C (350°F)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero Strength</td>
<td>260 to 300°C (500 to 570°F)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corona Endurance (hr)</td>
<td>TTR20SG4</td>
<td>ASTM Suggested T method</td>
<td>60 cPs, 1000 V/mil</td>
</tr>
<tr>
<td>Dielectric Constant</td>
<td>2.5</td>
<td>ASTM D-150</td>
<td>1 Kc at 22°C (72°F)</td>
</tr>
<tr>
<td>Dielectric Strength (kV/mil)</td>
<td>8.5</td>
<td>ASTM D-150</td>
<td>60 cPs, 22°C (72°F)</td>
</tr>
<tr>
<td>Dissipation Factor (%)</td>
<td>3.4</td>
<td>ASTM D-150</td>
<td>1000 cPs, 22°C (72°F)</td>
</tr>
<tr>
<td>Volume Resistivity (ohm.cm)</td>
<td>4 x 10¹³</td>
<td>ASTM D-257</td>
<td>100 cPs, 70°C (158°F)</td>
</tr>
<tr>
<td></td>
<td>2 x 10¹⁰</td>
<td>ASTM D-257</td>
<td>10 Kc, 22°C (72°F)</td>
</tr>
<tr>
<td></td>
<td>1.5 x 10¹³</td>
<td>ASTM D-257</td>
<td>10 Kc, 70°C (158°F)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
## Physical and Thermal Properties

DuPont™ Tedlar® PVF film is strong, flexible and fatigue-resistant. Its resistance to failure by flexing is outstanding. Tedlar® performs well in temperatures ranging from approximately -72 to 107°C (-98 to 225°F), with intermittent short-term peaking up to 204°C (400°F). Some physical and thermal properties of representative Tedlar® PVF films are summarized in Table 2 for the fabrication of specialty release laminates.

### Table 2

<table>
<thead>
<tr>
<th>Description</th>
<th>Units</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical Properties</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area Factor</td>
<td>ft²/lb</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>m²/kg</td>
<td>—</td>
</tr>
<tr>
<td>Ultimate Tensile Strength, Min. (MD)</td>
<td>kpsi</td>
<td>ASTM D-882</td>
</tr>
<tr>
<td></td>
<td>MPa</td>
<td></td>
</tr>
<tr>
<td>Tensile Modulus (MD)</td>
<td>kpsi</td>
<td>ASTM D-882</td>
</tr>
<tr>
<td></td>
<td>MPa</td>
<td></td>
</tr>
<tr>
<td>Ultimate Elongation, Min. (MD)</td>
<td>%</td>
<td>ASTM D-882</td>
</tr>
<tr>
<td>Bursting Strength</td>
<td>psi/mil</td>
<td>Mullen</td>
</tr>
<tr>
<td></td>
<td>MPa/m</td>
<td>ASTM-D-774</td>
</tr>
<tr>
<td>Tear Strength—Propagating (MD)</td>
<td>g/mil</td>
<td>Elmdorf</td>
</tr>
<tr>
<td></td>
<td>kN/m</td>
<td>ASTM-D-1922</td>
</tr>
<tr>
<td>Tear Strength—Propagating (TD)</td>
<td>g/mil</td>
<td>Elmdorf</td>
</tr>
<tr>
<td></td>
<td>kN/m</td>
<td>ASTM-D-1922</td>
</tr>
<tr>
<td>Tear Strength—Initial (MD)</td>
<td>g/mil</td>
<td>Graves</td>
</tr>
<tr>
<td></td>
<td>kN/m</td>
<td>ASTM-D-1004</td>
</tr>
<tr>
<td>Tear Strength—Initial (TD)</td>
<td>g/mil</td>
<td>Graves</td>
</tr>
<tr>
<td></td>
<td>kN/m</td>
<td>ASTM-D-1004</td>
</tr>
<tr>
<td>Impact Strength</td>
<td>in lb/mil</td>
<td>Spencer</td>
</tr>
<tr>
<td></td>
<td>kJ/m</td>
<td>ASTM-D-3420</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>—</td>
<td>ASTM D-1505</td>
</tr>
<tr>
<td>Coefficient of Friction Film/Metal</td>
<td>—</td>
<td>ASTM D-1894</td>
</tr>
<tr>
<td>Coefficient of Abrasion</td>
<td>—</td>
<td>ASTM D-658</td>
</tr>
<tr>
<td>Moisture Absorption</td>
<td>%</td>
<td>ASTM D-570</td>
</tr>
<tr>
<td>Moisture Vapor Transmission</td>
<td>g/m³d</td>
<td>ASTM E-96</td>
</tr>
<tr>
<td><strong>Thermal Properties</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aging in Air</td>
<td>Hours to embrittlement</td>
<td>Some varieties—see Heat Scalability Technical Bulletin</td>
</tr>
<tr>
<td>Heat Scalability</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Linear Coefficient of Expansion (MD)</td>
<td>m/mK</td>
<td>D-696 (at 50–70°C)</td>
</tr>
<tr>
<td>Linear Coefficient of Expansion (TD)</td>
<td>m/mK</td>
<td>D-696 (at 50–70°C)</td>
</tr>
<tr>
<td>Shrinkage, Max. (TD)</td>
<td>% at °C</td>
<td>ASTM D-1204</td>
</tr>
<tr>
<td>Specific Heat</td>
<td>cal/g °C</td>
<td>DuPont 990</td>
</tr>
<tr>
<td></td>
<td>kJ/kg K</td>
<td>Thermal Analyzer</td>
</tr>
</tbody>
</table>
For more information on DuPont™ Tedlar® PVF films, please visit our websites:

www.tedlar.com

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H-49725-5 Ltr 04/14