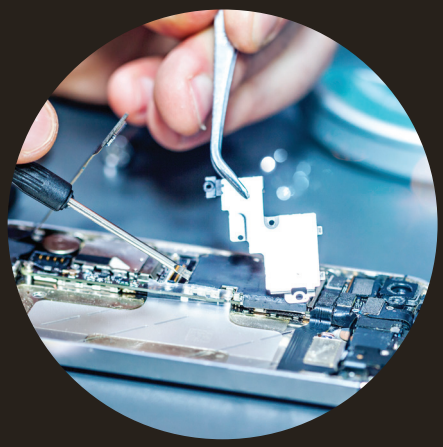
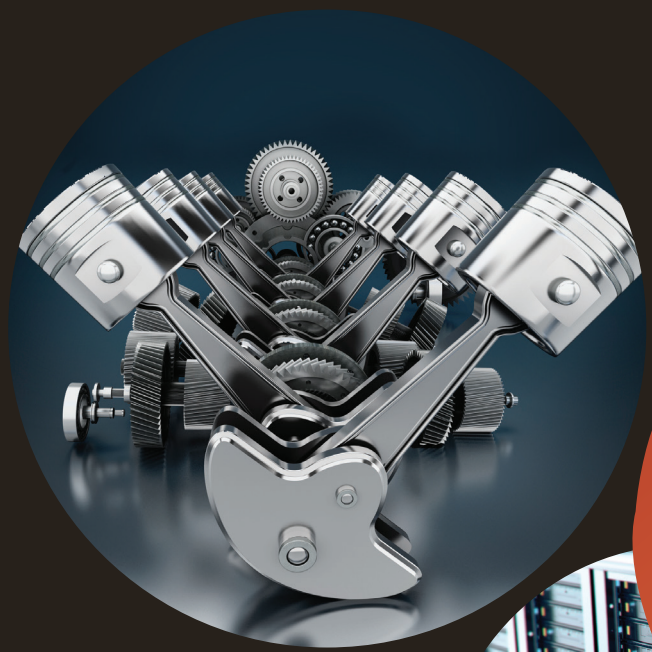
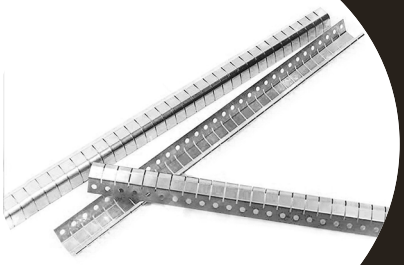
lebronze alloys





Niclafor® 1000

Wear and fatigue resistant, recyclable,
high performance beryllium-free spinodal alloy



NICLAFOR® 1000 CuNiSn alloys

Niclafor® 1000 is a range of Copper-Nickel-Tin (CuNi9Sn6) alloys designed and produced by Lebronze alloys (ex. CLAL).

Its complex manufacturing process includes solution annealing, work hardening and spinodal hardening to obtain very high mechanical and physical properties.

Niclafor can be a substitute to Copper-Titanium and Copper-Beryllium for some applications. It is available in strip in coils, sheet and plate forms, as well as wires, rods, and special profiles.

Mechanical advantages

Niclafor® 1000 exhibits very high mechanical properties, such as Tensile Strength and Yield Strength above 1,000 MPa (145 ksi) depending on temper, even at high temperatures.

It has an excellent fatigue resistance and low friction, making it suitable for heavy duty applications. For example it used in bushings and bearings, eg. Small end rings in high performance car engines.

Niclafor® products high elasticity and formability allow light and durable designs: for example, it is a material of reference in the eyewear industry.

High physical properties

Niclafor® exhibits high conductivity, very good corrosion resistance, magnetic properties and shielding effectiveness.

It is extensively used in the electronics industry, including aerospace systems, for applications such as EMI shielding and connector parts.

A recyclable and environment-friendly solution

Niclafor® materials are beryllium-free, lead-free and cadmium-free, and are compliant with REACH and RoHs regulations.

Lebronze alloys is committed to offer recyclable solutions, to enhance their environmental performance during manufacturing and also during the whole components life cycle.

CLAL

NICLAFOR® 1000

Temper designation

TB	Solution annealed
TD	Solution annealed cold rolled
TF	Solution annealed Precipitation heat treated
TH	Solution annealed cold rolled Precipitation heat treated

Generale features

Chemical composition

	Cu	Ni	Sn	Mn	Pb	Zn	Fe	P
Min %		8.5	5.5	0.05				
Max %	Balance	9.5	6.5	0.3	0.03	0.5	0.5	0.02

Physical properties

Density	8.9	(g/cm^3)
Melting range	968-1078	(°C)
Coefficient of thermal expansion from 20 to 200 °C	17.25	(x 10^{-6}/°C)
Modulus of elasticity	120	(GPa)
Resistivity at 20 °C :		(µ Ω.cm)
- solution annealed	≤ 19.5	
- precipitation hardened	≤ 15	
Electrical conductivity % IACS:		(% IACS)
-solution annealed	≥ 9	
-precipitation hardened (3h)	≥ 12	
Modulus of torsion	50	(GPa)
Thermal conductivity at 20 °C	53.6	(W/m.K)
Bending fatigue strength	450 at 10^8 cycles	(MPa)

Key benefits by tempers

Tempers	Key characteristics
TB	Maximum plasticity: drawing, stamping, bending
TD1-2-3	Formability, bending possible
TF **TH1-2-3-4-X**	Increased elasticity up to the maximum Better conductivity Very good fatigue properties Less formability

From these standardprecipitation heat treated tempers, some compromises can be obtained by adapting the temperature or the duration of the heat treatment.

