CarTech Ferrium M54 is an ultra high-strength steel for structural aerospace and other applications where 300M, 4340, and AMS 6532 are typically used. It is double-vacuum VIM/VAR processed by vacuum induction melting followed by vacuum arc remelting to provide optimum metallurgical quality and repeatability. CarTech Ferrium M54 has mechanical properties equivalent to the previously mentioned conventional alloys, but with the added benefit of very high toughness. This can be a major benefit in applications requiring high impact resistance or in flaw-tolerant designs. In addition, CarTech Ferrium M54 has greatly improved resistance to stress-corrosion cracking (SCC) compared to conventional ultra high-strength steels. It also has high hardenability, permitting less severe quench conditions for a given section size and resulting in less distortion during heat treatment.

CarTech Ferrium M54 utilizes an efficient M2C strengthening dispersion precipitated through tempering while avoiding other carbides. This maximizes strength, wear resistance, and toughness resulting in a unique combination of mechanical properties for a very high strength/toughness combination.

**APPLICATIONS**

Typical applications include aircraft landing gears, arresting tailhooks, blast-resistant or impact containment devices, armor, flap tracks, actuators, drive shafts, sporting goods, fasteners, and other structural applications.

**MECHANICAL PROPERTY DATA**

<table>
<thead>
<tr>
<th>Test Temperature</th>
<th>Room Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>YS (ksi/MPa)</td>
<td>250/1731</td>
</tr>
<tr>
<td>UTS (ksi/MPa)</td>
<td>293/2020</td>
</tr>
<tr>
<td>% El (in 1&quot;)</td>
<td>15</td>
</tr>
<tr>
<td>% RA</td>
<td>61</td>
</tr>
<tr>
<td>Fracture Toughness (ksi√in/ MPa√m)</td>
<td>115/127</td>
</tr>
</tbody>
</table>

**SPECIFICATIONS**

AMS 6516
MMPDS-09

US Patent Number 9,051,635
Applications specifically suggested for material described herein are made solely for the purpose of illustration to enable the reader to make his/her own evaluation and are not intended as warranties, either express or implied, of fitness for these or other purposes. There is no representation that the recipient of this literature will receive updated editions as they become available.

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**PHYSICAL PROPERTIES**

Density: 0.288 lb/in³ (7.98 g/cm³)

Critical Temperatures:
- $A_{cl}$ 1472°F (800°C)
- $A_{cm}$ 1616°F (880°C)
- $M_s$ 400°F (204°C)

Mean Coefficient of Thermal Expansion

<table>
<thead>
<tr>
<th>Temp Range</th>
<th>in/in/F (x 10⁻⁶)</th>
<th>mm/mm/°C (x 10⁻⁶)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75-212</td>
<td>24-100</td>
<td>5.65</td>
</tr>
<tr>
<td>75-392</td>
<td>24-200</td>
<td>5.82</td>
</tr>
<tr>
<td>75-572</td>
<td>24-300</td>
<td>5.99</td>
</tr>
<tr>
<td>75-752</td>
<td>24-400</td>
<td>6.17</td>
</tr>
<tr>
<td>75-932</td>
<td>24-500</td>
<td>6.47</td>
</tr>
<tr>
<td>75-1004</td>
<td>24-540</td>
<td>6.47</td>
</tr>
</tbody>
</table>

**CLEANLINESS REQUIREMENTS**

CarTech Ferrium M54 VIM-VAR steel conforms to AMS 2300 magnetic particle cleanliness. The microcleanliness, rated according to ASTM E-45, typically satisfies the worst field ratings:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thin</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Heavy</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

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