

Alloy Designation	
EN	Cu-OFE
DIN CEN/TS 13388	CW009A
JIS	C 1011
UNS	C10100

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		
Cu	≥ 99.99	%
O	≤ 0,0005	%

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

Characteristics

Cu-OFE is a high purity, oxygen free, non phosphorus-deoxidized copper that does not contain in vacuum evaporating elements. It has a very high electrical and thermal conductivity, good welding and excellent soldering properties. It has excellent hot and cold forming properties, and a good corrosion resistance, especially in atmosphere due to a good adherence of the oxide layer. Cu-OFE can be heat treated in reducing atmosphere.

Main Applications

Automotive
Automotive Rectifiers

Electrical
Transistor Component Bases, High Resistance-Ratio Cryogenic Shunts, Bus Conductors, Wave Guides, Hollow Conductors, Anodes for Vacuum Tubes, Coaxial Cable, Waveguides, High Frequency Cable, Submarine Cable, Coaxial Tube, Klystrons, Microwave Tubes, Bus Bars, Lead-in Wire, Vacuum Seals, Conductors, Glass-to-Metal Seals, Lead frames for semiconductors, Heat sinks

Preferred Applications

Electrical Engineering	Electronics	Vacuum Technology	High Frequency Cable	Coaxial Cable	Solar Applications
xx	xx	xx	xx	xx	xx

x = well suited xx = particularly well suited

Physical Properties

Typical values in annealed temper at 20 °C

Density		8.9	g/cm ³
Thermal expansion coefficient	-191 .. 16 °C	14.1	10 ⁻⁶ /K
	20 .. 300 °C	17.7	10 ⁻⁶ /K
Specific heat capacity		0.39	J/(g·K)
Thermal conductivity		394	W/(m·K)
Electrical conductivity	(1 MS/m = 1 m/(Ω mm ²))	≥ 58.6	MS/m
Electrical conductivity	(IACS)	101	%
Thermal coefficient of electrical resistance	(0 .. 200 °C)	3.81	10 ⁻³ /K
Modulus of elasticity	(1 GPa = 1 kN/mm ²) cold formed	130	GPa
	annealed	118	GPa

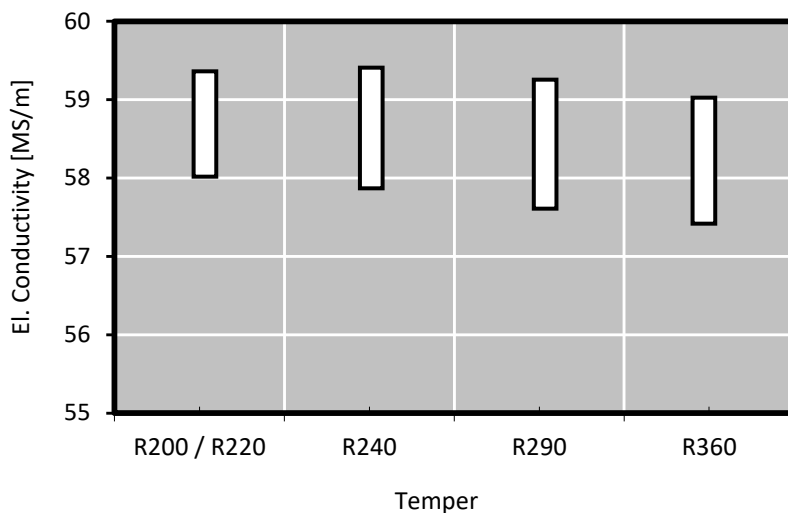


Mechanical Properties (EN 1652)

Temper		Tensile Strength	Yield Strength	Elongation Minimum	Hardness
		R _m	R _{p0.2}	A _{50mm}	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	Excellent
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, 1 .. 3h
Stress Relieving Annealing	150 .. 200°C, 1 .. 3h

* For more details call our technical service

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-OFE has a good resistance in in natural and industrial atmosphere (maritime air too).

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.

Material can be heat-treated in reducing atmosphere.

