Wieland-LV3
CuNi9Sn6 | Age hardening Copper-Nickel alloy

Material designation
EN not standardized
UNS C72700

Chemical composition*
Cu Rest
Ni 9 %
Sn 6 %
Pb ≤ 0.02 %
* Reference values in % by weight

Physical properties*
Electrical conductivity MS/m 5.2/7–8.7
%IACS 9/12
Thermal conductivity W/(m·K) 54
Thermal expansion coefficient (0–300 °C) 10^-6/°K 17.3
Density g/cm^3 8.89
Moduls of elasticity GPa 120
*Reference values at room temperature

Corrosion resistance
High-copper alloys generally exhibit good resistance to organic substances and neutral or alkaline compounds. Insensitive to stress corrosion cracking.

Material properties and typical applications
Wieland LV3 is an age-hardenable alloy which is excellently suited for highly technical parts. The property profile of the finished parts can be specifically adjusted by heat treatment. High strengths of more than 1,000 MPa can be achieved which allow miniaturisation of the component and at the same time offer good spring properties even at higher operating temperatures. LV3 can be used as an alternative to copper-beryllium alloys.

Applications: Springs, spectacles, miniature components, turned parts such as connectors.

The material is lead free according to RoHS and ELV.

Types of delivery
The Extruded and Drawn Products Division supplies bars, wire, sections and tubes. Please get in touch with your contact person regarding the available delivery forms, dimensions and tempers.

Fabrication properties
Forming
Machinability (CuZn39Pb3 = 100 %) 30 %
Capacity for being cold worked excellent
Capacity for being hot worked good

Joining
Resistance welding (butt weld) good*
Inert gas shielded arc welding good*
Gas welding fair*

Hard soldering good*
Soft soldering good
*high temperatures change the ageing condition

Surface treatment
Polishing mechanical electrolytic good good
Electroplating excellent

Heat treatment
Melting range 968–1,078 °C
Hot working 780–950 °C
Soft annealing 750–800 °C
Age hardening 350°C / 3 h

Product standards
Rod not standardized
Wire not standardized
Section not standardized

*Reference values in % by weight
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Dimensions and mechanical properties

Standard values for achievable tensile strength $R_m$ according to dimensional ranges

<table>
<thead>
<tr>
<th>Rods and wire</th>
<th>up to 8 mm</th>
<th>$R_m$ 400–1,200 MPa</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8.1–10 mm</td>
<td>$R_m$ 400–1,000 MPa</td>
</tr>
</tbody>
</table>

Possible tempers, guide values for mechanical properties

<table>
<thead>
<tr>
<th>TB</th>
<th>Solution annealed</th>
<th>from</th>
<th>up to</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_m$ [MPa]</td>
<td>500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_{p0.2}$ [MPa]</td>
<td>250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A50 [%]</td>
<td>30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TF</th>
<th>Solution annealed, age hardened</th>
<th>from</th>
<th>up to</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_m$ [MPa]</td>
<td>750</td>
<td>850</td>
<td></td>
</tr>
<tr>
<td>$R_{p0.2}$ [MPa]</td>
<td>500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A50 [%]</td>
<td>20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TD</th>
<th>Solution annealed and cold drawn</th>
<th>from</th>
<th>up to</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_m$ [MPa]</td>
<td>520</td>
<td>&gt; 850</td>
<td></td>
</tr>
<tr>
<td>$R_{p0.2}$ [MPa]</td>
<td>500</td>
<td>&gt; 780</td>
<td></td>
</tr>
<tr>
<td>A50 [%]</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TH</th>
<th>Solution annealed, cold drawn, age hardened</th>
<th>from</th>
<th>up to</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_m$ [MPa]</td>
<td>950</td>
<td>&gt; 1,200</td>
<td></td>
</tr>
<tr>
<td>$R_{p0.2}$ [MPa]</td>
<td>830</td>
<td>&gt; 1,150</td>
<td></td>
</tr>
<tr>
<td>A50 [%]</td>
<td>0.1</td>
<td>&gt; 13</td>
<td></td>
</tr>
</tbody>
</table>

Thermische Relaxation

Thermal Stress Relaxation LV3 – Age hardened 350°/3h
Tension $s_1 = 0.8 \times R_{p0.2}$

Stress remaining after thermal relaxation as a function of Larson-Miller parameter $P$:

$$P = (20 + \log(t)) \times (T + 273) \times 0.001$$

Time $t$ in hours
Temperature $T$ in °C

Example: $P = 9$ is equivalent to 1,000h/118 °C

![Graph of residual stress remaining after thermal relaxation as a function of Larson-Miller parameter P.](image)

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