

Uba

lebronze alloys



Siclanic S[®]

Special CuNiSi alloy for electronic
and elastic applications



Siclanic S®: copper-based alloy for electronic components

Siclanic S® is a Copper-Nickel-Silicon alloy, hardenable by heat treatment, which offers excellent electrical conductivity, mechanical strength and fatigue resistance. Those properties, combined with the product ability to be highly deformed before thermal treatment, are therefore ideal for the manufacture of relay springs, connectors or any high conductivity complex-shaped part.

An eco-friendly material

RoHS and REACH regulations aim to replace toxic materials with alternatives that are respectful to the environment, especially in Electronics.

Siclanic S® is a Beryllium-free and Lead-free alloy. Its composition of mainly Copper, with the addition of Nickel and Silicon, makes it compliant with those regulations, whilst its high physical and mechanical properties make it perfectly suitable for a vast range of applications.

High performance

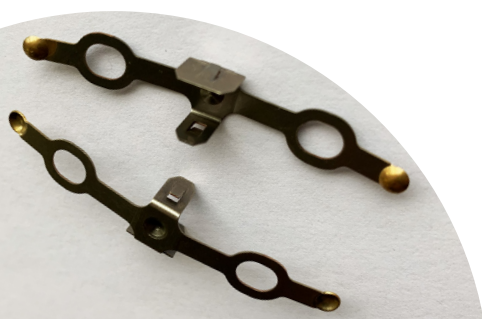
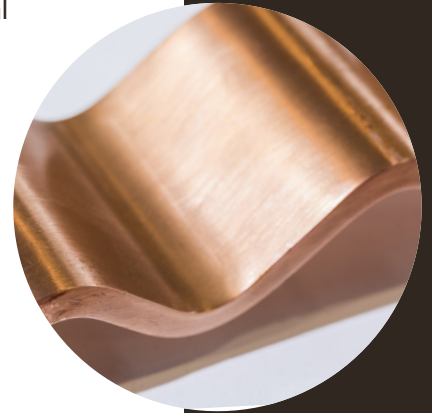
Siclanic S® offers excellent fatigue strength to conductivity ratio, greatly superior to bronzes, brasses and nickel silvers.

This alloy also exhibits high wear resistance when in sliding contact with ferrous metals, making it suitable for use in the manufacture of bearings. Moreover, thanks to the presence of nickel and silicon, its corrosion resistance is greater than that of pure copper. In contrast with brass alloys, Siclanic S® is insensitive to stress corrosion cracking.

Two categories of metallurgical condition

In the solution treated condition, Siclanic S® possesses a high deformation capacity for difficult forming application. Subsequent heat treatment gives components the required elasticity and conductivity. These states are recommended if brazing is to be carried out on the component.

However, in the factory heat treated condition, Siclanic S® offers the best compromise of properties. It may be used directly, provided the forming of the components does not involve a great amount of elongation.



Physical properties

Temper	Density at 20°C (g/cm ³)	Coefficient of thermal expansion between 20°C and 100°C (x10 ⁻⁶ /°C)	Thermal conductivity at 20°C (W/M.°K)	Electrical Resistivity at 20°C (μohm.cm)	Electrical conductivity (%IACS)	Modulus of elasticity, longitudinal (GPa)
Solid solution state	8.9	19	84			
Quenched state			188.4	7.8	22	120
Precipitation hardened state				<4.1	>43	130

Typical mechanical properties for Siclanic S[®] strips

Alloy	Hardness (HV)	Tensile Strength (MPa)	Yield Strength (MPa)	Elongation (%)
Solution treated & cold worked				
TB quenched state	70-85	270-300	140-170	30-47
TD3 quenched state 1/2 hard	105-125	320-400	290-380	10-20
TD4 quenched state Hard	195-250	400-470	390-450	3-9
Factory heat treated				
TF quenched and precipitation treated	170-190	580-680	450-550	10-20
TH3 quenched 1/2 hard precipitation treated	190-215	600-700	530-630	10-15
TH4 quenched hard precipitation treated	195-250	630-800	590-700	8-20

Bending ability

Condition	90° minimum bending radius as a function of the thickness t	
	Bend across rolling direction	Bend along rolling direction
TB	0 x t	0 x t
TD3	0 x t	1 x t
TD4	3 x t	3 x t
TF	0 x t	0 x t
TH3	1 x t	1 x t
TH4	1 x t	2 x t