Practically resistant against stress corrosion cracking

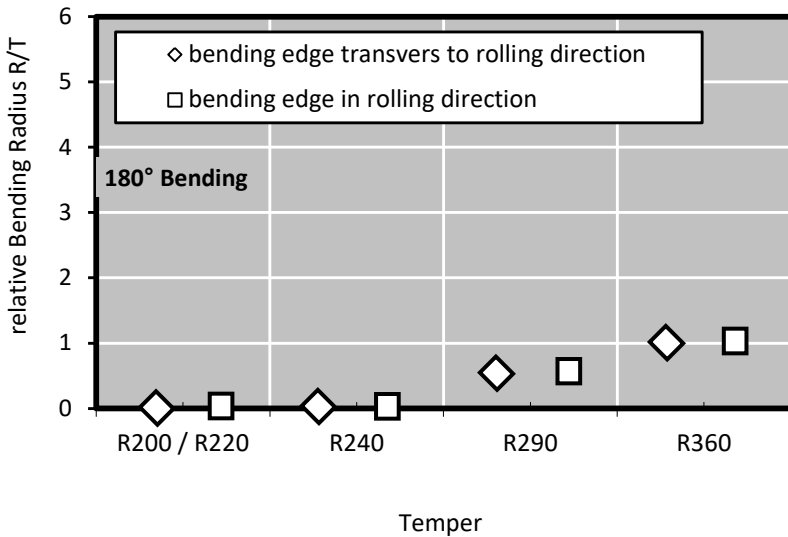
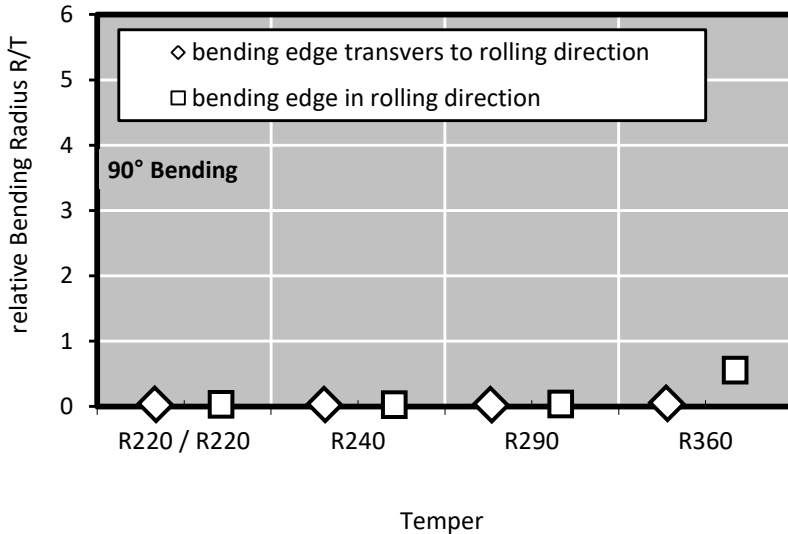
Not resistant to:

Oxidising acids, solutions containing cyanides, ammonia or halogens, hydrous ammonia and halogenated gases, hydrogen sulfide, seawater.

* For more details call our technical service



Bending Properties Thickness: ≤ 0.5 mm

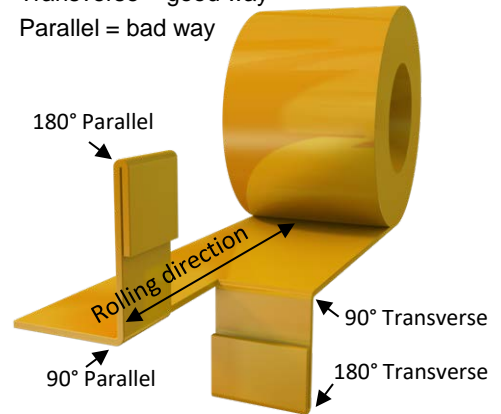


Bending test according to EN ISO 7438 is done with 10 mm wide samples. Smaller samples in general – as well as lower thickness – allow a lower bending radius without cracks. If needed we supply bending optimized temper classes that far exceed standard quality.

