LESCALLOY® HY-TUF* VAC-ARC®
HIGH STRENGTH ALLOY STEEL

Typical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>C</th>
<th>Mn</th>
<th>Si</th>
<th>Ni</th>
<th>Cr</th>
<th>Mo</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.25</td>
<td>1.35</td>
<td>1.50</td>
<td>1.80</td>
<td>0.30</td>
<td>0.40</td>
</tr>
</tbody>
</table>

GENERAL CHARACTERISTICS
LESCALLOY HY-TUF VAC-ARC steel is a high strength low alloy steel. It is typically used in the 220/240 ksi (1517/1655 MPa) tensile strength range. At this strength level, the alloy has good ductility, fracture toughness and impact strength. It is vacuum arc remelted to provide optimum cleanliness and preferred ingot structure for superior mechanical properties. This alloy is most frequently used for aircraft landing gear, flap tracks and other structural applications.

PHYSICAL PROPERTIES
Density: 0.281 lb/in$^3$ (7.77 g/cm$^3$)
Thermal Conductivity: 260.0 BTU·in/h·ft·°F
(37.49 W/m·K)
Coefficient of Thermal Expansion:

<table>
<thead>
<tr>
<th>Temp Range</th>
<th>in/in°F/°F</th>
<th>mm/mm°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-200</td>
<td>6.3</td>
<td>11.3</td>
</tr>
</tbody>
</table>

HEAT TREATMENT
Normalize: 1700°F (927°C), one hour, air cool.
Austenitize: 1600°F (871°C), one hour, oil quench
Temper: 400-600°F (204-316°C), four hours, air cool.
Anneal: Heat to 1370°F (743°C) and equalize, cool 50°F (27°C) per hour to 1100°F (593°C), air cool. Reheat to 1200°F (649°C), hold for 15-20 hours, air cool. Typical resulting hardness is 230 HBW.

WORKABILITY
Forging: Forge at 1950-2250°F (1066-1232°C) using a minimum forging temperature of approximately 1700°F (927°C).
Machining: For optimum machinability, Lescalloy HY-TUF VAC-ARC steel should be normalized and tempered. A 1200°F (649°C) tempering temperature is recommended. Maximum resulting hardness should be 285 HBW. As an alternative, a conventional anneal may be used.

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TYPICAL TRANSVERSE SPECIFICATION LIMITS*

<table>
<thead>
<tr>
<th></th>
<th>UTS min ksi</th>
<th>MPa</th>
<th>0.2% YS min ksi</th>
<th>MPa</th>
<th>El min %</th>
<th>RA min %</th>
<th>Fracture Toughness min K\textsubscript{IC}</th>
<th>\sqrt{in}</th>
<th>MPa \sqrt{m}</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>220</td>
<td>1517</td>
<td>185</td>
<td>1276</td>
<td>5</td>
<td>30</td>
<td>100</td>
<td>110</td>
<td></td>
</tr>
</tbody>
</table>

* After the following heat treatment
  1725°F (940°C), one hour, air cool.
  1600°F (871°C), one hour, oil quench.
  550°F (288°C), two hours, air cool.

JOMINY END QUENCH HARDENABILITY

SPECIFICATIONS
The following popular industry specifications are offered for general familiarization and cross-reference purposes. This should not be considered a complete listing.

AMS 6425
MIL-S-7108 (Air Melt)
EMS 126 (Bendix)
DMS 1841 Grade A (McDonnell-Douglas)
NAI 1275 (Northrop)
UNS Designation K32550