Measurements made in a laboratory.
Non contractual

Chemical composition

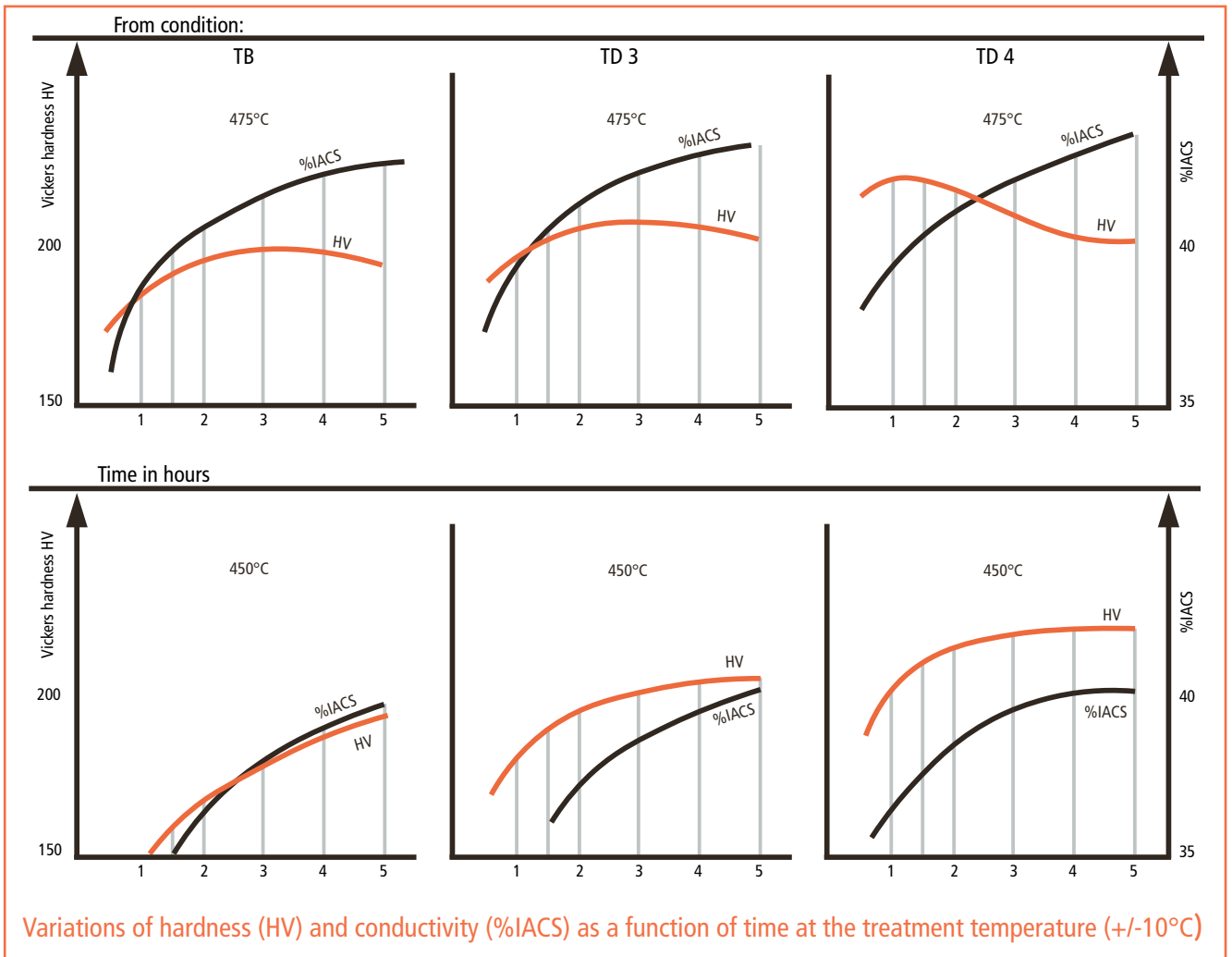
	Cu	Ni	Si
Siclanic S®	Remain	2.5	0.6

Comparative characteristics of Siclanic S® and other copper-based materials

Alloy	Hardness (HV)	Tensile Strength (MPa)	Yield Strength (MPa)	Electrical conductivity (%IACS)	Fatigue strength (MPa)	Limit of elasticity in bending (MPa)
Siclanic S® (TH4)	195-250	630-800	590-700	≥ 43	245	560
CuSn8 (H14) Bronze 158	210-230	700-780	≥ 680	13	210	440
CuNi18Zn20 (H15) Nical 180	≥ 215	≥ 680	≥ 650	5.4	200	510

Precipitation heat treatment

If SICLANIC S® is delivered in the untempered state, the formed components must undergo a precipitation heat treatment whose parameters are summarised in the following graphs :



Available forms

- Strips in coils
- Strips in cut to length
- Profiled wires
- Wires
- Bars

The following sizes are available:

Form	Thickness	Width
Strip	0.05 to 3.5 mm	120 to 380 mm
Cut to length	0.8 to 3.5 mm	20 to 380 mm
Wires	Contact us for these formats	
Bars		
Profiles		

Applications

- Conductive contact blades
- Switches/circuit breakers
- Thermostat
- Pressure switches
- Contactors
- Pieces for railway application
- Automotive commutators, relay blades
- Relay springs
- Washers for pressure/for pressure sensitive switch
- Bars, forged blocks for plastics technology (contact us)

