



**AMETEK**  
SPECIALTY METAL PRODUCTS

**NICKEL STRIP**

**SPINODAL COPPER**



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## Spinodal®: The High Performance Copper Alloy Strip

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### 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

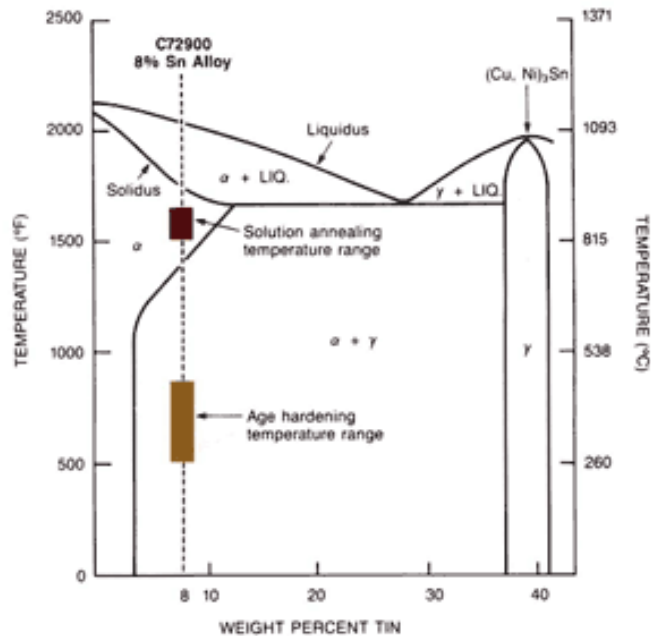
Nickel

14.5-15.5%

<b>Tin</b>	7.5-8.5%
<b>Copper</b>	Balance
<b>Copper and Named Elements</b>	99.9%
<b>Other Elements</b>	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.	

<b>Physical Properties of Spinodal C72900</b>		
<b>Electrical Conductivity at 68°F (20°C)</b>	7.8%	IACS
<b>Electrical Conductivity at 392°F (200°C)</b>	7.3%	IACS
<b>Thermal Capacity (Specific Heat)</b>	0.09 (30x10 <sup>3</sup> )	Btu/lb.° at 68° (J/Kg K)
<b>Thermal Conductivity</b>	17 29	Btu/ft . Hr . °F at 68° w/m.°k. at 20°C
<b>Coefficient of Thermal Expansion</b>	9.1x10 <sup>-6</sup> 16.4x10 <sup>-6</sup>	Per °F 68°F-572°F Per °C 20°C-200°C
<b>Modulus of Elasticity (Tension)</b>	18.5x10 <sup>6</sup> (127x10 <sup>3</sup> )	psi (MPa)
<b>Modulus of Rigidity</b>	7.5x10 <sup>6</sup> (52x10 <sup>3</sup> )	psi (MPa)
<b>Density</b>	0.323 (8.95)	lb./in <sup>3</sup> (gm/cc)

### 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](#)



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