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
Minimum radius = (R/T) x thickness
= 0.5 x 0.3 mm = 0.15 mm

Bending Properties*

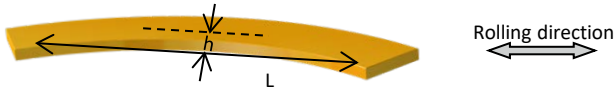
Temper	Thickness Range	Bending 90°		Bending 180°	
		Trans-vers	Parallel	Trans-vers	Parallel
	mm	R/T	R/T	R/T	R/T
R200	≤ 0.5	0	0	0	0
R220	≤ 0.5	0	0	0	0
R240	≤ 0.5	0	0	0	0
R290	≤ 0.5	0	0	0.5	0.5
R360	≤ 0.5	0	0.5	1	1

* Measured at sample width 10 mm according to EN 1654

Possible bending radius = (R/T) x thickness



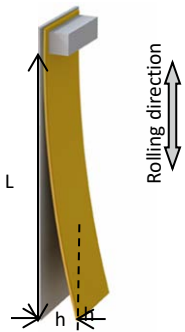
Camber



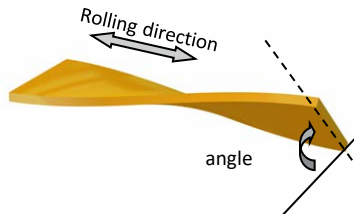
Evenness



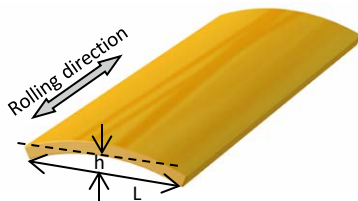
Coil set



Twist



Transverse Flatness



Customized Tolerances

Our products are produced in accordance with relevant norms EN 1652 / EN 1654. Customer specific tolerances for Thickness, Width, Camber, Transverse Flatness, Evenness, Twist and Coil set can be defined. We will be happy to meet your demands. EN 1652 defines only camber.

Thickness Tolerance

Thickness Range [mm]	EN 1652 ≤350 mm [mm]	KME Standard [mm]	KME Precision [mm]
0.10 .. 0.20	± 0.018	± 0.005	± 0.004
0.21 .. 0.30	± 0.022	± 0.007	± 0.005
0.31 .. 0.40	± 0.025	± 0.015	± 0.006
0.41 .. 0.50	± 0.030	± 0.015	± 0.008
0.51 .. 0.60	± 0.040	± 0.017	± 0.010
0.61 .. 0.70	± 0.040	± 0.020	± 0.010
0.71 .. 0.85	± 0.040	± 0.022	± 0.012
0.86 .. 1.30	± 0.050	± 0.025	± 0.015
1.31 .. 2.00	± 0.060	± 0.030	± 0.020
2.01 .. 3.00	± 0.070	± 0.045	± 0.025
3.00 .. 4.00	± 0.100	± 0.050	± 0.025
4.00 .. 6.00	± 0.120	± 0.060	± 0.030

Evenness Tolerance

Thickness Range [mm]	Width Range [mm]		
	7 .. 20	21 .. 50	51 .. 100
0.10 .. 0.50	+0.10	+0.20	+0.30
0.50 .. 1.00	+0.15	+0.25	+0.35

Roughness

Ra [μm]	Thickness [mm]
0.13 .. 0.18	0.1 .. 2.0
0.20 .. 0.30	0.1 .. 2.0
0.35 .. 0.46	0.1 .. 2.0
On request	> 2.0

