

Designation	DIN	EN Nr.	UNS (ASTM)	AISI	LMSA
Cu-OFE	-	-	C10100 C10200*	-	B109 B110*

*The requirements of Cu-OF - C10200 are fully covered by Cu-OFE - C10100.

Chemical composition

Cu	As	Sb	Te	P
99.99 min.	0.0005 max.	0.0004 max.	0.0002 max.	0.0003 max.

Values (Weight %). In order to achieve maximum homogeneity and consistent quality, the actual manufacturing tolerances are tighter and more precisely than the composition indicated.

Main technical properties and features

Cu-OFE (Oxygen Free Electronic Grade) is a high purity, oxygen free, non-phosphorus-deoxidized copper. This pure copper has a guaranteed minimal amount of 99.99 % of copper and a minimal electrical conductivity of 101 % IACS (International Annealed Copper Standard). Cu-OFE is produced from a high-purity copper cathode Cu-CATH-1 (CR001A). The high-purity of the Cu-OFE is maintained during all the fabrication process without any addition of deoxidizing elements, like phosphorus, for example. This high-purity ensures a very high electrical and thermal conductivity. With its very low amount of impurity, it is ideally suited to the high requirements of the electronic industry, superconducting at low temperature and vacuum applications. It is free of elements which can evaporate in vacuum and consequently Cu-OFE is more suitable for the vacuum application than Cu-OF. Cu-OFE fully complies with the specifications of Cu-OF, the acceptable level of impurities of the Cu-OF is just slightly higher. Cu-OFE contains no oxygen and is insensitive to hydrogen embrittlement. In contact with hydrogen, the coppers containing oxygen, such as Cu-ETP, can suffer serious damage inside the material, related to the reduction of copper oxides by hydrogen. Cu-OFE is insensitive to this phenomenon and can be heat treated in reducing atmospheres. Cu-OFE is an easily weldable inert gas; laser welding is more difficult. Its galvanizability is good. Cu-OFE can also easily be dip tinned; it is easily solderable.

It has excellent hot and cold forming properties and a good corrosion resistance, especially in an industrial atmosphere, pure water vapor, non-oxidizing acids and neutral saline solutions due to a good adherence of the oxide layer. However, Cu-OFE is non-resistant to oxidizing acids, hydrous ammonia, hydrogen sulfide and seawater.

Typical uses

Due to its excellent electrical and thermal conductivity, Cu-OFE is frequently used in the electronic and superconducting industries: lead frame for semiconductors, heat sinks, coaxial cables, underwater fiber optic cables, waveguides, hollow conductors, vacuum seals, anodes, microwaves tubes, etc.

Typical manufacturing range

	Thickness (mm)	Width (mm)	Length (mm)
Rolled products Strip in coils ^[1]	0.010 - 2.000	1.5 - 200.0	-
Strip as sheets ^[1]	0.010 - 1.500	10.0 - 200.0	100 - 3000

^[1] Not all our production possibilities are presented here. Other dimensions or product forms available upon request. Some combinations of thicknesses and widths are not possible.

Mechanical properties of strips

Temper	R _{p0.2} (N/mm ²)	R _m (N/mm ²)	A _{50mm} (%)	Hardness HV
R200 H45 Annealed	140 max.	200 - 260	33 min.	45 - 65
R240 H65 ½ hard	180 min.	240 - 300	8 min.	65 - 95
R240 H90 hard	250 min.	290 - 360	4 min.	90 - 110
R360 H110 extra hard	320 min.	360 min.	-	110 min.

Physical properties

Modulus of elasticity	kN/mm ²	127
Poisson ratio		0.34
Density	g/cm ³	8.94
Melting point	°C	1084
Linear dilatation coefficient	10 ⁻⁶ /°C	17.7 from 0 to 300°C
Thermal conductivity at 20°C	W/m °K	394
Electrical resistivity	μΩcm	1.7
Electrical conductivity	MS/m	58.6
Electrical conductivity	% IACS	101
Specific heat at 20°C	J/(kg. K)	385
Magnetic properties		Non magnetic

Tolerances (strip and foil)

Thickness	Thickness (mm)		EN Standard		Lamineries MATTHEY		
	≥	<	10140 Precision	10258 Precision	LMSA Standard	LMSA Precision	LMSA Extreme
<p>The table shown is an outline of our typical thickness tolerances available. They are tighter than industry standards.</p> <p>Our "LMSA Precision" and "LMSA Extreme" tolerances are available upon request.</p>	-	0.025	-	-	-	-	± 0.001
	0.025	0.050	-	-	± 0.003	± 0.002	± 0.0015
	0.050	0.065	-	± 0.003	± 0.003	± 0.0025	± 0.002
	0.065	0.100	-	± 0.004	± 0.004	± 0.0035	± 0.003
	0.100	0.125	± 0.005	± 0.006	± 0.005	± 0.004	± 0.003
	0.125	0.150	± 0.005	± 0.006	± 0.005	± 0.005	± 0.004
	0.150	0.250	± 0.010	± 0.008	± 0.008	± 0.006	± 0.004
	0.250	0.300	± 0.010	± 0.009	± 0.009	± 0.007	± 0.005
	0.300	0.400	± 0.010	± 0.010	± 0.010	± 0.007	± 0.005
	0.400	0.500	± 0.015	± 0.012	± 0.012	± 0.008	± 0.006
	0.500	0.600	± 0.015	± 0.014	± 0.014	± 0.010	± 0.007
	0.600	0.800	± 0.015	± 0.015	± 0.015	± 0.010	± 0.007
	0.800	1.000	± 0.015	± 0.018	± 0.018	± 0.012	± 0.009
	1.000	1.200	± 0.020	± 0.020	± 0.020	± 0.015	± 0.012
	1.200	1.250	± 0.020	± 0.020	± 0.020	± 0.015	± 0.012
1.250	1.500	± 0.020	± 0.020	± 0.020	± 0.015	± 0.014	
Width	Our width tolerances "Standard" is +0.2, -0.0 (or ± 0.1 mm upon request). They are available for slit widths < 125 mm and thicknesses < 1.00 mm. Special tolerances upon request.						
Camber	Width (mm)		Camber max. (mm/m)				
<p>Our tolerance "LMSA Standard" respects the EN Standard 1654 (Length of measurement 1000 mm). Other tolerances upon request.</p>	>	≤	LMSA Standard		LMSA Extreme		
			≤ 0.5 mm	> 0.5 mm	≤ 0.5 mm	> 0.5 mm	
	3	6	12	-	6	-	
	6	10	8	10	4	5	
	10	20	4	6	2	3	
20	250	2	3	1	1.5		
Surface	Special surface qualities upon request						
Flatness	Special requirement on the longitudinal or transversal flatness upon request						

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