

VALOX* FR1 Film

Product Datasheet

DESCRIPTION

VALOX* FR-1 is a flame retardant thermoplastic polybutylene, terephthalite film offering UL94 VTM-0 performance down to 125 microns and good temperature performance. VALOX FR-1 film's outstanding dielectric strength and ease of fabrication (ie: thermoforming, embossing, clean-edge die-cutting, folding and bending) make it very suitable for a wide range of electrical, electronic and medical applications.

Typical Property Values¹

| Property | ASTM Test Method | Units (USCS) | Value | ISO Test Method | Units (SI) | Value |
|---|-----------------------|-------------------------------|--------|-----------------|--------------------------|-------|
| Mechanical | | | | | | |
| Tensile Strength | | | | | | |
| @ Yield | ASTM D882 | psi | 7200 | ISO 527 | MPa | 49.7 |
| Ultimate | ASTM D882 | psi | 6000 | ISO 527 | MPa | 41.1 |
| Tensile Modulus | ASTM D882 | psi | 277000 | ISO 527 | MPa | 1910 |
| Tensile Elongation at Break | ASTM D882 | % | 57 | ISO 527 | % | 57 |
| Gardner Impact Strength at 0.03 in. (0.75 mm) | ASTM D3029 | ft-lb | 7 | ISO 6603-1 | J | 10 |
| Tear Strength | | | | | | |
| Initiation | ASTM D1004 | lb/mil | 1.46 | | kN/m | 255 |
| Propogation | ASTM D1922 | g/mil | 102.8 | | g/mil | 102.8 |
| Puncture Resistance (Dynatup) | ASTM D3763 | ft-lb | 9 | | J | 12 |
| Fold Endurance (MIT) | | | | | | |
| 0.007 inch (0.175 mm) | ASTM D2176-69 | double folds | 2000 | | | |
| 0.025 inch (0.625 mm) | ASTM D2176-69 | double folds | 83 | | | |
| Thermal | | | | | | |
| Coefficient of Thermal Conductivity | ASTM D5470 | Btu/hr/ft ² /°F/in | 1.35 | | W/m ² K | 0.17 |
| Coefficient of Thermal Expansion | ASTM E831 | (x 10 ⁻⁵ /°F) | 3.1 | ISO 11359 | (x 10 ⁻⁵ /°C) | 5.7 |
| Specific Heat @ 40 °F (4 °C) | ASTM E1269 | Btu/lb/°F | 0.3 | | KJ/Kg-°C | 1.31 |
| Glass Transition Temperature | ASTM D3417/D3418 | °F | 183 | ISO 11357 | °C | 84 |
| Vicat Softening Temperature, B | ASTM 1525-00 Modified | °F | 346 | | °C | 174 |
| Heat Deflection Temp. by TMA at 1.8 MPa | | °F | 418 | ISO 75 Modified | °C | 214 |
| Shrinkage at 302 °F (150 °C) | ASTM D1204 | % | 0.40% | | % | 0.40% |
| Brittleness Temperature | ASTM D746 | °F | -211 | | °C | -135 |

UL Flammability Rating / Performance Levels

| Thickness | Rating | HWI | HAI |
|---|-----------|-----|-----|
| > 0.003" (0.075 mm) and < 0.005" (0.130 mm) | UL94VTM-2 | - | - |
| > 0.005" (0.130 mm) and < 0.010" (0.250 mm) | UL94VTM-0 | - | - |
| > 0.020" (0.500 mm) and < 0.025" (0.625 mm) | UL94VTM-0 | 4 | 0 |
| 0.025" (0.625 mm) and greater | UL94V-0 | 4 | 0 |
| CTI: 2 HVTR: 4 D495: 6 | | | |
| File Number | E61257 | | |

Manufacturing Specifications

| Nominal Gauge Ranges | Min./Max Limit of Nominal |
|-------------------------------|---------------------------|
| 0.003-0.010" (0.075-0.250 mm) | ± 10% |
| 0.015-0.030" (0.375-0.750 mm) | ± 5% |



¹ These are typical properties and are not intended for specification purposes. If minimum certifiable properties are required, please contact your local GE Advanced Materials, Specialty Film & Sheet representative or the GE Advanced Materials, Specialty Film & Sheet Quality Services Department. Reported values are based on 0.010" (0.250 mm) thickness unless otherwise noted.
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GE Advanced Materials Specialty Film & Sheet

| Property | ASTM Test Method | Units | Value | ISO Test Method | Units | Value |
|--|---------------------------|----------------------|-------------|-----------------|-------------------|--------|
| Physical | | | | | | |
| Density | ASTM D792 | slug/ft ³ | 83.3 | ISO 1183 | kg/m ³ | 1335 |
| Water Absorption, 24 hrs. | ASTM D570 | % change | 0.48 | ISO 62 | % change | 0.48 |
| Surface Energy (1st surface / 2nd surface) | ASTM D5946-01 | - | 36/35 | | | |
| Surface Tension (1st surface / 2nd surface) | Dyne Pens | Dyne | >44 / 34-36 | | | |
| Pencil Hardness | ASTM D3363 | - | 2b-b | | | |
| Optical | | | | | | |
| Light Transmission | ASTM D1003 | % | 15 | | | |
| Yellowness Index | ASTM D1925 | % | 49 | | | |
| Haze | ASTM D1003 | % | 103 | | | |
| Gloss over Flat Black min/max @ 60° | ASTM D523-60 | - | 5 | ISO 2813 | - | 5 |
| Electrical | | | | | | |
| Dielectric Strength in oil, short time @ 72 °F (23 °C), 10 mils (0.25 mm) | ASTM D149-97a Method A | kV/mil | 1.09 | IEC 60243 | kV/mm | 43 |
| Dielectric Constant @ 60 Hz | ASTM D150 | - | 3.3 | IEC 60250 | - | 3.3 |
| @ 1,000,000 Hz | ASTM D150 | - | 2.8 | IEC 60250 | - | 2.8 |
| Dissipation Factor @ 60 Hz | ASTM D150 | - | 0.0015 | IEC 60250 | - | 0.0015 |
| @ 1,000,000 Hz | ASTM D150 | - | 0.01 | IEC 60250 | - | 0.01 |
| Volume Resistivity | ASTM D257 | Ω-cm | 1E+17 | IEC 60093 | Ω-cm | 1E+17 |
| Surface Resistivity | ASTM D257 | Ω/square | 1E+16 | IEC 60093 | Ω/square | 1E+16 |
| Arc Resistance, Tungsten Electrodes | ASTM D495 | s | 21 | | | |

% Gloss by Gauge: (ASTMD 523-85)

| FR1 | Gauge | Angle | Matte |
|-------------------------------|-------------------|--------------------|--------------------|
| | 0.003" (0.075 mm) | 85° | Minimum Maximum |
| 0.006-0.030" (0.150-0.750 mm) | 85° | Minimum Maximum | 0.1 17 |



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