Mechanical properties per temper

Rolled products

Temper	Hardness HV	Tensile Strength Rm (MPa)	Yield Strength Rp 0.2 (MPa)	Elongation A 50 mm (%)	Bending*		Rigidity, Elasticity bending fatigue (MPa)	
					longitudinal	transverse	longitudinal	transverse
Solution annealed								
TB	90 to 125	420 to 500	≥ 200	≥ 30	0.2	0.2	302	220
Solution annealed and Cold rolled								
TD1	140 to 180	460 to 560	≥ 300	≥ 15	0.2	0.2	216	359
TD2	160 to 200	540 to 640	≥ 400	≥ 10	0.2	0.2	275	390
TD3	200 to 240	620 to 720	≥ 550	≥ 3	0.5	0.5	444	523
TD4	220 to 260	700 to 820	≥ 600	≈ 1	2	1	467	568
TDX	≤ 320	≥ 780	≥ 650	≈ 1	10	2	472	613
Solution annealed and Precipitation heat treated								
TF	230 to 270	740 to 860	≥ 510	≥10	0.5	0.5	566	634
Solution annealed, Cold rolled and Precipitation heat treated								
TH1	270 to 310	850 to 950	≥ 650	≥ 8	0.5	0.5	684	724
TH2	290 to 320	880 to 980	≥ 720	≥ 8	1	1	730	770
TH3	310 to 340	950 to 1050	≥ 800	≥ 4	1	1	829	≥ 840
TH4	320 to 360	1000 to 1100	≥ 900	≈ 3	2	2	≥ 830	≥ 840
THX	≤ 390	≥ 1050	≥ 950	≈ 1	/	/	≥ 830	≥ 840

**90° bending accrossand in the rolling direction. According to DIN 5011 dated 25/10/85 Figures represent min* $\frac{\text{bending radius}}{\text{thickness}}$

Wires

Temper	Hardness HV	Tensile Strength Rm (MPa)	Yield Strength Rp 0.2 (MPa)	Elongation A 50 mm (%)	Striction Coeff. Z%
Solution annealed					
TB	≤ 150	400	≥ 200	≥ 30	≥ 80
Solution annealed and Cold rolled					
TD1	150 to 180	500 to 580	≥ 300	≥ 10	≥ 75
TD2	180 to 230	550 to 720	≥ 500	≥ 3	≥ 70
TD3	220 to 260	700 to 800	≥ 600	≥ 2	≥ 65
TD4	230 to 300	780 to 880	≥ 700	≥ 1.5	≥ 60
TDX	250 to 320	880 to 1000	≥ 800	≥ 0.1	≥ 50
Solution annealed and Precipitation heat treated					
TF	≤260	770 to 870	≥ 500	≥ 20	≥ 40
Solution annealed, Cold rolled and Precipitation heat treated					
TH1	260 to 300	870 to 970	≥ 700	≥ 13	≥ 30
TH2	290 to 310	930 to 1030	≥ 800	≥ 8	≥ 30
TH3	310 to 330	1000 to 1100	≥ 900	≥5	≥ 30
TH4	330 to 360	1100 to 1200	≥ 1000	≥ 2	≥ 30
THX	≥ 350	1175 to 1300	≥ 1100	≥ 0.5	≥ 30

Bars

Please contact us for bars mechanical properties

Welding and Brazability

Brazability

Wettability:

- Test
  - observation of the spreading on a piece of Niclafor® 1000
  - observation of the migration in T shaped joint.
- Conditions
  - brazing alloys tested
    Ref.: CS 111 - (Ag 55 - Cu 21 - Zn 22 - Sn 2)
    Melting range: 630-660°C
    Mechanical properties: Rm: 510 MPa - A %: 11
    Ref.: CS 77 - (Ag 38 - Cu 31 - Zn 28.8 - Sn 2.2)
    Melting range: 660-700°C
    Mechanical properties: Rm: 520 MPa - A %: 18
  - flux U1 (recommended temperature: 500-800°C)
  - heating with a torch
- Results
  Good wettability for both brazing alloys

Mechanical properties of the brazed joint:

- Conditions
  (brazing alloys CS 111 and CS 77 - Flux U1)
  5 mm simple overlapping sample
- Results
  Average shearstress by traction: CS 77:
  108 MPa CS 111: 116 MPa
- Conclusion
  Good mechanical strength of the brazed joint with both brazing alloys

