C51100
CuSn4

KME

Industrial Rolled

Alloy Designation	
EN	CuSn4
DIN CEN/TS 13388	CW450K
JIS	C 5111
BS	PB 101
UNS	C51100

Bronze Rolled Products

KME provides highest quality bronze strips for an extremely wide range of industrial applications: from connectors to electrical contacts, from membranes to spring elements and switches.

Chemical Composition Weight percentage		
Cu	Rest	
Sn	3.5 – 4.5	%
P	0.03 – 0.35	%

This alloy is in accordance with RoHS 2002/96/CE for electric & electronic equipments and 2002/53/CE for automotive industry

Characteristics

CuSn4 provides an excellent combination of strength, excellent formability and hardness. It has a good electrical conductivity and corrosion resistance. Soldering and brazing properties are excellent. We offer exceptionally narrow tolerances with regard to chemical composition, dimensional precision and mechanical properties. Special characteristics such as superfine particle size or thermal-mechanical stress relieving improve mechanical properties and provide increased strength and greater malleability.

Main Applications

Architecture: Bridge Bearing Plates.
Electrical: Miniaturized Connectors, Contact Springs, Relais Springs, Terminals, Switch Parts Fuse Clips, Electronic Connectors
Fasteners: Lock Washers, Fasteners.
Industrial: Bellows, Textile Machinery, Perforated Sheets, Springs, Sleeve Bushing, Clutch Disks, Beater Bar, Chemical Hardware
General: Stamped parts, Connectors, Contact springs, Spring elements, Ultra high strength spring elements, Membranes, Switch elements, Fixed contacts.

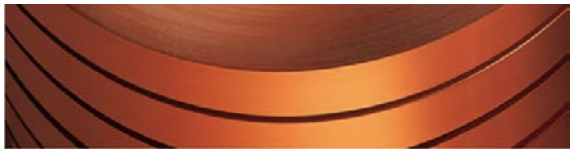
Preferred Applications

Spring Contact	Pin Contact	Fuse; Relay Box; Punshed Screen	Switches; Relays	Low Temperature Range ≤ 130°C	Current Carrying Capacity
x	x		x	x	

x = well suited xx = particularly well suited

Physical Properties Typical values in annealed temper at 20 °C			
Density		8.85	g/cm³
Thermal expansion coefficient	20 .. 100 °C	17.8	10^{-6}/K
	20 .. 200 °C	18.1	10^{-6}/K
Specific heat capacity		0.377	J/(g·K)
Thermal conductivity		100	W/(m·K)
Electrical conductivity (1 MS/m = 1 m/(Ω mm²)		≥ 11	MS/m
Electrical conductivity (IACS)		≥ 19	%
Thermal coefficient of electrical resistance (0 .. 100 °C)		0.10	10^{-3}/K
Modulus of elasticity (1 GPa = 1 kN/mm²)	cold formed	110	GPa
	annealed	120	GPa

C51100
CuSn4



KME

Industrial Rolled

Mechanical Properties (EN 1652)							
Temper		**Tensile Strength**	**Yield Strength Standard**	**Elongation Standard**	**Yield Strength Bending optimized**	**Elongation Thermal Stress Relieved**	**Hard-ness**
		Rm	**$Rp_{0.2}$**	**A_{50mm} Minimum**	**$Rp_{0.2}$ Minimum**	**A_{50mm} Minimum**	**HV***
		MPa	MPa	%		%	HV
R290	annealed	290 .. 390	≤ 190*	40		40	70 .. 105
R390		390 .. 490	≥ 320	17	≥ 250	20	115 .. 155
R480		480 .. 570	≥ 440	8	≥ 400	13	150 .. 180
R540		540 .. 630	≥ 480	6	≥ 450	12	160 .. 200
R600		600 .. 660	≥ 560	5	≥ 530	12	> 180
R660		660 .. 760	≥ 620	-	≥ 590	7	> 180
R700		700 .. 800	-	-	≥ 640	3	> 190

* only for information

Fabrication Properties*	
Cold Forming Properties	Excellent
Hot Forming Properties at 750 .. 850°C	Limited
Machinability (Rating 20)	Less suitable
Electroplating Properties	Excellent
Hot Tinning Properties	Excellent
Soft soldering, Brazing	Excellent
Resistance Welding	Good
Gas Shielded Arc Welding	Good
Laser Welding	Good
Soft Annealing	450 .. 700°C
Stress Relieving Annealing	200 .. 350°C

* For more details call our technical service

Corrosion Resistance*

Resistant to:
CuSn4 has a good resistance to seawater, different agents and industrial atmosphere.

It is in a large extend resistant to pitting corrosion. Even in seawater the laminar attack is higher than localized corrosion.

