MOLYBDENUM ARC-CAST PRODUCTS

MOLYBDENUM ALLOY TZM AFBT
Arc-Cast Forging Billet

Description of Product
This specification covers carbon-deoxidized TZM alloy. (Molybdenum + 0.5 %
titanium + 0.08 % zirconium) wrought forging billets produced from ingots
consolidated by the H.C. Starck consumable electrode vacuum-arc-casting
process.

Chemical Characteristics
(Mass fraction in % [cg/g]; ppm [µg/g])

<table>
<thead>
<tr>
<th></th>
<th>min.</th>
<th>99.25 %</th>
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</thead>
<tbody>
<tr>
<td>Mo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ni</td>
<td>max.</td>
<td>0.002 %</td>
</tr>
<tr>
<td>*N</td>
<td>max.</td>
<td>0.002 %</td>
</tr>
<tr>
<td>*O</td>
<td>max.</td>
<td>0.0025 %</td>
</tr>
<tr>
<td>Fe</td>
<td>max.</td>
<td>0.008 %</td>
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<tr>
<td>Si</td>
<td>max.</td>
<td>0.008 %</td>
</tr>
<tr>
<td>C</td>
<td>0.01 - 0.030 %</td>
<td></td>
</tr>
<tr>
<td>Zr</td>
<td>0.06 - 0.12 %</td>
<td></td>
</tr>
<tr>
<td>Ti</td>
<td>0.40 - 0.55 %</td>
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*Unless method of analysis is agreed upon, deviations from these limits alone shall not be cause for rejection.

Mechanical Properties
The billets will be supplied in the recrystallized condition, with a maximum
hardness of 215 B.H.N. (10 mm ball/1500 kg/30 sec.). Material can be supplied in
the stress-relieved condition upon request.

Dimensional Tolerance
The diameter of each billet will be uniform along its length within ± 1/16 inch. Any
variation in diameter will be smoothly blended into adjacent areas.

1) Information on testing methods on request.
Surface Condition
Billets will be supplied with machined or chemically cleaned surfaces. Minor surface imperfections revealed by dye penetrant inspection may be removed by conditioning to a maximum depth of 0.090 inch. The internal integrity of all billets will be determined by ultrasonic inspection and shall satisfy H.C. Starck Ultrasonic Specification No. (latest revision).

Identification
All billets will be identified with an appropriate ingot number. Each shipping container will be marked with the name of the customer and the purchase order number.

none.

Reports
Shipments will be accompanied by documents which indicate the applicable specification number, purchase order number, ingot number, chemical analyses and hardness.

Rejection
H.C. Starck must receive written notification of rejected material with the reason for rejection. The right is reserved to inspect rejected material at customer plant for claim validation. The material may be returned only after proper authorization.