Available forms

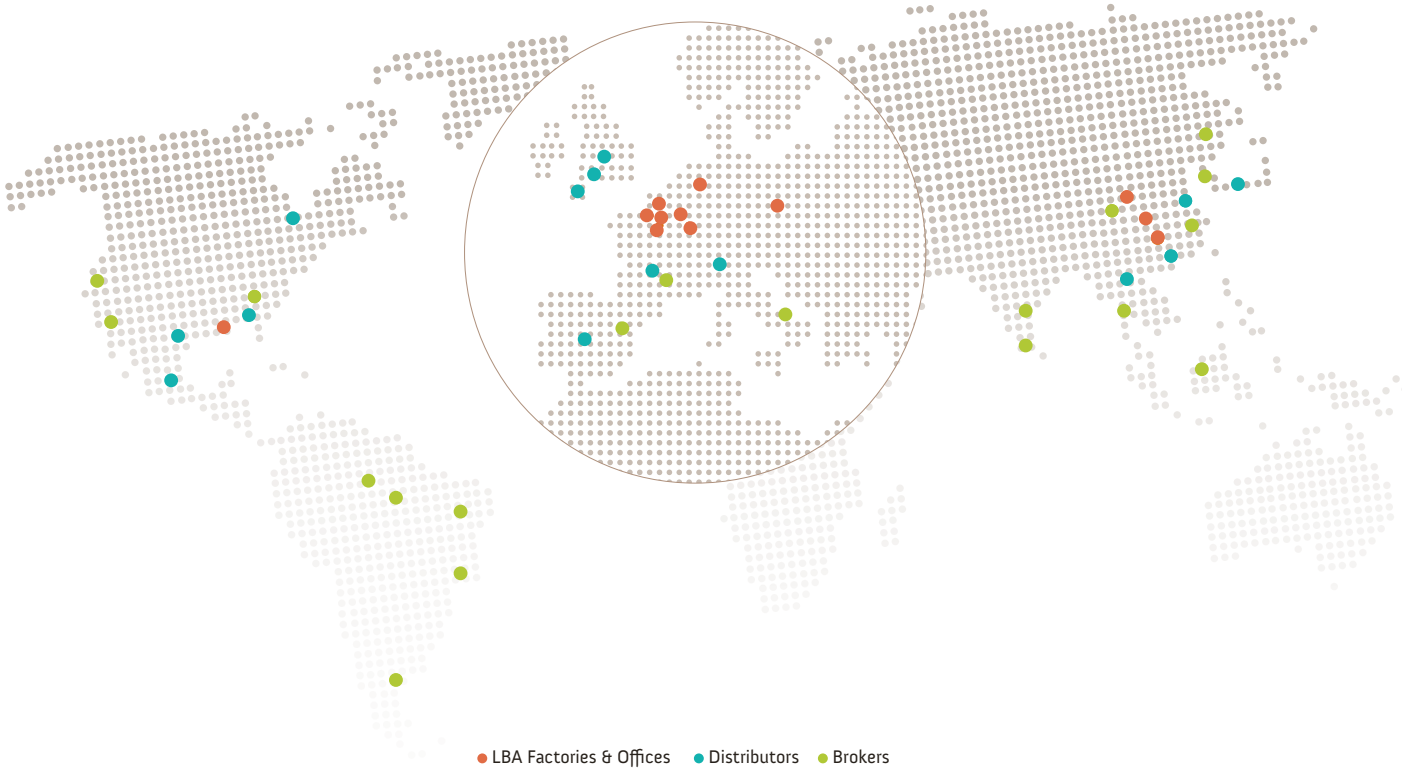
- Strip in coils
- Wire, rod
- Sheet, plate and profile on request

Applications

- Electronics (Connectors, Relays, fingerstock for EMI shielding, test probes, etc.)
- Electrical engineering
- Automotive (bushings)
- Telecom and Mobile phones
- Eyewear and Spectacles industry
- Domestic appliance
- Watch industry (micro-components)

lebronze alloys

An international distribution network: stocks available near final markets



Lebronze alloys Group was born from the integration of different companies specializing in development and production of technical high-performance alloys components : copper alloys, nickel alloys, but also aluminium alloys, specialty steels, stainless steels, titanium and nickel superalloys.

Thanks to a multidisciplinary know-how, the Group provides innovative solutions to all major industries such as Aerospace, Power, E-mobility, Oil & Gas, Railway but also in sectors manufacturing smaller equipment and products.

Our 8 production facilities and 850 employees manage a unique range of metal processing technologies: continuous and semi-continuous casting, die precision chill casting, extrusion, ring rolling, hot and cold rolling, drawing, open-die forging, hot stamping, closed-die forging, cold forming, machining, non-destructive testing, etc.

The Group's commitment is to find appropriate and optimized solutions for every sector's requirements.

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