2xxx Plate

2xxx

2XXX series alloys contain copper as the main alloying element, often in combination with magnesium and silicon.

Strength:
Strength is developed through solution treatment and natural ageing (T351, T451) or artificial age hardening (T651, T851). Strength levels in the naturally aged alloys may be further increased by artificial ageing, but this reduces fatigue properties and toughness.

Welding:
With the exception of a few specialised alloys, the 2XXX series alloys are not generally weldable by fusion welding.

Corrosion:
2XXX alloys are susceptible to corrosion and may be require protective surface treatments such as anodising or painting.

2XXX alloys are generally used where good levels of strength and toughness are required. The most widely used alloys in this series are 2014A, 2017A and 2024.

Applications include:
- Machined parts
- Truck wheels
- Load cells
Alcoa Europe only supply plate that exceeds the requirements issued by the major specifying authorities e.g. European Standards (a summary of the main requirements of EN485 is available on request).

Radii expressed as thickness (t) are minimum recommended for bending plates in a standard press brake with air bend dies. Minimum permissible radii will also vary with design and condition of tooling. Forming over smaller radii is possible immediately after solution heat treatment and quenching.

**TYPICAL PHYSICAL PROPERTIES**

<table>
<thead>
<tr>
<th>Alloy</th>
<th>Temper</th>
<th>Relative Density</th>
<th>Co-efficient of Linear Expansion (20°C - 100°C) 10^-6°C</th>
<th>Thermal Conductivity (0-100°C) W/m°C</th>
<th>Electrical Resistivity (20°C) micro-Ohm cm</th>
<th>Melting Range °C</th>
<th>Young's Modulus (GPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014A</td>
<td>T651</td>
<td>2.81</td>
<td>22.0</td>
<td>159</td>
<td>4.5</td>
<td>530-610</td>
<td>74</td>
</tr>
<tr>
<td>2017A</td>
<td>T451</td>
<td>2.81</td>
<td>23.6</td>
<td>134</td>
<td>5.0</td>
<td>510-640</td>
<td>72</td>
</tr>
<tr>
<td>2024</td>
<td>T351</td>
<td>2.77</td>
<td>23.0</td>
<td>151</td>
<td>5.7</td>
<td>500-640</td>
<td>73</td>
</tr>
</tbody>
</table>

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**2014/2014A, 2017A AND 2024**

2014 and 2014A are commonly supplied in the T651 temper, offering a higher level of strength than 6XXX, and good toughness. Alcoa can also supply 2014/2014A in O condition, which gives good formability and permits further strengthening by means of heat treatment.

2017A and 2024 are characterised by high levels of strength and toughness, allied to good fatigue properties. Because they develop good levels of strength through natural ageing they are usually supplied in the T451 and T351 conditions respectively. Strength in 2024 can be further increased by means of artificially ageing, but this is achieved at the expense of fatigue properties and toughness. Fatigue resistance is higher in 2024 T351 compared to 2017A T451. These alloys are often selected when fatigue is an important consideration and are widely used for other engineering applications.

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Advice and further details on Alcoa’s specialised alloys is available on request.

**FORMABILITY**

<table>
<thead>
<tr>
<th>Thickness</th>
<th>6 mm</th>
<th>9 mm</th>
<th>12 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014A</td>
<td>T651</td>
<td>8t</td>
<td>8.5t</td>
</tr>
<tr>
<td>2017A</td>
<td>T451</td>
<td>7t</td>
<td>7.5t</td>
</tr>
<tr>
<td>2024</td>
<td>T351</td>
<td>7t</td>
<td>7.5t</td>
</tr>
</tbody>
</table>

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