

# Wieland-B15

CuSn5 | C51000 | CW451K

CuSn5 is the most frequently used phosphor bronze in North America (European equivalent: CuSn6). It is characterized by a favorable combination of cold formability, strength, electrical conductivity and spring properties. It even provides reasonable thermal stability. This makes CuSn5 strip a prime candidate for signal connectors produced by stamping and bending operations, which require a certain spring force. It is also very frequently used for compliant pins with a flexible press-fit zone. The temperature stability of this alloy allows application even at elevated service temperatures. Thermal relaxation is negligible at 100 °C and acceptable up to 120 °C.

### Chemical composition (Reference)

Sn	5 %
Cu	remainder

### Physical properties (Reference values at room temperature)

Electrical conductivity	11 MS/m	19 %IACS
Thermal conductivity	82 W/(m·K)	47 Btu·ft/(ft <sup>2</sup> ·h·°F)
Coefficient of electrical resistance*	0.9 10 <sup>-3</sup> /K	0.5 10 <sup>-3</sup> /°F
Coefficient of thermal expansion*	17.8 10 <sup>-6</sup> /K	9.9 10 <sup>-6</sup> /°F
Density	8.85 g/cm <sup>3</sup>	0.320 lb/in <sup>3</sup>
Modulus of elasticity	120 GPa	17,500 ksi
Specific heat	0.377 J/(g·K)	0.090 Btu/(lb·°F)
Poisson's ratio	0.34	0.34

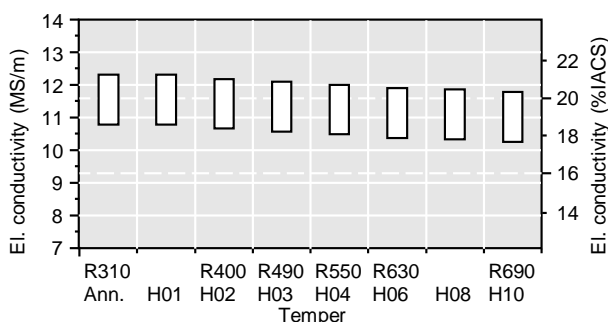
\* Between 0 and 300 °C

### Mechanical properties (values in brackets are for information only)

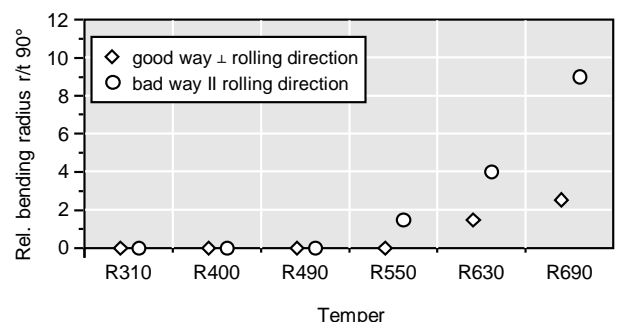
Temper	Tensile strength R <sub>m</sub>		Yield strength R <sub>p0.2</sub>		Elongation A <sub>50</sub> %	Hardness HV
	MPa	ksi	MPa	ksi		
R310	310-390	45-57	≤ 250	≤ 36	≥ 45	(75-105)
R400	400-500	58-72	≥ 340	≥ 49	≥ 14	(120-160)
R490	490-580	71-84	≥ 450	≥ 65	≥ 8	(160-190)
R550	550-640	80-93	≥ 520	≥ 75	≥ 4	(180-210)
R630	630-720	91-104	≥ 600	≥ 87	≥ 3	(200-230)
R690	≥ 690	≥ 100	≥ 670	≥ 97	-	(≥ 210)
Annealed*	315-385	46-56	≥ 130	≥ 19	≥ 48	
H01*	340-420	49-61	≥ 150	≥ 22	≥ 32	
H02*	400-505	58-73	≥ 325	≥ 47	≥ 10	
H03*	470-545	68-79	≥ 420	≥ 61	≥ 10	
H04*	525-625	76-91	≥ 510	≥ 74	≥ 9	
H06*	605-710	88-103	≥ 585	≥ 85	≥ 2	
H08*	655-760	95-110	≥ 635	≥ 92	≥ 1	
H10*	690-785	100-114	≥ 675	≥ 98	≥ 1	

\* According to ASTM B888

### Electrical conductivity



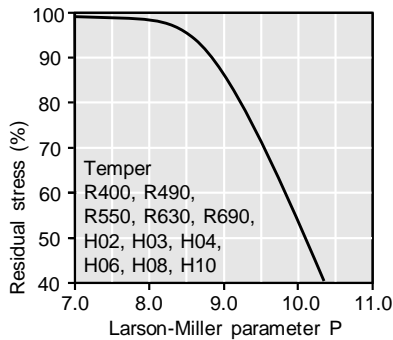
### Bendability (Strip thickness t ≤ 0.5 mm)



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## Thermal stress relaxation



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

(F. R. Larson, J. Miller, Trans ASME74 (1952) 765–775) given by:  
 $P = (20 + \log(t)) \cdot (T + 273) \cdot 0.001$

Time t in hours, temperature T in °C.

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

Measured on stress relief annealed specimens parallel to rolling direction.

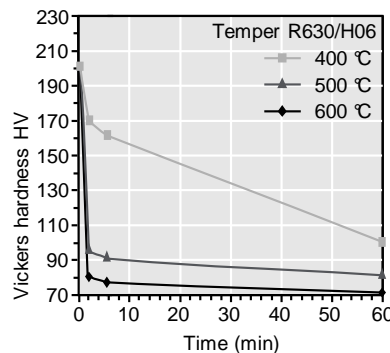
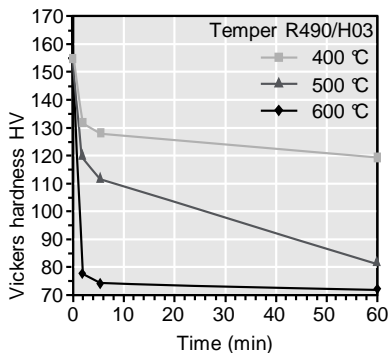
Total stress relaxation depends on the applied stress level.

Furthermore, it is increased to some extent by cold deformation.

## Fatigue strength

The fatigue strength is defined as the maximum bending stress amplitude which a material withstands for  $10^7$  load cycles under symmetrical alternate load without breaking. It is dependent on the temper tested and is about 1/3 of the tensile strength  $R_m$ .

## Resistance to softening



Vickers hardness after heat treatment (typical values)

## Types and formats available

- Standard coils with outside diameters up to 1,400 mm
- Traverse-wound coils with drum weights up to 1.5 t
- Multicoil up to 5 t
- Hot-dip tinned strip
- Contour-milled strip
- Sheet
- Strip and sheet with protective coating

## Dimensions available

- Strip thickness from 0.10 mm, thinner gauges on request
- Strip width from 3 mm, however min. 10 x strip thickness

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