Description
HexPly® M20 is an epoxy structural prepreg, designed to provide high temperature performance combined with a low energy cure cycle. Due to its processing flexibility (vacuum bag or autoclave) it is ideally suitable for composite repair. HexPly® M20 cures at 130°C (265°F) to form a tough, high temperature resistant fibre-reinforced composite.

HexPly® M20 has been chosen as a standardised repair material by the Commercial Aircraft Composite Repair Committee (CACRC) which sets global aerospace standards for composite repair.

HexPly® M20 is available as woven carbon and UD carbon tape for structural repairs. The pre-impregnated woven glass version is used for non-structural galvanic corrosion protection.

Benefits and Features
- Short cure cycle allowing quick & efficient repair
- Low pressure moulding capability: vacuum bag cure – heater blanket
- Excellent temperature performance – laminate properties similar to 180°C (350°F) curing system
- Long room temperature tack life
- Excellent drape and tack
- Available as carbon UD tape, woven carbon and woven glass

Composite repair prepreg kits are available through Hexcel approved distribution channels.

Resin Matrix Properties

Rheology

Viscosity/poise

Gel Time (min)

<table>
<thead>
<tr>
<th>Temperature - °C (°F)</th>
<th>Gel Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(185)</td>
<td>50</td>
</tr>
<tr>
<td>(212)</td>
<td>40</td>
</tr>
<tr>
<td>(248)</td>
<td>30</td>
</tr>
<tr>
<td>(284)</td>
<td>20</td>
</tr>
<tr>
<td>(320)</td>
<td>10</td>
</tr>
<tr>
<td>(356)</td>
<td>0</td>
</tr>
</tbody>
</table>

Viscosity/poise

Rheometrics dynamic spectrometer. Heat-up rate 2°C (3.3°F)/min
Prepreg Lay-up
To achieve the best laminate quality, vacuum debulking of plies may be necessary to ensure removal of air trapped during the lay-up process.

A repair should be carried out according to the Aircraft Structural Repair Manual (SRM). As an indication, the drawing below shows Hexcel’s typical bagging configuration for curing mechanical test laminates:

Prepreg Curing Conditions
Typical cure vacuum bag (no pressure) or autoclave (1-3 bars):
Full vacuum (> -0.75bar)
Heat up rate: 0.5 - 1°C/min
Dwell: 120 - 240 min at 130°C
Cool down rate: at 3°C/min under vacuum

The optimum cure cycle, heat up rate and dwell period depend on part size, laminate construction, oven capacity and thermal mass of the tool.

For thick repairs a dwell and a slower heat up rate are recommended to slow down and equalise the temperatures in the repair.

Prepreg Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Units</th>
<th>M20/40%/G904</th>
<th>M20/34%/134/IM7 (12K)</th>
<th>M20/39%/120</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weave</td>
<td>-</td>
<td>Plain Weave</td>
<td>UD</td>
<td>4-H satin E-glass</td>
</tr>
<tr>
<td>Nominal Fibre Mass</td>
<td>g/m²</td>
<td>193</td>
<td>134</td>
<td>105</td>
</tr>
<tr>
<td>Nominal Prepreg Mass</td>
<td>g/m²</td>
<td>322</td>
<td>203</td>
<td>172</td>
</tr>
<tr>
<td>Theoretical Calculated</td>
<td>mm</td>
<td>0.211</td>
<td>0.129</td>
<td>0.094</td>
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<tr>
<td>Cured Ply Thickness</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Theoretical Calculated Fibre Volume</td>
<td>%</td>
<td>52</td>
<td>58</td>
<td>44</td>
</tr>
<tr>
<td>Cured Resin Density</td>
<td>g/cm³</td>
<td>1.27</td>
<td>1.78</td>
<td>2.56</td>
</tr>
<tr>
<td>Fibre Density</td>
<td>g/cm³</td>
<td>1.53</td>
<td>1.57</td>
<td>1.83</td>
</tr>
<tr>
<td>Theoretical Calculated Laminate Density</td>
<td>g/cm³</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Cured Carbon Prepreg Properties

