

Alloy Designation	
EN	Cu-DLP (SW-Cu)
DIN CEN/TS 13388	CW 023 A
JIS	-
UNS	C12000

**Copper Rolled Products**



We produce a vast assortment of copper rolled products with highest purity in various chemical compositions, sizes and formats, all suited to many types of final processing.

Chemical Composition		
Weight percentage in %		
Cu	≥ 99.90	%
P	0.004 .. 0.012	%

**Characteristics**

Cu-DLP is a phosphorus-deoxidized copper with a limited, medium amount of residual Phosphorus. It has a good electrical conductivity and excellent welding and soldering properties. It can be formed excellent, either hot or cold.

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

**Main Applications**

**Electrical**  
Cable Strip, Busbars (Welded or Brazed), Tubular Bus, Leadframes for power semiconductors,

**Industrial**  
Tubing, LP Gas Service, Conductors, Resistance Welding Equipment, Welded Tube, Medical Gas- Oxygen

**Other**  
Applications Requiring Welding or Brazing, Apparatus industry

Physical Properties		
Typical values in annealed temper at 20 °C		
Density	8.94	g/cm <sup>3</sup>
Thermal expansion coefficient	-191 .. 16 °C	14.1
	20 .. 300 °C	17.3
Specific heat capacity		0.386
		J/(g·K)
Thermal conductivity		375
		W/(m·K)
Electrical conductivity (1 MS/m = 1 m/(Ω mm <sup>2</sup> ))		55
		MS/m
Electrical conductivity (IACS)		95
		%
Thermal coefficient of electrical resistance (0 .. 100 °C)		3.6
		10 <sup>-3</sup> /K
Modulus of elasticity ( 1 GPa = 1 kN/mm <sup>2</sup> ) cold formed		132
		GPa
	annealed	118
		GPa

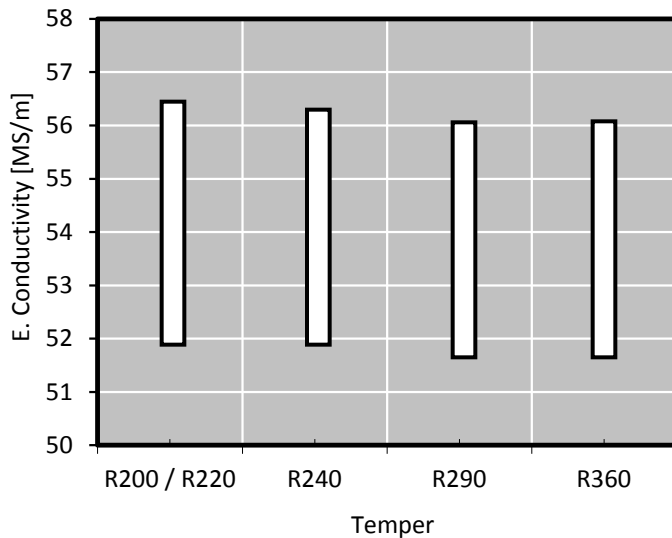


#### Mechanical Properties (EN 1652)

Temper		Tensile Strength	Yield Strength	Elongation Minimum	Hardness
		R <sub>m</sub>	R <sub>p0.2</sub>	A <sub>50mm</sub>	HV *
		MPa	MPa	%	HV
R200	annealed	200 .. 250	≤ 100*	(≥ 2,5 mm) 42	40 .. 65
R220	annealed	220 .. 260	< 140*	33	40 .. 65
R240		240 .. 300	≥ 180	8	65 .. 95
R290		290 .. 360	≥ 250	4	90 .. 110
R360		≥ 360	≥ 320	2	≥ 110

\* only for information

#### 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.

#### Fabrication Properties\*

Cold Forming Properties	Excellent
Hot Forming Properties at 750 .. 950°C	Good
Machinability (Rating 20)	Less suitable
Electroplating Properties	Excellent
Hot Tinning Properties	Excellent
Soft soldering, Brazing	Excellent
Resistance Welding	Less suitable
Gas Shielded Arc Welding	Excellent
Laser Welding	Fair
Soft Annealing	250 .. 650°C
Stress Relieving Annealing	150 .. 200°C

#### Corrosion Resistance\*

Resistant to:

Atmospheric corrosion: formation of the a greenish protective patina due to the formation of copper basic salts (such sulphates, chlorides in marine environment, nitrates and carbonates). Cu-DLP has a good resistance in in natural and industrial atmosphere.

Industrial and drinking water, aqueous and alkaline solutions (not oxidizing), pure water vapour (steam), non oxidizing acids (without oxygen in solution) and salts, neutral saline solutions.

Practically resistant against stress corrosion cracking

Not resistant to:

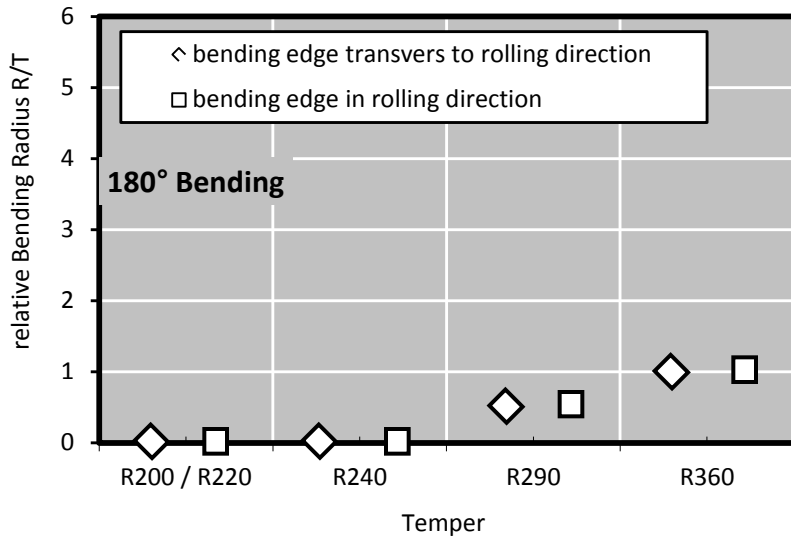
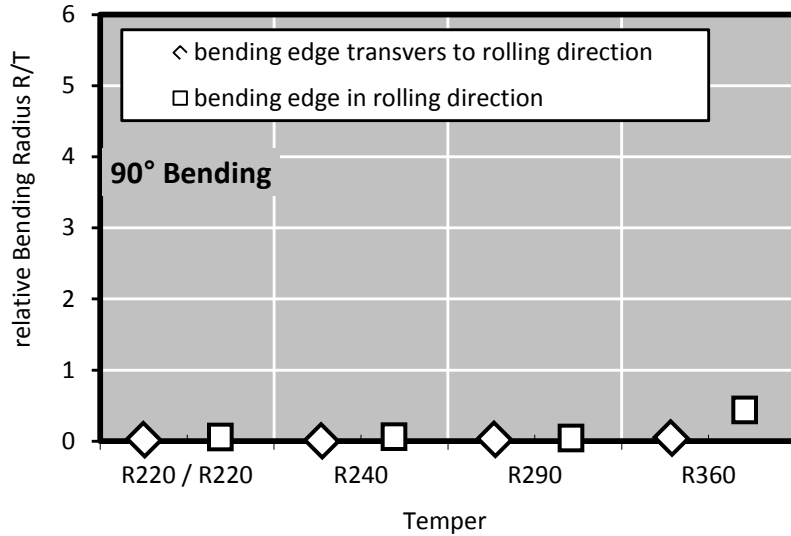
Oxidising acids, solutions containing cyanides, ammonia or halogens, hydrous ammonia and halogenated gases, hydrogen sulfide, seawater especially with high flow rates.

\* For more details call our technical service

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**Bending Properties** Thickness: ≤ 0.5 mm

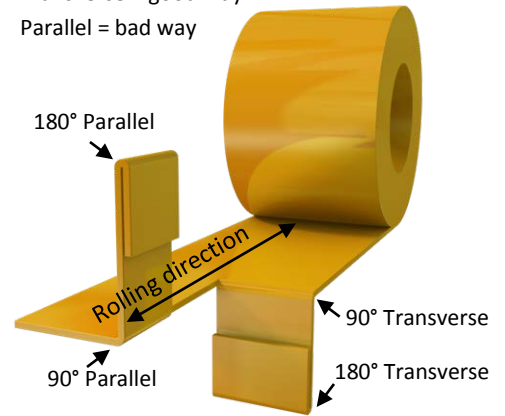


Bending test according to EN ISO 7438 is done with 10 mm wide samples. Smaller samples in general – as well as lower thickness – allow a lower bending radius without cracks. If needed we supply bending optimized temper classes that far exceed standard quality.

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

**Bending Definition**

Transverse = good way  
Parallel = bad way



**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

$$\text{Minimum radius} = (R/T) \times \text{thickness} \\ = 0.5 \times 0.3 \text{ mm} = 0.15 \text{ mm}$$

**Bending Properties\***

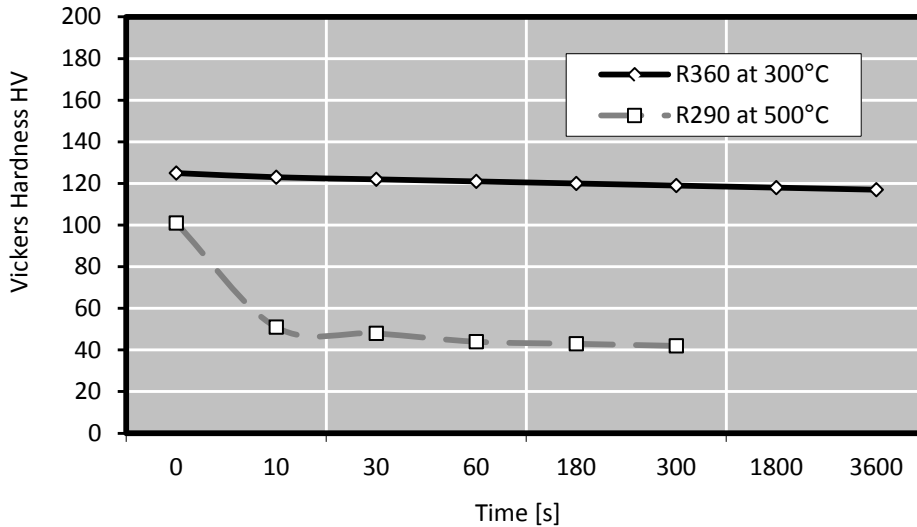
Temper	Thickness Range	Bending 90°		Bending 180°	
		Transvers	Parallel	Transvers	Parallel
	mm	R/T	R/T	R/T	R/T
R200	≤ 0.5	0	0	0	0
R220	≤ 0.5	0	0	0	0
R240	≤ 0.5	0	0	0	0
R290	≤ 0.5	0	0	0.5	0.5
R360	≤ 0.5	0	0.5	1	1

\* Measured at sample width 10 mm according to EN 1654

Possible bending radius = (R/T) x thickness



**Softening Resistance**



After short time heat treatment Vickers Hardness is measured. The diagram shows typical values.

**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  $R_m$ .

**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