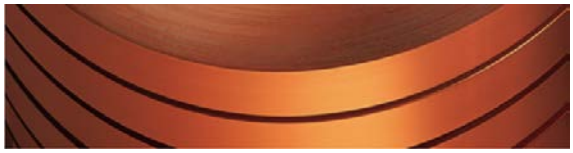
Largely insensitive to stress corrosion cracking

* For more details call our technical service

Bend Fatigue (at room temperature)

The fatigue strength gives an indication about the resistance to variations in applied tension. It is measured under symmetrical alternating load. The maximum bending load for 10^7 load cycles without crack is measured. Dependent on the temper class it is approximately 1/3 of the tensile strength R_m.

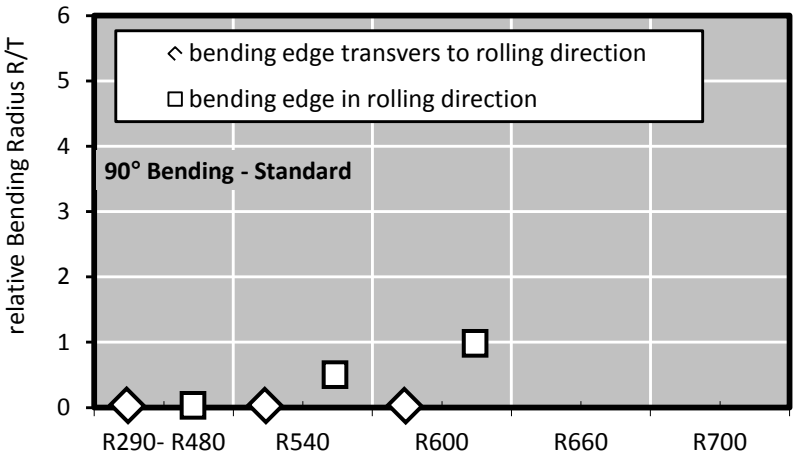
C51100
CuSn4

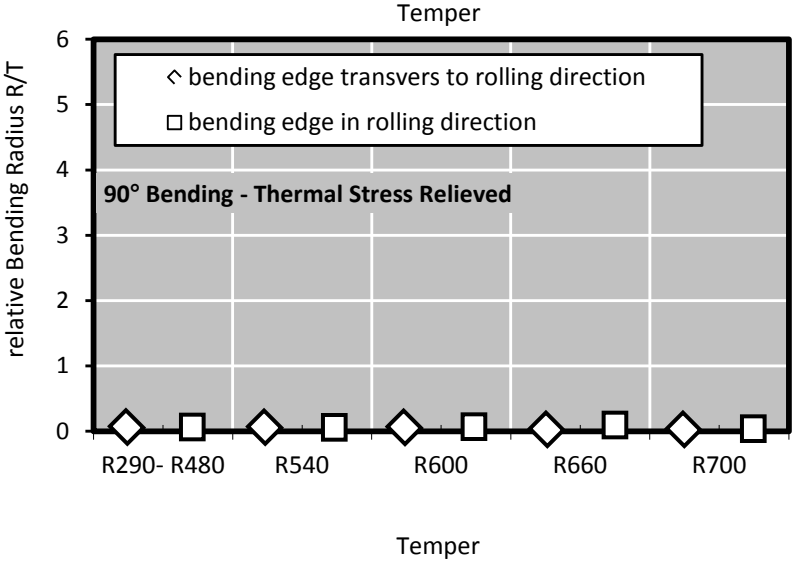


KME

Industrial Rolled

Bending Properties Standard & Thermal Stress Relieved Thickness: ≤ 0.5 mm

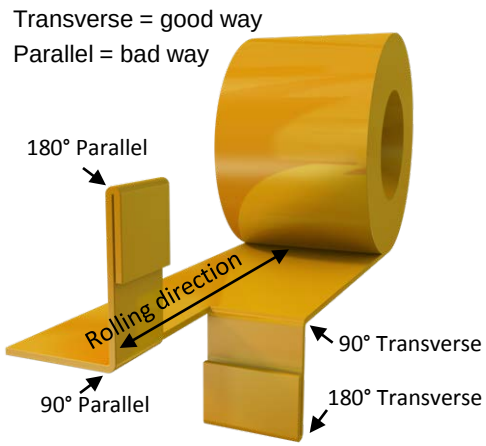




Bending test according to EN ISO 7438 is done with 10 mm wide samples. Smaller samples in general – as well as lower thickness – allow a lower bending radius without cracks. If needed we supply bending optimized temper classes that far exceed standard quality.

Please take care when comparing with ASTM E 290 results, there the bend definition direction is contradictory.