<table>
<thead>
<tr>
<th>Test</th>
<th>Units</th>
<th>M20/40%/G904 (1)</th>
<th>M20/34%/134/IM7 (12K) (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass Transition Temp.</td>
<td>Method</td>
<td>EN 6032</td>
<td></td>
</tr>
<tr>
<td>(extrapolated onset E') - Dry</td>
<td>°C</td>
<td>155 (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(°F)</td>
<td>(311 (1))</td>
<td></td>
</tr>
<tr>
<td>Tensile Strength - warp</td>
<td>Method</td>
<td>SACMA 4R-94</td>
<td>EN 2561B</td>
</tr>
<tr>
<td>RT test</td>
<td>MPa</td>
<td>877</td>
<td>2790</td>
</tr>
<tr>
<td></td>
<td>(ksi)</td>
<td>(127)</td>
<td>(405)</td>
</tr>
<tr>
<td>Tensile Modulus - warp</td>
<td>GPa</td>
<td>65</td>
<td>175</td>
</tr>
<tr>
<td>RT test</td>
<td>(ksi)</td>
<td>(9)</td>
<td>(25)</td>
</tr>
<tr>
<td>Tensile Strength - weft</td>
<td>Method</td>
<td>SACMA 4R-94 869</td>
<td>-</td>
</tr>
<tr>
<td>RT test</td>
<td>MPa</td>
<td>869</td>
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</tr>
<tr>
<td></td>
<td>(ksi)</td>
<td>(126)</td>
<td>-</td>
</tr>
<tr>
<td>Tensile Modulus - weft</td>
<td>GPa</td>
<td>65</td>
<td>-</td>
</tr>
<tr>
<td>RT test</td>
<td>(ksi)</td>
<td>(9)</td>
<td>-</td>
</tr>
<tr>
<td>Compression Strength - weft</td>
<td>Method</td>
<td>SACMA 1R-94</td>
<td>-</td>
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<td>RT test</td>
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<td>840</td>
<td>-</td>
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<tr>
<td></td>
<td>(ksi)</td>
<td>(122)</td>
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<tr>
<td>ILSS – warp</td>
<td>Method</td>
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<td>EN 2563</td>
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<td>RT test</td>
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<td>78</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>(ksi)</td>
<td>(11)</td>
<td>(16)</td>
</tr>
<tr>
<td>ILSS – warp</td>
<td>Method</td>
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<td>-</td>
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<td>80°C (175°F) test</td>
<td>MPa</td>
<td>60</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(ksi)</td>
<td>(9)</td>
<td>-</td>
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<tr>
<td>In-plane Shear Strength</td>
<td>Method</td>
<td>SACMA 7R-94</td>
<td>EN 6031</td>
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<td>RT test</td>
<td>MPa</td>
<td>110</td>
<td>120</td>
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<tr>
<td></td>
<td>(ksi)</td>
<td>(16)</td>
<td>(17)</td>
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<tr>
<td>In-plane Shear Strength</td>
<td>Method</td>
<td>SACMA 7R-94</td>
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<tr>
<td>120°C (250°F) test</td>
<td>MPa</td>
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<td>-</td>
</tr>
<tr>
<td></td>
<td>(ksi)</td>
<td>(11)</td>
<td>-</td>
</tr>
</tbody>
</table>

**Comments:**

1. Data generated following vacuum bag cure at 125°C (257°F) - 2 hours
   Data normalised to Vf = 52% - except for ILSS & IPS which are based on actual resin content.

2. Data generated following vacuum bag cure at 130°C (266°F) - 4 hours
   Data normalised to Vf = 58% - except for ILSS & IPS which are based on actual resin content.

Theoretical calculated cured ply thickness quoted are based on zero bleed and is determined using the fibre weight, resin content and resin and fibre density.

**RT** = Room Temperature.

Data quoted is typical values, for comparison only. Additional data could be available on request.
Prepreg Storage Life

**Tack Life:** 30 days at 23°C (73°F)

**Out Life:** 42 days at 23°C (73°F)

**Shelf Life:** 31 months at −18°C (0°F) (maximum, from date of manufacture)

**Definitions**

**Shelf Life:** The maximum storage life for HexPly® prepreg, from date of manufacture, when stored continuously, in a sealed moisture-proof bag, at −18°C (0°F). To accurately establish the exact expiry date, consult the box label.

**Tack Life:** The time, at room temperature, during which prepreg retains enough tack for easy component lay-up.

**Out Life:** The maximum accumulated time allowed at room temperature between removal from the freezer and cure.

HexPly® M20 prepregs should be stored as received in a cool dry place or in a refrigerator. After removal from refrigerator storage, prepreg should be allowed to reach room temperature before opening the polythene bag, to prevent condensation (a full roll in its packaging can take up to 48 hours).

**Precautions for Use**

The usual precautions when handling uncured synthetic resins and fine fibrous materials should be observed, and a Safety Data Sheet is available for this product. The use of clean disposable inert gloves provides protection for the operator and avoids contamination of material and components.

For more information

Hexcel is a leading worldwide supplier of composite materials to aerospace and industrial markets. Our comprehensive range includes:

- HexTow® carbon fibers
- HexForce® reinforcements
- HiMax® multiaxial reinforcements
- HexPly® prepregs
- HexMC®-i molding compounds
- HexFlow® RTM resins
- HexBond™ adhesives
- HexTool® tooling materials
- HexWeb® honeycombs
- Acousti-Cap® sound attenuating honeycomb
- Engineered core
- Engineered products
- Polyspeed® laminates & pultruded profiles
- HexAM® additive manufacturing

For U.S. quotes, orders and product information call toll-free 1-800-688-7734. For other worldwide sales office telephone numbers and a full address list, please go to:

https://www.hexcel.com/contact