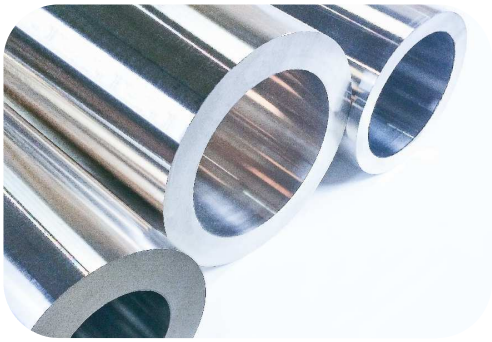
HARDIALL®

High Strength Spinodal Copper Nickel Tin Alloys

lebronze alloys

Aerospace Applications



Hardiall® is a wrought spinodally hardened copper alloy **CuNi15Sn8 (C72900)** designed for high strength applications where toughness is required. It is non-magnetic and resists mechanical wear, galling, stress relaxation, corrosion and erosion.

It is easily machined into complex components whilst being **environmentally friendly being both lead and beryllium free.**

Hardiall® is used within the aerospace industry thanks to its **outstanding physical and mechanical properties in many varied components**. Lebronze alloys has developed a full range of Hardiall® products matching the stringent needs of the Aerospace industry.

Hardiall® Properties and Benefits

Hardiall® Key Features & Benefits

- High strength & hardness
- Low friction
- Excellent lubricity
- Corrosion & Erosion resistant
- Excellent wear resistance
- Excellent machinability
- Excellent galling resistance
- Pitting & spalling resistance
- No Hydrogen embrittlement
- Non-magnetic
- High performance at both elevated and sub-zero temperatures -193 °F up to 572 °F
- Dimensional stability

***Lebronze Alloys manufacturing process for Hardiall® is fully integrated**: internal processes include casting, hot and cold working stage, heat treatment and non-destructive testing. Being fully integrated ensures reactivity and complete traceability.*

Hardiall® Physical Properties		
Electrical Conductivity at 20 °C (68 °F)	7.5	% IACS
Thermal Conductivity at 20 °C to 200°C (68 °F to 392 °F)	38 (22)	W/m/°C (Btu/ft/hr/°F)
Coefficient of Thermal Expansion at 20 °C to 200 °C (68 °F to 392 °F)	16.4×10^{-6} (9.1×10^{-6})	Per °C (Per °F)
Density	8.95 (0.323)	g/cm^3 (lb/in^3)

Hardiall® Key Applications in Aerospace

Bushings and Bearings for landing gears

In landing gears, bushings and bearings are required to operate under severe conditions, they need to be lubricated and replaced frequently causing recurring maintenance downtimes.

To reduce maintenance costs Hardiall® is used for such applications as it demonstrates excellent **lubricity, wear, and galling resistance**. Thus providing a **longer service life** and an improved **total cost of ownership (TCO)** compared to other copper and non-copper alloys materials.

Hardiall® is ideal for applications where the load required exceeds the **performance of copper-nickel-aluminum based alloys** or where **lubricity is critical and titanium cannot satisfy the Engineers requirements**.

Other applications:

- Landing gear attachments
- Engine and Pylon attachments
- Flight control mechanisms
- Doors and Hatches

Hardiall® Products Portfolio

Hardiall® is available in various tempers and grades differing from their mechanical properties. The following table indicates Hardiall® products available for the Aerospace industry.

Mechanical Properties of Hardiall® Alloys*						
LBA Designation / Norm	**Minimal Yield Strength 0.2% offset (MPa [ksi])**	**Minimal Elongation 4D (%)**	**Typical Hardness (HRC)**	**Minimal UTS (Mpa [ksi])**	**Available forms**	**Available sizes**
Wrought and spinodally hardened Hardiall® rods						
Hardiall TX 90	620 [90]	15	26	**Contact us for more properties, customized products, size information, and stock availabilities:** contact-hardiall@lebronze-alloys.com		
Hardiall TX 100	710 [102]	5	28			
AMS 4596	738 [107]	9.5	30			
	745 [108]	3	30			
Hardiall TX 110	760 [110]	10	30			
	760 [110]	6	30			
Solution annealed, cold finished and spinodally hardened Hardiall® rods						
Hardiall TS 160U	1035 [150]	3	34	**Contact us for more properties, customized products, size information, and stock availabilities:** contact-hardiall@lebronze-alloys.com		
	1020 [148]	3	32			
AMS 4597	1069 [155]	6	35			
	1020 [148]	3	34			
Wrought and spinodally hardened Hardiall® hollow bars/tubes (length limited to 1,000 mm) Wall thickness: 10 to 20 % of Ø						
AMS 4598	717 [104]	8	30	**Contact us for more properties, customized products, size information, and stock availabilities:** contact-hardiall@lebronze-alloys.com		
	745 [108]	5	30			
Hardiall TX 110	760 [110]	10	30			
	760 [110]	6	30			
	760 [110]	5	30			

**Measurements made in laboratory conditions. Non contractual. TS 160U refers to the UTS, other tempers refer to YS.*

All products can be ultrasonic tested at LBA upon customer request.

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 1,300 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.

lba
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Do you want to know more, discuss a project with us or make a request for quotation?

Contact: contact-hardiall@lebronze-alloys.com
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