Bending Definition



Minimum Bending Radius Calculation

To find out the minimum possible bending radius take the R/T value from the list.

Example: R/T = 0.5 and thickness 0.3 mm

Minimum radius = (R/T) x thickness

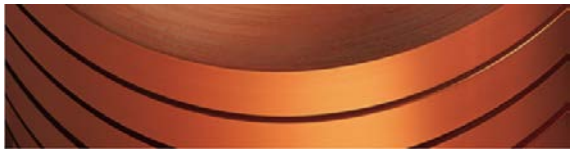
= 0.5 x 0.3 mm = 0.15 mm

Bending Properties* (Thickness t ≤ 0.5 mm)

	Standard		Thermal Stress Relieved	
Temper	**Bending 90°**		**Bending 90°**	
	Transverse	**Parallel**	**Transverse**	**Parallel**
	R/T	R/T	R/T	R/T
R290	0	0	0	0
R390	0	0	0	0
R480	0	0	0	0
R540	0	0,5	0	0
R600	0	1	0	0
R660	-	-	0	0
R700	-	-	0	0

* Measured at sample width 10 mm. according EN 1654; Possible bending radius = (R/T) x thickness

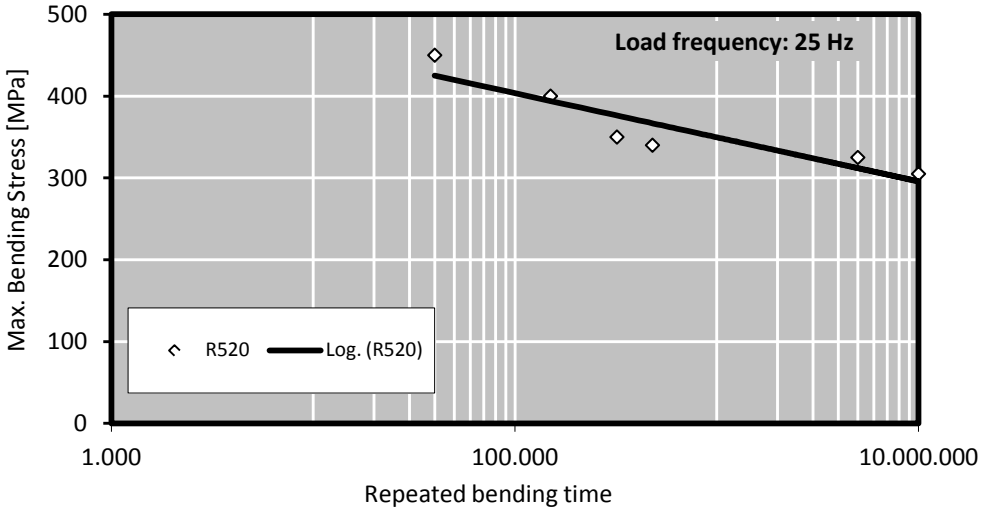
C51100
CuSn4



KME

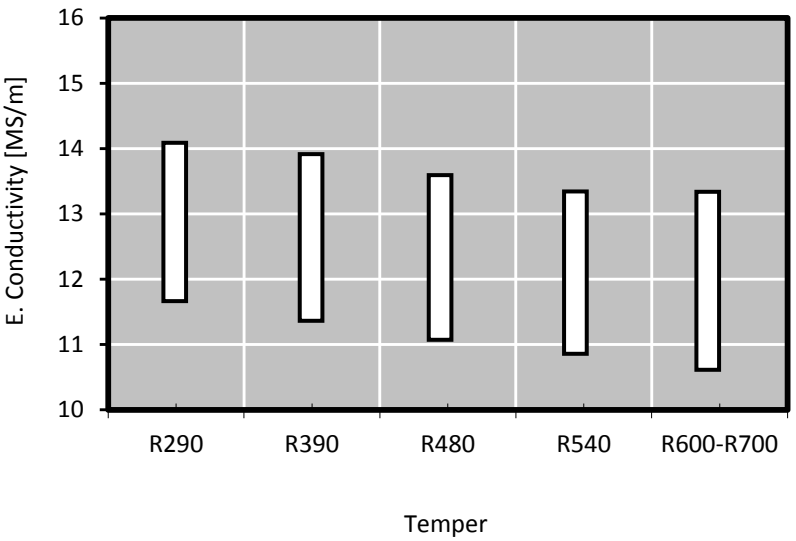
Industrial Rolled

Bend Fatigue (at room temperature)

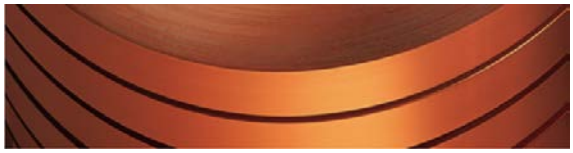


The fatigue strength gives an indication about the resistance to variations in applied tension. It is measured under symmetrical alternating load. The maximum bending load for 10^7 load cycles without crack is measured. Dependent on the temper class it is approximately 1/3 of the tensile strength R_m.