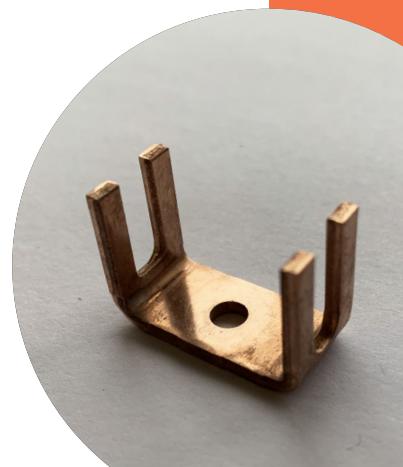
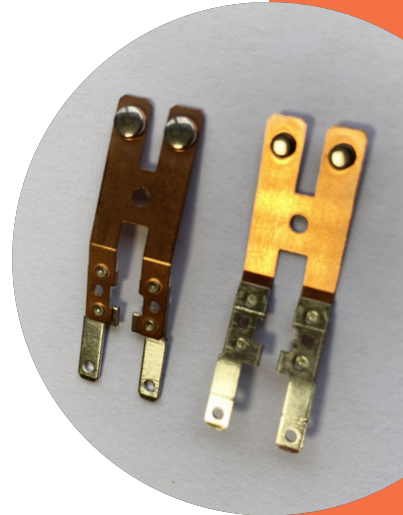
Work conditions

Degreasing the components before treatment is recommended. It is preferable to operate in a neutral or reducing atmosphere in order to prevent oxidation. However if the heat treatment has been carried out in an oxidizing atmosphere pickling in 10% sulphuric acid solution with the addition of 2% potassium or sodium bichromate will restore the components to satisfactory appearance.

In its hardened state, Siclanic S® is highly suitable for bending and forming, and in particular for drawing and drop forging.

Siclanic S® can also be brazed or soldered (copper phosphorous brazes are to be avoided because of their high melting range).

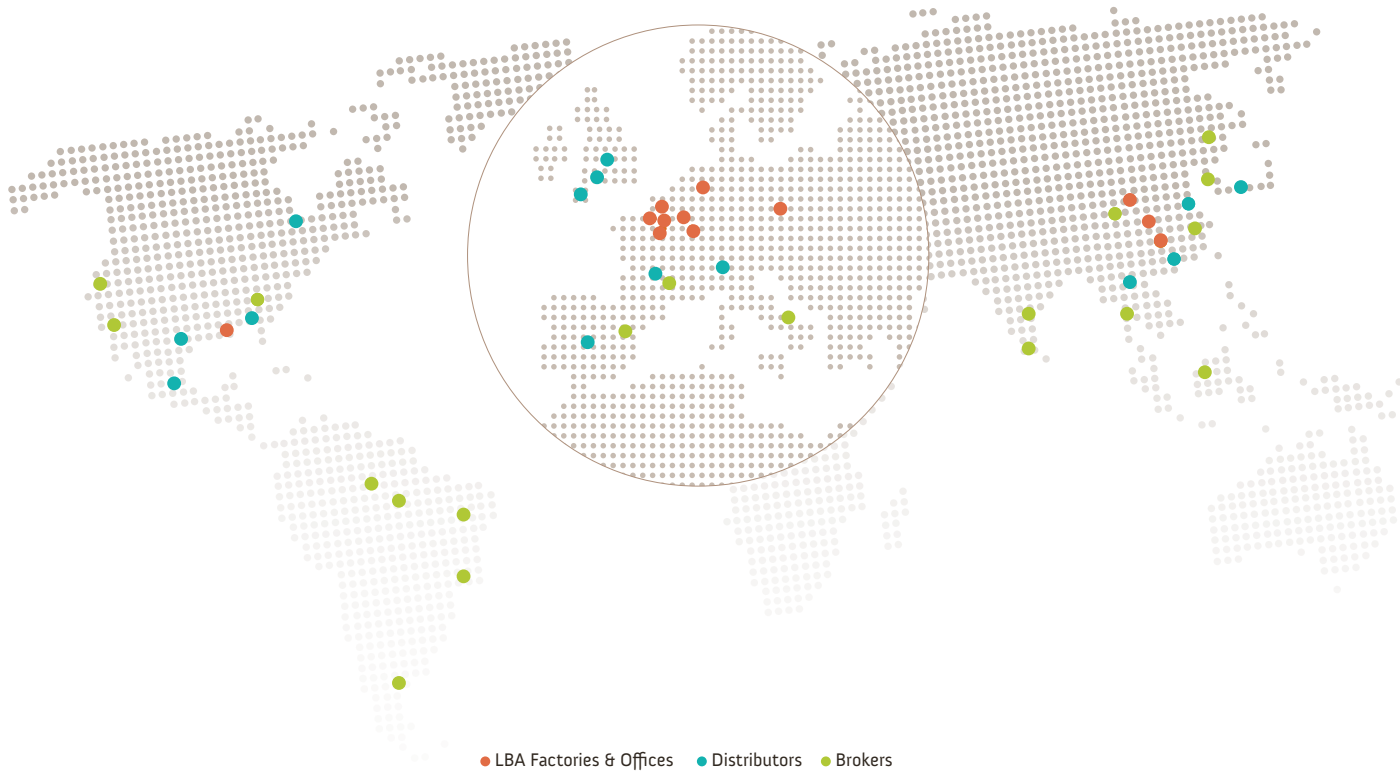
Moreover, Siclanic S® is as suitable as copper for silver, nickel or rhodium plating.





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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