Width Tolerance Standard / Precision

Thickness Range [mm]	Width Range [mm]						* Only R200 and R220
	10 .. 50	51 .. 100	101 .. 200	201 .. 350	351 .. 700	700 .. 1.250	
0.10 .. 1.00	+0.2 / +0.1	+0.3 / +0.2	+0.4 / +0.3	+0.6 / +0.4	+1.0 / +0.5	-	
0.20 .. 1.00	+0.2 / +0.1	+0.3 / +0.2	+0.4 / +0.3	+0.6 / +0.4	+1.0 / +0.5	+2.0	
1.01 .. 2.00	+0.3 / +0.2	+0.4 / +0.2	+0.5 / +0.4	+1.0 / +0.6	+1.5 / +0.7	+2.0	
2.01 .. 3.00	+0.5 / +0.3	+0.6 / +0.3	+0.7 / +0.5	+1.2 / +0.7	+2.0 / +0.9	+3.0	
3.01 .. 6.00	+2.0 / -	+2.3 / -	+2.5 / -	+3.0 / -	+4.0 / -	+6.0	



Formats	Dimension*			
	Coil	Strip thickness (other thicknesses on request)	≥ 0.1 .. 6.00	mm
		Strip width	≥ 3 .. 1,250	mm
		Outside diameter	≤ 1,400	mm
		Weight (Standard)	≤ 8,400	kg
		Weight (Deep-Drawing Quality)	≤ 8,000	kg
		Weight per mm	≤ 12.0	kg
	Traverse wound strip	Thickness	≥ 0.2 .. ≤ 1.50	mm
		Width	≥ 8 .. ≤ 60.0	mm
		Weight	300 .. 1,500	kg
		Drums: wood, plastic, metal, flangeless		
	TECSTRIP® _multicoil	Thickness	0.18 .. 0.80	mm
		Width	15 .. 50	mm
		Inner diameter 300 mm for thickness	0.15 .. 0.80	mm
		Inner diameter 400 mm for thickness	0.41 .. 0.80	mm
		Maximum weight	5,000	kg
		Outer diameter maximum	1,600	mm
	Sheet ≤ 6.35 mm	Thickness	0.3 .. 6.35	mm
		Width	50 .. 1,250	mm
		Length	200 .. 6,500	mm
		Weight	2,800 .. 8,000	kg
		Sheets in standard dimensions e.g. 1,000 x 2,000 mm on stock		
	Sheet > 6.35 mm	Thickness	6.35 .. 9.50	mm
		Width	50 .. 2,450	mm
		Length	200 .. 7,500	mm
		Weight	≤ 10,000	kg
		Sheets in standard dimensions e.g. 1,000 x 2,000 mm		
	Plate	Thickness	9.5 .. 150	mm
		Width	≤ 4,500	mm
		Length	≤ 15,000	mm
		Weight	≤ 8,000	kg
	Disc	Thickness	0.3 .. 150	mm
		Diameter	20 .. 3,100	mm
		Weight	≤ 10,000	kg

* Some combinations might not be possible



Surface coatings & Special Treatments *		Dimension	
	Hot-Dip tinned and STOL®28M Tin-Silver STOL®13 Thermic Sn	Width Thickness Tin Layer Thickness	≤ 330 mm ≤ 1.5 mm 0.4 .. 20 μm
	Different thickness per side possible	R360 on request	
	Electroplating	Width Thickness	≤ 400 mm ≤ 2.5 mm
	Tin, Silver, Gold, Cu-Flash, Ni-Flash, Selective plating	Other coatings on request	
	Profiled strips STOL®Multigauge	Width Thickness	15 .. 90 mm 0.23 .. 1 mm
		Other width on request	
	Deburred and rounded edges (e.g. for Transformer Strips)	Width Thickness * 0.3 - 2.0 mm Width ≤ 700 mm and 0.4 - 2.0 mm Width ≥ 700 mm	≥ 200 .. 1,250* mm 0.3 .. 2.0* mm
	Precision Strip		
	With low periodic thickness variation for e.g. High Frequency Cable Applications	Fully Integrated Fast Fourier Transformation (FFT) Analysis per coil	
	Surface with extra low residual carbon content possible.		
	Protection with oil or adhesive foil on request		

* Further details you find at www.kme.com

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