

# C97<sup>®</sup> & C98<sup>®</sup>

Low alloyed copper for high performance connectors used in harsh environments

**Uba**  
lebronze alloys

## Alloys for connectors

LBA is a specialist manufacturer of materials for the connector industry: we offer a wide range of products, from standard brass to special, a-magnetic or lead-free materials. We supply them to most of the connector manufacturers or their subcontractors.

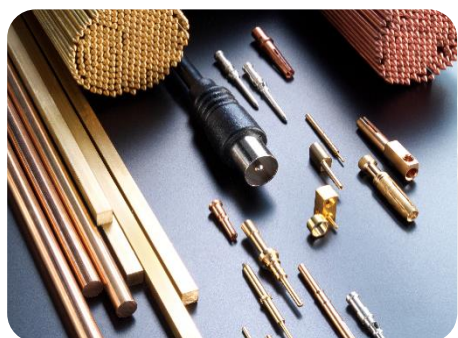
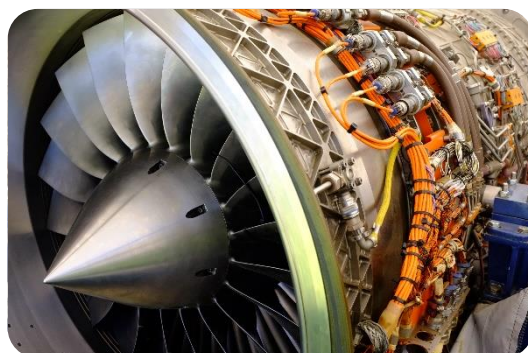
C97<sup>®</sup> is a free-machining heat-treated leaded copper nickel alloy offering both high mechanical strength and electrical conductivity. C97<sup>®</sup> is primarily used for connectors components: it is perfectly suited for use in harsh environments presenting both high temperature and high mechanical solicitation.

In addition, C97<sup>®</sup> is a more eco-friendly alternative to beryllium and cadmium copper alloys.

## C97<sup>®</sup> Key Applications

### Connectors for Aerospace and Automotive industries:

C97<sup>®</sup> is used for female contact body in circular or RF connectors. C97<sup>®</sup> demonstrates outstanding **thermal stress relaxation resistance** allowing it to better support high temperatures and high vibrations specific to these industries, providing a longer service life of the connector compared to connectors made of other alloys.



### Connectors for medical devices:

C97<sup>®</sup> is used for female contact body for specific connectors used in medical devices. For such applications, C97<sup>®</sup> demonstrates excellent **fatigue resistance**, allowing it to support daily mating cycles providing a longer service life of the connector compared to other alloys.

### Chemical composition of C97<sup>®</sup>

Ni	0.8% to 1.2%
Pb	0.8% to 1.2%
P	0.15% to 0.35%
Cu	Remainder

### C97<sup>®</sup> Physical Properties

Density (kg/dm <sup>3</sup> )	8.9
Electrical Conductivity (%IACS) <sup>(1)</sup>	50
Thermal Conductivity (W/mK)	245
Thermal capacity (K/kgK)	380
Coefficient of thermal expansion (m/m°C) <sup>(2)</sup>	18.10 <sup>-6</sup>

(1) After heat treatment

(2) For a validity range of [20;200°C]

## C97<sup>®</sup> main properties

### Limited stress relaxation

**Thermal stress relaxation** represents the stress decrease over time in a connector under outside solicitation in a high temperature environment: thus, the decrease must be limited in order to preserve the contact force of the connector.

C97<sup>®</sup> presents **one of the best thermal stress relaxation resistance** compared to other copper alloys (such as brass and copper-beryllium) with very high levels of remaining stress after exposure in high temperatures environments. Therefore, connectors made of C97<sup>®</sup> are **more likely to maintain their mechanical properties** while used at high temperatures.



