Tough 1500 Resin for Resilient Prototyping

Tough 1500 Resin is the most resilient material in our functional family of Tough and Durable Resins. It produces stiff and pliable parts that bend and spring back quickly under cyclic loading.

- Springy prototypes and assemblies
- Snap fit and press fit connectors
- Polypropylene-like strength

To the best of our knowledge the information contained herein is accurate. However, Formlabs, Inc. makes no warranty, expressed or implied, regarding the accuracy of these results to be obtained from the use thereof.
### Mechanical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Green</th>
<th>Post-Cured</th>
<th>Green</th>
<th>Post-Cured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultimate Tensile Strength</td>
<td>26 MPa</td>
<td>33 MPa</td>
<td>3771 psi</td>
<td>4786 psi</td>
</tr>
<tr>
<td>Tensile Modulus</td>
<td>0.94 GPa</td>
<td>1.5 GPa</td>
<td>136 ksi</td>
<td>218 ksi</td>
</tr>
<tr>
<td>Elongation at Break</td>
<td>69 %</td>
<td>51 %</td>
<td>69 %</td>
<td>51 %</td>
</tr>
</tbody>
</table>

### Flexural Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Green</th>
<th>Post-Cured</th>
<th>Green</th>
<th>Post-Cured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexural Strength</td>
<td>15 MPa</td>
<td>39 MPa</td>
<td>2175 psi</td>
<td>5656 psi</td>
</tr>
<tr>
<td>Flexural Modulus</td>
<td>0.44 GPa</td>
<td>1.4 GPa</td>
<td>58 ksi</td>
<td>203 ksi</td>
</tr>
</tbody>
</table>

### Impact Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Green</th>
<th>Post-Cured</th>
<th>Green</th>
<th>Post-Cured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notched IZOD</td>
<td>72 J/m</td>
<td>67 J/m</td>
<td>1.3 ft-lb/in</td>
<td>1.2 ft-lb/in</td>
</tr>
<tr>
<td>Unnotched IZOD</td>
<td>902 J/m</td>
<td>1387 J/m</td>
<td>17 ft-lb/in</td>
<td>26 ft-lb/in</td>
</tr>
</tbody>
</table>

### Thermal Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Green</th>
<th>Post-Cured</th>
<th>Green</th>
<th>Post-Cured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat Deflection Temp. @ 1.8 MPa</td>
<td>34 °C</td>
<td>45 °C</td>
<td>93 °F</td>
<td>113 °F</td>
</tr>
<tr>
<td>Heat Deflection Temp. @ 0.45 MPa</td>
<td>42 °C</td>
<td>52 °C</td>
<td>108 °F</td>
<td>126 °F</td>
</tr>
<tr>
<td>Thermal Expansion</td>
<td>114 µm/m/°C</td>
<td>97 µm/m/°C</td>
<td>63 µin/in/°F</td>
<td>54 µin/in/°F</td>
</tr>
</tbody>
</table>

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1 Material properties can vary with part geometry, print orientation, print settings, and temperature.  
2 Data was obtained from green parts, printed using Form 2, 100 µm without additional treatments.  
3 Data was obtained from parts printed using Form 2, 100 µm and post-cured with a Form Cure for 60 minutes at 70 °C.

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### Solvent Compatibility

Percent weight gain over 24 hours for a printed and post-cured 1 x 1 x 1 cm cube immersed in respective solvent:

<table>
<thead>
<tr>
<th>Solvent</th>
<th>24 Hour Weight Gain (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic Acid, 5 %</td>
<td>0.75</td>
</tr>
<tr>
<td>Acetone</td>
<td>19.07</td>
</tr>
<tr>
<td>Isopropyl Alcohol</td>
<td>315</td>
</tr>
<tr>
<td>Bleach, ~5 % NaOCl</td>
<td>0.62</td>
</tr>
<tr>
<td>Butyl Acetate</td>
<td>5.05</td>
</tr>
<tr>
<td>Diesel</td>
<td>0.11</td>
</tr>
<tr>
<td>Diethyl glycol monomethyl ether</td>
<td>5.25</td>
</tr>
<tr>
<td>Hydric Oil</td>
<td>0.17</td>
</tr>
<tr>
<td>Skydrol 5</td>
<td>0.46</td>
</tr>
<tr>
<td>Hydrogen Peroxide (3 %)</td>
<td>0.71</td>
</tr>
<tr>
<td>Isooctane</td>
<td>0.02</td>
</tr>
<tr>
<td>Mineral Oil, light</td>
<td>0.05</td>
</tr>
<tr>
<td>Mineral Oil, heavy</td>
<td>0.09</td>
</tr>
<tr>
<td>Salt Water (3.5 % NaCl)</td>
<td>0.66</td>
</tr>
<tr>
<td>Sodium hydroxide (0.025 %, pH = 10)</td>
<td>0.7</td>
</tr>
<tr>
<td>Water</td>
<td>0.69</td>
</tr>
<tr>
<td>Xylene</td>
<td>3.22</td>
</tr>
<tr>
<td>Strong Acid (HCl Conc)</td>
<td>4.39</td>
</tr>
</tbody>
</table>