

# URETHANE

The more you know...

PART 6

## Urethane Lamination Layer Adds Performance

Stevens Urethane offers a combination of outstanding physical properties plus superior fabricability which makes it the ideal material laminate in applications ranging from medical products to sporting equipment, camping gear and other products requiring high performance.

Stevens thermoplastic urethane (TPU) also offers exceptional adhesion characteristics to a wide variety of substrates — ranging from fabrics such as polyester and nylon, to plastics and even glass — which enhances TPU's value as an inter-layer.

(Continued on back)



The following table represents a comparison of Stevens polyurethane film with flexible vinyl. The values listed are generalizations and may not represent all polymer and compound variations.

### Why Stevens Urethane was selected

E = Excellent  
G = Good  
F = Fair  
P = Poor

|                                     | Stevens Urethane | Flexible Vinyl |
|-------------------------------------|------------------|----------------|
| <b>Hardness (Shore A)</b>           | 75-95A           | 60-95A         |
| <b>Specific Gravity</b>             | 1.12-1.21        | 1.12-1.5       |
| <b>Elongation, %</b>                | 350-800          | 200-400        |
| <b>Tear Strength, #/in (Graves)</b> | 400-800          | 100-400        |
| <b>Low Temperature Flexibility</b>  | G-E              | G              |
| <b>Acid Resistance - Weak</b>       | F                | F              |
| <b>- Strong</b>                     | P                | P              |
| <b>Base Resistance - Weak</b>       | E                | E              |
| <b>- Strong</b>                     | P                | P              |
| <b>Fuel and Oil Resistance</b>      | E                | F              |
| <b>Migration</b>                    | E                | P-G            |
| <b>Flex Strength</b>                | E                | F              |
| <b>Abrasion Resistance</b>          | E                | F              |
| <b>UV Resistance</b>                | F-G              | G-E            |
| <b>Ozone Resistance</b>             | E                | E              |
| <b>Moisture Resistance</b>          | P-E              | G              |

SOURCE: STEVENS URETHANE FILM & SHEET

TPU's ability to "breathe" while repelling water, along with its excellent abrasion resistance characteristics, makes it an ideal outer layer as well. Good moisture vapor transmission rates (MVTR) allow moisture to evaporate from beneath, so surgical gowns, rain gear and other apparel, for example, keep the wearer both dry and comfortable. TPU lends protection, durability and waterproofing to tent fabrics and backpacks as well.

Stevens Urethane is also available in optically clear formulations that allow

excellent light transmission as well as providing a strong adhesive bond between polycarbonate and glass in security glazing applications.

### Easier Fabricability

Stevens Urethane exhibits uniform melt properties that contribute to consistency and processability, making it easier to work with and fabricate. TPU laminations can be dielectrically sealed rather than sewn, making it easier to design a "seamless" waterproof system necessary for air and liquid bladders, and eliminating an additional

waterproof coating step to seal needle holes and seams.

### Stevens Urethane for Your Application

Stevens offers many different grades of TPU to suit specific application requirements, such as flame retardant material. Typical applications where Stevens Urethane has been used to increase the performance characteristics of the product and/or to enhance its fabrication include child car seats, flotation life vests, airline emergency slides, scuba buoyancy compensators, and different types of apparel.

### About TPUS

- Stevens Urethane is a thermoplastic polyurethane, or TPU. TPUs are versatile elastomers that combine the best properties of both rubber and plastic to offer a unique combination of high performance properties.
- Stevens Urethane offers exceptional strength and durability, so a thinner gauge of TPU can be used when compared to PVC and other materials.
- TPU offers excellent resistance to a wide range of chemicals, as well as moisture and fungus.
- TPU is non-irritating, and is ideal for applications requiring contact with human skin.
- Because it contains no plasticizers, TPU offers excellent low temperature performance.
- TPU can be produced in a wide range of durometers, 75-95 Shore A, from a relatively stiff material to a soft material with a non-plastic feel.
- Stevens Urethane is available as sheet, film, tubing, cord and profile extrusions. A range of colors, opacities, and surface finishes suits any application's aesthetic requirements.

### Product Features of Stevens Aromatic Polyurethanes

|                               | ST-625FS-85 | ST-1665-90   |
|-------------------------------|-------------|--------------|
| <b>Durometer, D2240</b>       | 85A         | 90±5 Shore A |
| <b>Specific Gravity, D792</b> | 1.14        | 1.14         |

### Thermal Properties:

#### Maximum Service Temperatures

|                       | °F            | °C            | °F           | °C            |
|-----------------------|---------------|---------------|--------------|---------------|
| • continuous          | -60° to +200° | -60° to +240° | -51° to +93° | -51° to +116° |
| • melting point range | 350° to 390°  | 392° to +428° | 177° to 199° | 200° to 222°  |

### Tensile Properties, D638:

|  |           |           |
|--|-----------|-----------|
| Modulus @ 100% strain                  | 1,000 psi | 1200 psi  |
| Modulus @ 300% strain                  | 1,500 psi | 2,750 psi |
| Modulus @ break                        | 7,000 psi | 8,500 psi |
| Modulus of elasticity up to 10% strain | 30 psi    | N/A       |
| Elongation at break                    | 450%      | 350%      |
| Set @ break                            | 40%       | 20%       |

### Tear Properties D624 :

|       |         |         |
|-------|---------|---------|
| Die C | 400 pli | 525 pli |
|-------|---------|---------|

- Stevens Urethane is easy to work with and can be fabricated in many ways: die-cut, radio frequency sealed, thermally bonded, vacuum formed, heat laminated, and adhesive bonded to itself or other materials. It can also be printed or silk-screened.
- Technical support includes chemists, quality control personnel, technical sales staff and production experts who are ready to work with you to find the best solution to your design challenge.



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