Advanced HiMod® Composite Bearings

Strong and light thermoplastic composite bearings for demanding environments.

At Trelleborg Sealing Solutions, we’re experts in innovating and producing high-performance composite parts. Our solutions bring additive manufacturing technology to advanced composites, creating customized parts for critical applications in demanding environments around the world.

Our patented Automated Fiber Placement (AFP) technology is a robotic fabrication method for thermoset and thermoplastic composites. It creates high-quality, consistent and repeatable parts using a heating system to bond composite layers to one another. AFP is used to manufacture HiMod® Thermoplastic Composite Bearings that are often used as plain bearings, wear rings and bushings in a wide range of industries. Unlike other non-metal bearings, these do not crack or swell in extreme conditions making them a reliable choice for a wide range of applications. These unique bearings can operate from an extremely low temperate of -156 °C to +274 °C / -250 °F to +525 °F and are capable of continuous service even when wet, with nearly zero water absorption.

Available As:

- HiMod® Advanced Composite Bearing – continuous carbon fiber PEEK composite
- HiMod® Advanced Composite Bearing Plus – enhanced dual-layer bearing with a low friction modified PEEK liner, bonded to continuous carbon fiber PEEK composite backing
- Sizes up to 5ft (1.52m) outer diameter and 40ft (12.2m) lengths
- Made-to-order finished machined structures, stock cylinders and flanged plain bearings

Applications

- Petrochemical pump wear rings
- Oil & Gas swivel joint back-up rings
- Aerospace landing gear high-load bearings
- Aerospace hydraulic actuator housings
- Industrial heavy truck high-load bearings

Material Benefits

- Will not seize or gall
- Allows tight tolerances when mating components
- Can withstand short-term dry running wear
- Lightweight with high specific strength
- Nearly zero CTE with traditional layup
- Higher CTE available
- High chemical resistance: Continuous Carbon Fiber/PEEK
- Nearly zero moisture absorption
- Up to 50% less friction with HiMod® Advanced Composite Bearing Plus
**HiMod® Advanced Composite Bearing Properties**

<table>
<thead>
<tr>
<th>Bearing Properties*</th>
<th>HiMod® Advanced Composite Bearing Carbon/PEEK</th>
<th>HiMod® Advanced Composite Bearing Carbon/PEEK Backing + Solid lubricant-filled PEEK Liner</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Max. Compression Strength</strong>, ksi (MPa) Through-thickness direction</td>
<td>194 (1,338)</td>
<td>130 (896.3)</td>
<td>ISO 604</td>
</tr>
<tr>
<td><strong>Modulus</strong>, msi (MPa) Through-thickness direction</td>
<td>1.5 (10,342)</td>
<td>1.26 (8,687)</td>
<td>ISO 604</td>
</tr>
<tr>
<td><strong>Operating Temperature Range</strong>, °F (°C) Varies with loading and constraints</td>
<td>-250 °F to +525 °F (-156 °C to +274 °C)</td>
<td>-250 °F to +525 °F (-156 °C to +274 °C)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Coefficient of Friction</strong> Dynamic, dry, chrome plate steel</td>
<td>0.15</td>
<td>0.07</td>
<td>In-house friction/wear test</td>
</tr>
<tr>
<td><strong>Max. PV Value</strong>, psi-ft/min (MPa-m/min) Dry, Max. tested 900fpm (4.57 m/s), 4,500psi (31 MPa), 1018 Steel, 16 ± 2 µin Ra</td>
<td>250,000 (525)(^{1})</td>
<td>-(^{2})</td>
<td>(^{1})ASTM D3702 (^{2})In-house PV test Reached test machine limit before failure</td>
</tr>
<tr>
<td><strong>Wear Factor</strong>, (10^{-10}) in(^3) min/ft. lb. hr. ((10^{-8}) mm(^3)/N-m)</td>
<td>4.38 (8.82)</td>
<td>-</td>
<td>In-house friction/wear test</td>
</tr>
<tr>
<td><strong>Type of Maintenance</strong></td>
<td>Maintenance Free</td>
<td>Maintenance Free</td>
<td>-</td>
</tr>
<tr>
<td><strong>Coefficient Linear Thermal Expansion</strong>, (10^{-6}/)°F ((10^{-6}/)°C) Varies with layup</td>
<td>0.15 to 17.0 (0.27 to 30.6)</td>
<td>0.15 to 17.0 (0.27 to 30.6)</td>
<td>-</td>
</tr>
</tbody>
</table>

*HiMod® Advanced Composite Bearing raw material is unidirectional, continuous carbon fiber reinforced PEEK, 60% fiber volume. Test conditions are +73 °F (+23 °C), ambient. Friction and wear properties vary with test method, counter surface material, roughness, ambient conditions, and PV combination.