

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 precise than the composition indicated.

Main technical properties and features

Cu-OFE (Oxygen Free Electronic Grade) is a high-purity oxygen-free copper grade. It is characterized by a minimum copper content of 99.99% and a minimum electrical conductivity of 101% IACS (International Annealed Copper Standard). After cold working, its electrical conductivity decreases slightly while still maintaining values, generally ranging between 98 and 101% IACS. It is produced from a selection of very high-quality cathodes containing very low levels of impurities, of Cu-CATH-1 (CR001A) grade. The quality of oxygen-free copper is maintained throughout the casting process without the addition of deoxidizing elements such as phosphorus, which ensures excellent electrical and thermal conductivity.

Due to its very low impurity content, Cu-OFE fully meets the demanding requirements of the electronics industry, low-temperature superconducting applications, and vacuum environments. It is free from elements that may evaporate under vacuum and provides better performance in high-vacuum conditions than Cu-OF.

Cu-OFE fully complies with the specifications of Cu-OF, although the acceptable impurity level of Cu-OF is slightly higher. As it contains no oxygen, Cu-OFE is insensitive to hydrogen embrittlement. In the presence of hydrogen, oxygen-containing copper grades such as Cu-ETP may suffer significant internal damage due to the reduction of copper oxides by hydrogen.

Cu-OFE can therefore be heat treated in reducing atmospheres. It is easily weldable using inert gas welding processes; however, laser welding is more challenging. Its suitability for electroplating and immersion tinning is excellent. It is also readily brazable and exhibits excellent cold and hot forming capabilities.

Thanks to its strongly adherent oxide layer, Cu-OFE also provides good resistance to oxidation in certain polluted atmospheres, as well as resistance to water, water vapor, and neutral saline solutions. However, its corrosion resistance is insufficient in oxidizing environments, in the presence of wet ammonia, or in 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 (annealed) / 98 - 101% (after cold working)
Specific heat at 20°C	J/(kg. K)	385
Magnetic properties		Nonmagnetic

Tolerances (strip and foil)

Thickness	Thickness (mm)		EN Standard		Lamineries MATTHEY		
	≥	<	10140 Precision	10258 Precision	LMSA Standard	LMSA Precision	LMSA Extreme
	-	0.025	-	-	-	-	± 0.001
The table shown is an outline of our typical thickness tolerances available. They are tighter than industry standards. Our "LMSA Precision" and "LMSA Extreme" tolerances are available upon request.	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)				
			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	
Our tolerance "LMSA Standard" respects the EN Standard 1654 (Length of measurement 1000 mm). Other tolerances upon request.	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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