

Designation	Cu-ETP	DIN	EN Nr.	UNS (ASTM)	AISI	LMSA
		-	-	C11000	-	B100

Chemical composition

Cu	Bi	O	Pb	Others
99.90 min	0.0005 max	0.04 max	0.03 max	0.03 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-ETP (Electrolytic Tough-Pitch) is a pure copper grade. It is characterized by a minimum copper content of 99.90% and a minimum electrical conductivity of 100% IACS (International Annealed Copper Standard) in the soft temper. After cold work, the electrical conductivity decreases slightly and typically ranges between 97 and 99% IACS. Oxygen introduced during melting and casting operations is present at levels of a few hundred ppm and gives copper specific properties. The presence of copper oxide (Cu_2O), combined with other impurities, reduces their detrimental effect on electrical and thermal conductivity. Cu-ETP is the most widely used copper grade in the field of electrical engineering. The presence of oxygen makes Cu-ETP unsuitable for operations requiring heating above 300 °C in a reducing atmosphere containing hydrogen. Indeed, hydrogen, which has a high diffusion rate at these temperatures, reduces copper oxides (Cu_2O), forming water (H_2O), which is completely insoluble in copper. If such a heat treatment is required, oxygen-free copper grades such as Cu-OF or Cu-OFE should be selected, as they can be heat treated in reducing atmospheres. Cu-ETP can be easily brazed; however, inert gas welding or laser welding is difficult. Its suitability for electroplating and immersion tinning is excellent, and it also exhibits excellent cold forming capability.

Thanks to its strongly adherent oxide layer, Cu-ETP also provides good resistance to oxidation in certain polluted atmospheres, as well as 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

Cu-ETP is primarily used in the electronic industry to produce stamped and folded parts. This alloy is also used in the superconductor industry, as a heat dissipater, as lead frames, in coaxial cables and in underwater fiber optic cables. In vacuum applications, Cu-OF or Cu-OFE are more appropriate as anodes, waveguides, joints, 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	140 max.	200 - 260	33 min.	45 - 65
R240 H65	180 min.	240 - 300	8 min.	65 - 95
R240 H90	250 min.	290 - 360	4 min.	90 - 110
R360 H110	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	1.72
Electrical conductivity	MS/m	58
Electrical conductivity	% IACS	100 (annealed) / 97 - 99% (after cold working)
Specific heat at 20°C	J/(kg. K)	386
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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