LESCALLOY® 52100 VAC-ARC®
HIGH PERFORMANCE BEARING STEEL

Typical Composition

<table>
<thead>
<tr>
<th></th>
<th>C</th>
<th>Mn</th>
<th>Si</th>
<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.05</td>
<td>0.35</td>
<td>0.30</td>
<td>1.50</td>
</tr>
</tbody>
</table>

GENERAL CHARACTERISTICS
LESCALLOY 52100 VAC-ARC steel is a deep hardening alloy steel used for aircraft bearings and other high stressed parts where good rolling contact fatigue strength is required at operating temperatures below 400°F (204°C). This grade is produced by the vacuum-arc remelting process and offers greatly improved cleanliness and internal soundness over conventionally air melted bearing quality SAE 52100 steel.

This alloy can also be made available as a vacuum induction melted plus vacuum arc remelted (VIM-VAR) product.

PHYSICAL PROPERTIES
Specific Gravity: 7.8
Density: 0.28 lb/in³ (7.75 g/cm³)
Modulus of Elasticity: 29x10⁶ psi (200 GPa)
Modulus of Rigidity: 12x10⁶ psi (82.7 GPa)

COEFFICIENT OF THERMAL EXPANSION

<table>
<thead>
<tr>
<th>Temp Range °F</th>
<th>°C</th>
<th>in / in °F (x 10⁻⁶)</th>
<th>mm / mm °C (x 10⁻⁶)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 - 500</td>
<td>38 - 260</td>
<td>6.45</td>
<td>11.6</td>
</tr>
<tr>
<td>100 - 800</td>
<td>38 - 427</td>
<td>7.35</td>
<td>13.2</td>
</tr>
<tr>
<td>100 - 1000</td>
<td>38 - 538</td>
<td>7.78</td>
<td>14.0</td>
</tr>
<tr>
<td>100 - 1200</td>
<td>38 - 649</td>
<td>7.96</td>
<td>14.3</td>
</tr>
</tbody>
</table>

HEAT TREATMENT
Normalizing: Air cool from 1650-1700°F (898-926°C).
Spheroidize Anneal: An isothermal anneal of the following cycle is recommended:
1500°F (815°C) 3 hours
1350°F (734°C) 4 hours
1250°F (675°C) 3 hours
Slow cool to 1000°F (538°C) and then air cool.
Maximum annealed hardness: 207 HBW

Hardening: Quench in water from 1475-1525°F (802-829°C) or quench in oil from 1500-1550°F (816-842°C).

Tempering: Temper to desired hardness as indicated by tempering curves after water or oil quench.
LESCALLOY® 52100 VAC-ARC®

TYPICAL END QUENCH HARDENABILITY DATA

<table>
<thead>
<tr>
<th>Distance from Quenched End (1/16 inch)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rockwell C</td>
<td>67</td>
<td>66.5</td>
<td>66</td>
<td>64</td>
<td>55</td>
<td>46</td>
<td>45</td>
<td>45</td>
</tr>
</tbody>
</table>

MICROCLEANLINESS STANDARDS

<table>
<thead>
<tr>
<th>Typical Microscopic Cleanliness Requirements (J/K ASTM E45)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worst field, thin</td>
<td>1.5</td>
<td>1.0</td>
<td>1.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Worst field, heavy</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Frequency for A, B and C thin type inclusions combined, there shall not be more than three 1.5 (A type) fields and not more than five 1.0 fields. For type D thin, there shall not be more than three 1.5 fields and not more than two 1.0 fields. There shall not be more than one field each of 1.0 heavy type A, B, C or D. Note: Fields of less than 1.0 are not ratable.

FORGING

Forge at 1950-2100°F (1065-1149°C). Do not forge below 1700°F (926°C). After forging equalize at 1375°F (746°C) and hold for 4-6 hours, then air cool.

MACHINABILITY RATING

In the annealed condition the machinability rating of Lescalloy 52100 VAC-ARC steel is 45% of B-1112 steel. Cold drawn bars exhibit a 37% rating.

FORMS AVAILABLE

Billets; hot rolled rounds, square and flat bars; rough turned and centerless ground bars; forgings.

SPECIFICATIONS

The following specifications are offered for general reference and should not be considered a complete listing.

AMS 6444
CFR 5202 (SNFA) (VAR)
CFR 5201 (SNFA) (VIM-VAR)
EMS 166 (Timken Aerospace)
EMS 26 (Timken Aerospace)
EMS 26.1 (Timken Aerospace) (VIM-VAR)
FL-LA 2211.8 (VAR) (FAG)
FL-LA 2211.9 (VAR) (FAG)
FL-LA 2211.5 (VIM-VAR) (FAG)
KMB-600 (Kaydon)
MP-48 (RBC)

MS 30 (MRC)
MS 194 (MRC) (VIM-VAR)
MS 112 (Winstead)
MSP-10-27-02 (McGill)
PES 1.104 (NHBB)
PES 1.106 (NHBB)
CPW 52 (Pratt & Whitney)
PWA 723 (Pratt & Whitney)
SM6 (NMB)
SA1253 (Barden) (VAR)
SA5589 (Barden) (VIM-VAR)