TenCate AmberTool®
HXR56
Tooling prepreg

PRODUCT DESCRIPTION
TenCate AmberTool® HXR56 is an epoxy resin system fully impregnated into a carbon multi-axis backing ply construction. This two-layer product facilitates complex tool construction while allowing efficient lay-up, reducing overall tooling costs. HXR56 is co-compatible with our heritage HX56 carbon 205gsm 2x2 twill reinforcement surface ply. After a suitable post-cure, an end-use temperature of 180°C (356°F) is achieved.

TENcate AMBERTool® HXR56 PREPREG BENEFITS / FEATURES

- Fully impregnated multiaxial construction
- Vastly reduced laminating time
- Reduction in de-bulk stages
- Reduction in waste
- Improved cutting efficiency
- Low initial cure temperature
- Capable of unsupported post cure
- Excellent drape for complex shapes
- High glass transition temperature
- Low coefficient of thermal expansion
- Low volatile content
- 50 hours tack life at 18°C (64°F)

TYPICAL APPLICATIONS
• Small to medium sized 3D autoclave tooling with fast cure, more efficient processing, excellent surface finish and reduced cost

KEY PROPERTIES
Excellent surface finish
Pliable at room temperature

SHELF LIFE
Tack life
50 hours @ 18°C (64°F)

Storage life
6 months @ -18°C (0°F)

Tack life is time during which the prepreg retains enough tack, drape and handling for easy tool lay-up.

To avoid moisture condensation:
Following removal from cold storage, allow the prepreg to reach room temperature before opening the polythene bag. Typically, the thaw time for a full roll of material will be 4 to 6 hours.

<table>
<thead>
<tr>
<th>Description</th>
<th>Construction</th>
<th>Format</th>
<th>Moulded thickness (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HX56</td>
<td>HS 46% 3K Carbon 205gsm 2x2 twill (surface ply)</td>
<td>400mm x 400mm squares</td>
<td>0.23</td>
</tr>
<tr>
<td>HXR56 101</td>
<td>HS 37% 50K Carbon 600gsm ±45° Bi-Axial HS 35% 12K Carbon 650gsm 2x2 twill</td>
<td>400mm x 400mm squares</td>
<td>1.30</td>
</tr>
</tbody>
</table>

2 Piles HX56 205 gsm 2x2 twill

4 Piles HXR56 NEW
600 gsm / 650 gsm co-laminated
**TYPICAL NEAT RESIN PROPERTIES**

Density: \(1.23 \text{ g/cm}^3 (77\text{lbs/ft}^3)\) at 23°C (73°F)

\(T_g\) (DMA) after 190°C (374°F) post-cure: Onset: 185°C (365°F); Peak \(\tan \delta\): 209°C (408°F)

**VISCOSEITY PROFILE**

- \(\eta_{min} = 10.49 \text{ Pa.s}\)
- \(T_{\eta_{min}} = 66 \degree C\)
- \(t_{\eta_{min}} = 1 \text{ hr } 11 \text{ mins}\)
- \(T_{gel} = 76 \degree C\)
- \(t_{gel} = 1 \text{ hr } 31 \text{ mins}\)

**TENCATE AMBERTOOL® LAMINATING PROCEDURE**

<table>
<thead>
<tr>
<th>Procedure (gsm)</th>
<th>Ply no.</th>
<th>Fibre orientation</th>
<th>Pattern direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trim strips 205 2x2</td>
<td>-</td>
<td>+/- 45°</td>
<td>-</td>
</tr>
<tr>
<td>Laminate 205 2x2</td>
<td>1</td>
<td>0°</td>
<td>➡</td>
</tr>
<tr>
<td>Debulk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HXR56 101</td>
<td>2</td>
<td>0°</td>
<td>➡</td>
</tr>
<tr>
<td>HXR56 101</td>
<td>3</td>
<td>90°</td>
<td>➡</td>
</tr>
<tr>
<td>Debulk</td>
<td>LAMINATE MID PLANE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HXR56 101</td>
<td>4</td>
<td>90°</td>
<td>➡</td>
</tr>
<tr>
<td>HXR56 101</td>
<td>5</td>
<td>0°</td>
<td>➡</td>
</tr>
<tr>
<td>Debulk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laminate 205 2x2</td>
<td>6</td>
<td>0°</td>
<td>➡</td>
</tr>
<tr>
<td>Preparation for autoclave</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autoclave cure</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Summary**

- Individual plies: 6
- Debulks: 3
- Total fabric weight: 5.41 kg/m²
- Laminate thickness: 5.5 mm
INITIAL MINIMUM CURE TIMES

<table>
<thead>
<tr>
<th>Temperature °C (°F)</th>
<th>Time (hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 (104)</td>
<td>18</td>
</tr>
<tr>
<td>45 (113)</td>
<td>12.5</td>
</tr>
<tr>
<td>50 (122)</td>
<td>8.5</td>
</tr>
<tr>
<td>55 (131)</td>
<td>6</td>
</tr>
</tbody>
</table>

Alternative cure cycles at higher temperature may be used e.g. 4 hours at 60°C (140°F).

Caution: TenCate AmberTool HX56R & HX56 prepreg contains a reactive resin system and care must be taken to avoid exothermic heating during the initial cure. Avoid exceeding 65°C (149°F) during the initial cure.

POST-CURE

Post-cure schedule A:

- Ramp 1°C (1.8°F) / min to 60°C (140°F) Dwell for 2 hours
- Ramp 1°C (1.8°F) / min to 90°C (194°F) Dwell for 1 hour
- Ramp 1°C (1.8°F) / min to 120°C (248°F) Dwell for 1 hour
- Ramp 1°C (1.8°F) / min to 150°C (302°F) Dwell for 1 hour
- Ramp 1°C (1.8°F) / min to 170°C (338°F) Dwell for 1 hour
- Ramp 1°C (1.8°F) / min to 190°C (374°F) Dwell for 6 hours

Cool to 50°C (122°F) at 2.5°C / min (4.5°F / min)
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An alternative post-cure schedule may also be used as follows:

HANDLING SAFETY
Observe established precautions for handling epoxy resins and fibrous materials. Ensure adequate ventilation, wear gloves and protective clothing. For further information, refer to our AmberTool® HX56 Safety Data Sheet available from TenCate Advanced Composites, Langley Mill.

PROCESSING
Processing parameters and instructions are provided in the TenCate AmberTool material processing information guide from TenCate Advanced Composites or at www.tencate.com/tooling