Features of EN AW-5083

The EN AW-5083 ranks among the non-curable (naturally hard) alloys. Correspondingly, they can either be used directly or reshaped after homogenization. A heat treatment for increasing strength is not possible. Due to its very good corrosion resistance, this alloy is primarily used in shipbuilding and in the chemical industry.

Chemical Composition*

<table>
<thead>
<tr>
<th>Element</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>others, each</th>
<th>others, total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min.</td>
<td></td>
<td>0.40</td>
<td>4.0</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max.</td>
<td></td>
<td>0.40</td>
<td>0.10</td>
<td>1.0</td>
<td>4.9</td>
<td>0.25</td>
<td>0.25</td>
<td>0.15</td>
<td>0.05</td>
<td>0.15</td>
</tr>
</tbody>
</table>

Customer-Specific Adjustments

For many of our customers, the standard-compliant adherence of the chemical composition as represented above is not sufficient. We can therefore construct or further limit the analysis presets specially according to your processing needs and quality requirements for the end product. The feasible span of the individual elements in depicted in the following graphic below. In addition, we are capable of producing high-purity allows with only low amounts of sodium, calcium, or beryllium, which facilitates optimal end results. Typical values can be drawn from the graphic on the right.

A limitation of non-listed elements, or a further limitation of individual elements, is possible upon consultation.
Structure of Our Billets

Depending on the process, a segregation zone occurs immediately in the marginalized layer of continuously cast billets.

Fundamentally, these should be removed prior to further processing of the billet: this is already the case for the turned billets we produce. Usually, these billets are also subjected to a final quality test by means of an automatic ultrasonic test underwater.

In the case of casting lengths, the depth of the segregation zone is shown by way of example at D. 178 mm.

Casting Length Dimensions:

- Ø 178 mm
- Ø 203 mm
- Ø 225 mm
- Ø 252 mm
- Ø 277 mm
- Ø 313 mm
- Ø 372 mm
- Ø 424 mm
- Ø 432 mm
- Ø 525 mm

There is no standard for cast round rods (cast billets/bolts) that defines mechanical properties. A Brinell hardness in the homogenized state of approx. 72 HBW can be named as a guideline for cast material. The homogenized state (=“O3” as per EN 515) is comparable in strength with the annealed state (=“O” ) for extruded products. The final strength is essentially adjusted by the reshaping processes and/or heat treatments of our customers. On the next page, you can find empirical values on attainable strength values depending on the heat treatment.

Mechanical Properties

Turned billets can be produced in all diameters from D. 140 mm – D. 500 mm.
Empirical Values

We generally ship billets in the homogenized state (O3). This has the benefit of guaranteeing a consistent structure as well as good properties for further processing with reshaping processes like forging or extruding. Empirical values of attainable mechanical properties can be found in the table “Mechanical Parameters.” Furthermore the physical properties of the alloy, as well as the possible heat treatments and technological properties, are also listed here.

Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>2.8 g / cm³</td>
</tr>
<tr>
<td>Solidification range</td>
<td>512 – 650 °C</td>
</tr>
<tr>
<td>Electr. Conductivity</td>
<td>18 - 28 MS / m</td>
</tr>
<tr>
<td>Thermal conductivity</td>
<td>130 - 200 W / (mK)</td>
</tr>
<tr>
<td>Modulus of elasticity</td>
<td>72,500 MPa</td>
</tr>
<tr>
<td>Specific heat</td>
<td>860 J / (kgK)</td>
</tr>
<tr>
<td>Shear modulus</td>
<td>27,200 MPa</td>
</tr>
</tbody>
</table>

Heat Treatment

Soft annealing, recrystallization annealing

- Annealing temperature: 380 - 420 °C
- Heat-up time: 1-2 h
- Cooling conditions: 30 – 50 °C / h

Mechanical Parameters

<table>
<thead>
<tr>
<th>Condition</th>
<th>$R_{p0.2}$ (MPa)</th>
<th>$R_m$ (MPa)</th>
<th>A (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>110</td>
<td>270</td>
<td>10</td>
</tr>
<tr>
<td>H111</td>
<td>110</td>
<td>270</td>
<td>10</td>
</tr>
<tr>
<td>H112</td>
<td>125</td>
<td>270</td>
<td>10</td>
</tr>
</tbody>
</table>

(all stated values for extruded round rods d between 80-200 mm)

Technological Properties*

- Weldability
  - Gas: o
  - WIG / MIG / Resistance welding: +
- Surface treatment
  - Protective anodization: +
  - Anodization, decorative: o
  - Veneer, coating: o
- Cold reshapeability
  - Bending: +
  - Pressing: o
  - Deep-drawing: +
  - Upsetting: +
  - Impact Extrusion: o
- Corrosion resistance
  - Atmospheric conditions: ++
  - Seawater: ++
- Brazability
  - Hard soldering with / without flux: -
  - Abrasion soldering: o
  - Soft soldering with flux: -
- Hot reshapeability
  - Extrusion molding: -
  - Drop forging / Open die forging: o
- Machinability
  - Annealed: o
  - Work-hardened: +
- Use in contact with food: Yes

*: ++: Very good, ---: Not possible