INTRODUCTION

KRYSALFLEX® PE399 is a high performance aliphatic polyether film intended for processing by lamination with a range of glass and plastic components.

KRYSALFLEX® PE399 is part of the HUNTSMAN film and sheet product range for glass, polycarbonate, acrylic, CAB lamination applications. It is used in aerospace, transportation, security, and architectural markets.

PERFORMANCE FEATURES

- Excellent laminated transparency
- Excellent hydrolysis & microbial resistance
- Good low temperature flexibility
- Enhanced UV stability
- Medium durometer
- Contains adhesion promoter
- Medium modulus
- Excellent cold impact

APPLICATIONS

- Prison containment glazing
- Ballistic / Blast / Intrusion
- Vehicle armoring
- Retail kiosks
- Hurricane / Vandal glazing
- Zoos
- Liquid crystal laminates
- Computer screens

Table 1: Typical Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Key</th>
<th>DIN</th>
<th>Unit</th>
<th>Value</th>
<th>ASTM</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardness</td>
<td>M</td>
<td>53505</td>
<td>Shore A</td>
<td>80</td>
<td>D-2240</td>
<td>Shore A</td>
<td>80</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>E</td>
<td>53504</td>
<td>MPa</td>
<td>45</td>
<td>D-412</td>
<td>psi</td>
<td>6500</td>
</tr>
<tr>
<td>Elongation @ break</td>
<td>E</td>
<td>53504</td>
<td>%</td>
<td>500</td>
<td>D-412</td>
<td>%</td>
<td>500</td>
</tr>
<tr>
<td>100% Modulus</td>
<td>E</td>
<td>53504</td>
<td>MPa</td>
<td>2</td>
<td>D-412</td>
<td>psi</td>
<td>300</td>
</tr>
<tr>
<td>300% Modulus</td>
<td>E</td>
<td>53504</td>
<td>MPa</td>
<td>7</td>
<td>D-412</td>
<td>psi</td>
<td>1000</td>
</tr>
<tr>
<td>Tear Resistance</td>
<td>E</td>
<td>53515</td>
<td>N/mm</td>
<td>37</td>
<td>D-624</td>
<td>pli</td>
<td>210</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>E</td>
<td>53478</td>
<td></td>
<td>1.07</td>
<td>D-792</td>
<td></td>
<td>1.07</td>
</tr>
<tr>
<td>Softening Range Low</td>
<td>E</td>
<td></td>
<td>Huntsman</td>
<td>80</td>
<td></td>
<td>Huntsman</td>
<td>175</td>
</tr>
<tr>
<td>Softening Range High</td>
<td>E</td>
<td></td>
<td>Huntsman TMA</td>
<td>140</td>
<td></td>
<td>Huntsman TMA</td>
<td>285</td>
</tr>
<tr>
<td>Midpoint Tg by DSC</td>
<td>E</td>
<td></td>
<td>Huntsman DSC</td>
<td>-36</td>
<td></td>
<td>Huntsman DSC</td>
<td>-33</td>
</tr>
</tbody>
</table>

E = 0.050” extruded film cut to ASTM requirements
M = Injection moulded parts to meet DIN & ASTM requirements
ASTM measurements were tested at 20 in/min.
DIN measurements were tested at 500 mm/min.
POLYMER SELECTION
Before selecting this product it is necessary that the user ensures the product performance will meet all operational and end use requirements. Having satisfied these requirements, should changes be contemplated in method of application, materials, service conditions or any other change that could affect the ultimate performance of the end product, then further tests and trials should be carried out. For assistance with particular problems and applications, please contact the HUNTSMAN TPU Technical Service Department listed below.

HEALTH & SAFETY ADVICE
Before undertaking any trials with this product it is essential that all personnel are aware of the necessary precautions that must be taken. These are detailed in the relevant Material Safety Data Sheet, which will be provided by HUNTSMAN.

SUPPLY & STORAGE
KRYSTALFLEX® PE399 is supplied in the form of film with interlayer in cardboard boxes. Rolls on pallets must be stacked and aligned properly so the rolls remain suspended in the box.

KRYSTALFLEX® PE399 has a minimum expected shelf life of 12 months from the date of shipment when stored in a cool and dry place in the manufacturer's original packaging.

PHYSICAL FORM
Type: Film

PROCESSING PARAMETERS

<table>
<thead>
<tr>
<th>Table 2: Typical Laminating Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultimate Temperature:</td>
</tr>
<tr>
<td>110°C – 130°C</td>
</tr>
<tr>
<td>230°F – 266°F</td>
</tr>
<tr>
<td>Ultimate Pressure:</td>
</tr>
<tr>
<td>8 bar – 12 bar</td>
</tr>
<tr>
<td>116 psi – 174 psi</td>
</tr>
<tr>
<td>Soaking Time:</td>
</tr>
<tr>
<td>30 min. / 6 mm.</td>
</tr>
<tr>
<td>30 min. / 0.25 inch.</td>
</tr>
</tbody>
</table>

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