Spinodal®: The High Performance Copper Alloy Strip

- Available in Mill Hardened Tempers
- Available in Age Hardenable Tempers
- Burn-in and Elevated Temperature Applications

SPINODAL Metallurgy

- Spinodal strengthening occurs spontaneously during aging and results from submicroscopic chemical composition fluctuations.
- For Spinodal, the alloying elements are homogeneous throughout the strip prior to aging due to the wrought powder metallurgy process.
- Spinodal hardening is distinctly different metallurgically from precipitation hardening that occurs in other alloys.
- The amount of cold rolling, aging temperature and time all affect the strength and formability of Spinodal

SPINODAL Properties and Benefits

- Excellent high temperature stress relaxation resistance
- High strength and excellent formability
- Lack of distortion during aging
- Available in mill hardened and age hardenable tempers
- Excellent solderability and resistance to intermetallic formation at high temperature
- Excellent corrosion resistance and ease of cleaning. In moist ammonia it resists corrosion for over 500 hrs. at 400°C
- Lower initial cost and cost savings during processing

Chemical Composition

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Nickel</td>
<td>14.5-15.5%</td>
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AMETEK Nickel Strip | Spinodal: The High Performance Copper Alloy Strip

Tin | 7.5-8.5%
Copper | Balance
Copper and Named Elements | 99.9%
Other Elements | 0.1% Maximum

C72900 is CDA-UNS designation for Cu-15 Ni-8 Sn alloy. ASTM B-740 standard specification for Copper-Nickel-Tin Spinodal alloy strip.

Physical Properties of Spinodal C72900

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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<tbody>
<tr>
<td>Electrical Conductivity at 68°F (20°C)</td>
<td>7.8% IACS</td>
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<tr>
<td>Electrical Conductivity at 392°F (200°C)</td>
<td>7.3% IACS</td>
</tr>
<tr>
<td>Thermal Capacity (Specific Heat)</td>
<td>0.09 (30x10³)</td>
</tr>
<tr>
<td>Thermal Conductivity</td>
<td>17 Btu/ft. Hr. °F at 68°\n29 Btu/ft. Hr. °F at 20°C</td>
</tr>
<tr>
<td>Coefficient of Thermal Expansion</td>
<td>9.1x10⁻⁶ Per °F\n16.4x10⁻⁶ Per °C</td>
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<tr>
<td>Modulus of Elasticity (Tension)</td>
<td>18.5x10⁶ psi (127x10³ MPa)</td>
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<tr>
<td>Modulus of Rigidity</td>
<td>7.5x10⁶ psi (52x10³ MPa)</td>
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<tr>
<td>Density</td>
<td>0.323 lb./in³ (8.95 gm/cc)</td>
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Cu-Ni-Sn Pseudo-Binary Phase Diagram
Available in Mill Hardened Tempers

- Mill Hardened Temper Designations for Spinodal C72900
- 0.01% Yield Strength vs. 0.2% Yield Strength for Spinodal and BeCu Strip
- Spinodal 180° Minimum Bend Ratio vs. 0.2% Yield Strength

Available in Age Hardenable Tempers

- Mechanical Properties of Age Hardenable Spinodal Alloy C72900
- Mechanical Properties of Age Hardened Spinodal Alloy C72900
- No Distortion
- Dimensional Changes of Spinodal and BeCu During Age Hardening
- Equipment and Atmosphere
- Heat Treating Parameters for Spinodal Parts
- Heat Treating Curves for Spinodal Parts
- Special Consideration for Heat Treatment of Spinodal Parts
- Stress/Thermal Relaxation

Burn-in and Elevated Temperature Applications

- Soldering
- Application of Common Solders
- Lower Intermetallic Formation Rate of Solders at 150° with Spinodal C72900 Than With Beryllium-Copper C17200