

Designation	CuNi9Sn6	DIN	EN Nr.	UNS (ASTM)	AISI	LMSA
		-	-	C72700	-	B800 / B805

Chemical composition

Cu*	Ni	Sn	Mn	Pb	Zn	Fe	P
Balance	8.50 - 9.50	5.50 - 6.50	0.05 - 0.30	0.03 max.	0.50 max.	0.50 max.	0.02 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

Niclafor® 1000 is a copper-nickel-tin alloy (single-phase face-centered cubic) with very high mechanical strength, good corrosion resistance and good wear resistance. Niclafor® 1000 hardening is obtained by cold work followed by spinodal decomposition heat treatment (decomposition of nano-sized coherent phase of the $(\text{Cu}_x\text{Ni}_{1-x})_3\text{Sn}$ type). CuNi9Sn6 - Niclafor® 1000 alloy can be easily submitted to high-precision stamping, cold forming and cutting operations. This alloy presents excellent fatigue resistance and thermal relaxation. The geometric stability of parts during hardening (spinodal decomposition) is excellent. Niclafor® 1000 alloy can be supplied in the solid-solution or solution-hardened condition. In the TB00, TD01 and TD02 tempers, its deformability is excellent. After spinodal decomposition, manufactured parts can reach mechanical strength up to 1000 N/mm² (TM08 condition).

Niclafor® 1000 alloy is lead- and cadmium-free and therefore complies with REACH and RoHs regulations.

Typical uses

Niclafor® 1000 offers a range of mechanical and physical properties making it ideal for the production of many parts used in various applications field, such as the connector industry (spring contacts, clips, etc.), the watch industry (hands, wheels, bridge, etc.) and the automotive industry.

Typical manufacturing range

	Thickness (mm)	Width (mm)	Length (mm)
Rolled products Strip in coils ^[1]	0.010 - 0.500	1.5 - 200.0	-
Strip as sheets ^[1]	0.010 - 1.500	10.0 - 200.0	300 - 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.

Physical properties

Modulus of elasticity	kN/mm ²	120
Density	g/cm ³	8.90
Melting point / Melting range	°C	970 - 1080
Linear dilatation coefficient 20 to 200 °C	10 ⁻⁶ / °C	17.25
Thermal conductivity at 20°C	W/m °K	53.6
Electrical resistivity at 20 °C	μΩcm	≤ 19.5 (annealed temper) / ≤ 15 (heat treated temper)
Electrical conductivity	% IACS	≥ 9 (annealed temper) / ≥ 12 (heat treated temper)
Magnetic properties		Nonmagnetic
Fatigue resistance in bending	MPa	450 at 10 ⁸ cycles
Torsion modulus	GPa	50

Heat treatment

The annealing temperature is in the range 700 - 800°C.

Niclafor® 1000 alloy can be hardened by spinodal decomposition under the following conditions:

Spinodal decomposition temperature (°C)	Time (h)
250 - 350	2 - 4

Mechanical properties of strips

Explanation of metallurgical tempers	TB00	Solution heat treated
	TD01 - 08	Solution heat treated + cold formed
	TX00	TB00 + thermal treatment at customer factory
	TS01 - 08	TD01 - TD08 + thermal treatment (spinodal decomposition) at customer factory (TS01 - TS04: 350 °C / 2h-4h; TS08: 350 °C / 2h - 4h)
	TM00 - 08	Mill-hardened (no further heat treatment is needed)

Temper	Heat treatment	Rp0.2 (N/mm²)	Rm (N/mm²)	A50mm (%)	Hardness HV	R/t (90°) T/L [1]
TB00 annealed	-	460 max.	300 max.	30 min.	140 max.	0.2 / 0.2
TD01 ¼ hard	-	460 - 560	300 min.	15 min.	140 - 180	0.2 / 0.2
TD02 ½ hard	-	540 - 640	400 min.	10 min.	160 - 200	0.2 / 0.2
TD03 ¾ hard	-	620 - 720	550 min.	3 min.	200 - 240	0.5 / 0.5
TD04 hard	-	700 - 820	600 min.	-	220 - 260	1 / 2
TD08 spring	-	780 min.	650 min.	-	320 min.	2 / 10

Mill Hardened temper	Heat treatment	Rp0.2 (N/mm²)	Rm (N/mm²)	A50mm (%)	Hardness HV	R/t (90°) T/L [1]
TM00	Mill-hardened tempers. No further heat treatment is needed.)	740 - 860	510 min.	10 min.	230 - 270	0.5 / 0.5
TM02		850 - 950	650 min.	8 min.	270 - 310	1 / 1
TM04		880 - 980	720 min.	8 min.	290 - 320	1 / 1
TM06		950 - 1050	800 min.	4 min.	310 - 340	2 / 2
TM08		1000 - 1100	900 min.	2 min.	320 - 360	-
TH (treated)		1000 min.	900 min.	-	320 min.	-

[1] Minimum bend radius at 90°. R = radius, t = strip thickness, G = "Good way", perpendicular to rolling direction and B = "Bad way", parallel to rolling direction. According to DIN 5011.

Heat treatment at customer's factory

Temper	Heat treatment	Rp0.2 (N/mm²)	Rm (N/mm²)	A50mm (%)	Hardness HV
TX00 soft + hardened	2h - 4h / 350 °C	690 - 900	380 - 680	15 min.	210 - 290
TS01 ¼ hard + hardened	2h - 4h / 350 °C	790 - 970	590 - 770	10 min.	250 - 300
TS02 ½ hard + hardened	2h - 4h / 350 °C	860 - 1030	690 - 850	6 min.	270 - 310
TS04 hard + hardened	2h - 4h / 350 °C	930 - 1100	790 - 930	4 min.	300 - 360
TS08 spring + hardened	2h - 4h / 350 °C	1000 - 1230	860 - 1030	3 min.	320 - 390

Tolerances (strip and foil)

Thickness	Thickness (mm)		EN Standard		Lamineries MATTHEY		
	≥	<	10140 Precision	10258 Precision	LMSA Standard	LMSA Precision	LMSA Extreme
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	-	-	-	-	± 0.001
	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)				
	>	≤	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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