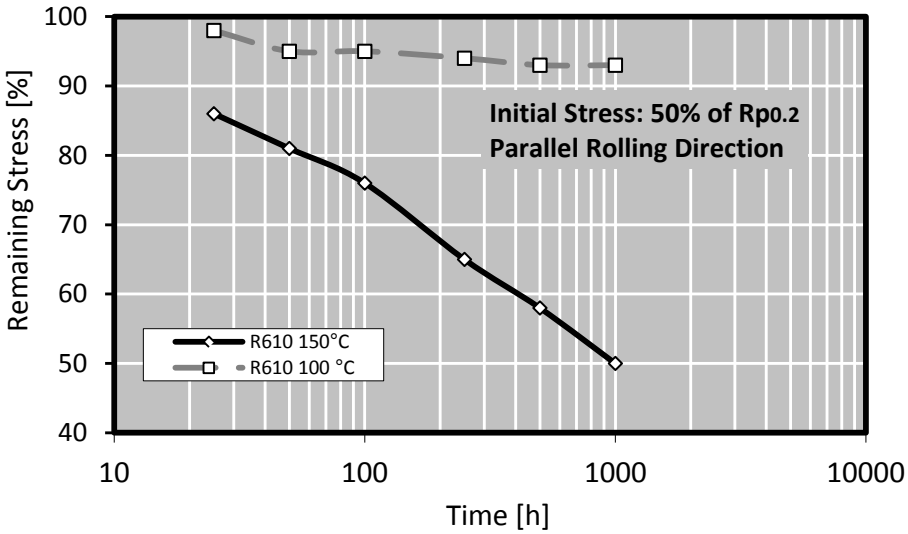
Electrical Conductivity

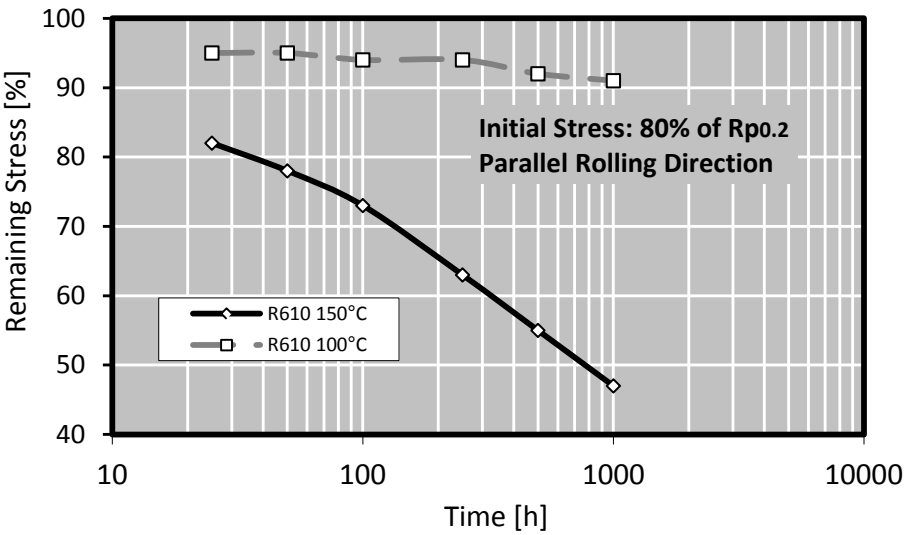


Electrical conductivity is strongly influenced by chemical composition. A high level of cold deformation and small grain size decrease the electrical conductivity moderately. Minimum conductivity level can be specified.



Relaxation Properties	Thermal stress relieved





Stress relaxation is tested with cantilever bending test equipment. This method is taking short time relaxation into account. so that the values achieved are very realistic, while other test methods like tube test pretend better properties from the achieved values. Relaxation values give an indication about stress relieve of strip under tension for a certain time and temperature. As it is measured on plain strip. the behaviour of deformed parts may differ. nevertheless the ratio between the different tempers remains the same.

Typical test sample thickness is 0.3 – 0.6 mm.

Standards for copper and copper alloys	
EN 1652	Plate, sheet, strip and circles for general purposes
EN 1654	Strip for springs and connectors
EN 1758	Strip for lead frames
EN 13148	Hot-dip tinned strip
EN 13599	Copper plate, sheet and strip for electrical purposes
EN 14436	Electrolytically tinned strip