Aerospace Aluminum
AA5024 AlMgSc Sheet
Aluminum Magnesium Scandium Technology

DESCRIPTION
Aleris AlMgSc alloy AA5024 H116 as part of its AlMgSc technology allows to considerably simplify the manufacturing process of aircraft fuselage components. With AA5024 H116 AlMgSc, stringer reinforced aircraft fuselage components can be either Laser Beam Welded (LBW) or Friction Stir Welded (FSW) when the individual parts are still flat, without any prior treatment. The single or double curvature of the fuselage part required for the aircraft body is achieved by creep forming at elevated temperature.

Using this method, there is no distortion or springback of the material, thus enabling a high-precision and cost-effective production process. Even for traditionally riveted designs AlMgSc sheets can be formed with subsequent attachment of any kind of stringer material.

AA5024 H116 Sheet
- low density
- good weldability
- excellent damage tolerance
- good corrosion resistance
- creep-formable
- thermally stable
- easy-to-recycle

APPLICATION
AA5024 H116 low density sheets are recommended for use as fuselage skin sheet with medium strength but excellent damage tolerance and corrosion properties and can potentially replace traditionally used 2xxx alloys even as drop-in solution. The material is supplied in bare condition.

AVAILABILITY
Sheets in AA5024 H116 are typically produced in gauges between 1.6 and 8.0 mm and supplied in annealed condition. Other dimensions as well as a material safety data sheet are available upon request.

Chemical Composition Limits (all data in wt.-%) according to the Aluminum Association

<table>
<thead>
<tr>
<th>Alloy</th>
<th>Si</th>
<th>Fe</th>
<th>Cu</th>
<th>Mn</th>
<th>Mg</th>
<th>Cr</th>
<th>Zn</th>
<th>Ti</th>
<th>Zr</th>
<th>Sc</th>
<th>Others each</th>
<th>Others total</th>
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</thead>
<tbody>
<tr>
<td>AA5024</td>
<td>0.25</td>
<td>0.40</td>
<td>0.20</td>
<td>0.20</td>
<td>3.9-5.1</td>
<td>0.1</td>
<td>0.25</td>
<td>0.2</td>
<td>0.05-0.2</td>
<td>0.10-0.40</td>
<td>0.05</td>
<td>0.15</td>
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</table>

Mechanical Properties (typical values)*

<table>
<thead>
<tr>
<th>Alloy</th>
<th>Temper</th>
<th>Thickness</th>
<th>Tensile</th>
<th>Yield strength</th>
<th>Elongation strength</th>
<th>Compression</th>
<th>Tension yield strength</th>
<th>Compression modulus</th>
<th>Density modulus</th>
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<tbody>
<tr>
<td></td>
<td>[mm]</td>
<td>[MPa]</td>
<td>[MPa]</td>
<td>[MPa]</td>
<td>[%]</td>
<td>[MPa]</td>
<td>[MPa]</td>
<td>[GPa]</td>
<td>[GPa]</td>
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<tr>
<td>AA5024</td>
<td>H116</td>
<td>1.6</td>
<td>395</td>
<td>380</td>
<td>315</td>
<td>15</td>
<td>325</td>
<td>72</td>
<td>2.65</td>
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<td></td>
<td>3</td>
<td>380</td>
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<td>1.00</td>
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<td></td>
<td>7</td>
<td>380</td>
<td>375</td>
<td>305</td>
<td>17</td>
<td>295</td>
<td>10</td>
<td>0.096</td>
</tr>
<tr>
<td>AA5024</td>
<td>H116</td>
<td>0.06</td>
<td>57</td>
<td>55</td>
<td>46</td>
<td>15</td>
<td>47</td>
<td>10</td>
<td>0.096</td>
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<td></td>
<td>0.12</td>
<td>55</td>
<td>54</td>
<td>44</td>
<td>15</td>
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<td>10</td>
<td>0.096</td>
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<td>0.28</td>
<td>55</td>
<td>54</td>
<td>44</td>
<td>15</td>
<td>43</td>
<td>10</td>
<td>0.096</td>
</tr>
</tbody>
</table>

* after creep forming and welding, if applicable
CORROSION RESISTANCE
- NAMLT (Nitric Acid Mass Loss Test) according to ASTM G67-04 requirement: < 15 mg/cm² typical values: < 6 mg/cm²
- SCC according to ASTM G44-99 250 MPa, 30 days without failure
- ASSET (Assessment of Exfoliation Corrosion Test) according to ASTM G66-99 requirement: better or equal PC typical values: PA

PROCUREMENT SPECIFICATION
Temper, AMS and MMPDS registration pending. AA5024 H116 is covered by the Airbus specification AIMS 03-04-055 (Technical qualification complete, customer paperwork pending).

FATIGUE CRACK GROWTH

\[
\begin{align*}
da/dN [\text{mm/cycle}] & \quad \Delta K [\text{MPa m}^{1/2}] \\
10 & \quad 10 \quad 20 \quad 30 \quad 40 \quad 50 \quad 60 \\
10^{-13} & \quad 10^{-14} & \quad 10^{-15} & \quad 10^{-16} & \quad 10^{-17} & \quad 10^{-18}
\end{align*}
\]

S-N FATIGUE*

\[
\begin{align*}
\sigma_{\text{max}} [\text{MPa}] & \quad \Delta a_e [\text{mm}] \\
400 & \quad 200 \quad 100 \quad 50 \quad 0 \\
10^2 & \quad 10^3 \quad 10^4 \quad 10^5 \quad 10^6 \quad 10^7 \\
\end{align*}
\]

\* Open hole specimen according to EN 6072; Kt=2.5, R=0.1

FRACTURE TOUGHNESS – R-CURVE

\[
\begin{align*}
K_1 [\text{MPa m}^{1/2}] & \quad K_2 [\text{MPa m}^{1/2}] \\
0 & \quad 0 \quad 20 \quad 40 \quad 60 \quad 80 \quad 100 \\
\text{L-T} & \quad \text{T-L} \\
\end{align*}
\]

\* not thermally exposed
\* 85°C / 1000 h
\* 85°C / 3000 h

Source: Airbus