### Excellent fatigue resistance

**Fatigue strength** illustrates the durability of the mechanical properties of the material over repeated mechanical solicitations. For a connector, it represents its reliability over repeated mating cycles (connection / reconnection).

**C97<sup>®</sup> presents excellent fatigue strength properties**; it is therefore a material of choice for medical devices and other electronic equipment that are often plugged and unplugged.

*Therefore, in addition to the excellent compromise of C97<sup>®</sup> between machinability, electrical conductivity and tensile strength, it also guarantees high durability for connectors in harsh environments.*

## C97<sup>®</sup> mechanical properties

Mechanical Properties of C97<sup>®</sup> alloys

Round/profile diameter (mm)	Minimal Yield Strength (MPa)	Minimal UTS (MPa)	Minimal elongation (%)	Typical Hardness (HV)	Available forms
0.5 to 5.0	560	620	2	180	Wire, Rods
5.0 to 6.0	520	590	3	170	Wire, Rods
6.0 to 9.5	490	570	3	160	Wire, Rods
>9.5	490	550	3	150	Wire up to 12 mm Rods up to 11 mm

## LBA alloys for the connectors industry

C98<sup>®</sup> is also a copper nickel alloy, nearly identical to C97<sup>®</sup>; both C97<sup>®</sup> and C98<sup>®</sup> share the same properties and the same applications.

**However, C98<sup>®</sup> is less machinable than C97<sup>®</sup>, but better for cold working**, i.e. crimping or other mechanical connection processes.

	C97 <sup>®</sup>	C98 <sup>®</sup>	C98T <sup>®</sup>
ISO	CuNiPb1P	CuNiPb0.5P	CuNiPb0.5P
UNS	C19160	C19140	C19150
Minimal electrical conductivity (%IACS)	50	50	50
Minimal Yield Strength (MPa)	490-560	490-560	490-560
Minimal Ultimate Tensile Strength (MPa)	550-620	550-620	550-620
Minimal elongation (%)	2-3	2-3	2-3
Typical Hardness (HV)	150-180	150-180	150-180
Machinability (%) <sup>(1)</sup>	70	60	60
Cold workability	Good	Excellent	Excellent

*(1) In comparison to CuZn39Pb3, for which machinability is 100%*

## LBA packaging for C97<sup>®</sup> & C98<sup>®</sup>

Depending on the product size, rods (2m to 4m length) are supplied in wooden cases.

Round or profile wire supplied in:

- Coils from 5 to 50 kg
- Drums from 100 to 300 kg
- Spools from 10 to 180 kg



## LBA typical product ranges and sizes for C97<sup>®</sup> & C98<sup>®</sup>

Round/profiles diameter [mm]	Tolerance h9 (standard)	Tolerance h8
1.1-3.0	+0/-0.025	+0/-0.014
3.1-6.0	+0/-0.030	+0/-0.018
6.1-10.0	+0/-0.036	+0/-0.022
10.1-12.0	+0/-0.043	+0/-0.027 <sup>(1)</sup>

*(1) Only in wires*

## Lebronze alloys' worldwide distribution network



● LBA production sites and sales offices

● Partner distributors



**Lebronze alloys was born from the integration of companies specialized in the production of copper alloys, copper, nickel alloys, aluminum, special steel, stainless steel, titanium and super alloys.**

Thanks to its multidisciplinary know-how, the Group provides innovative solutions to all major industries such as Aerospace, Oil & Gas, Energy, Off-highway Mining and Railways, but is also present in sectors that manufacture personal equipment.

Our 14 production sites and 1,200 employees master a unique range of metal processing technologies: continuous and semi-continuous casting, sand casting, chill casting (manual, mechanized, robotic), centrifugal casting, extrusion, ring rolling, hot and cold rolling, drawing, free forging, forging, die stamping, stamping, heat treatment, cold stamping, machining, non-destructive tests, etc.

Offering a solution that is suited and optimized to the needs of each industry is our Group's commitment.