

HARDIAL[®]

High Strength Spinodal
Copper Nickel Tin Alloys



lebronze alloys

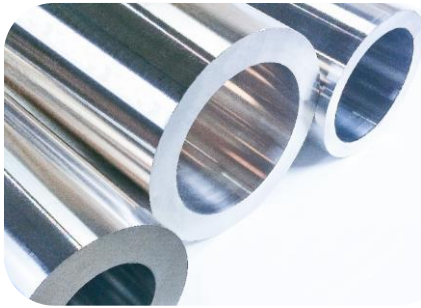
Industrial Applications

Hardial[®] 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, and corrosion.

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

Hardial[®] is used within various industrial applications thanks to its **outstanding physical and mechanical properties in many varied components.**

Lebronze alloys has developed a full range of Hardial[®] products to match the variety of requirements for demanding industrial applications



Hardial[®] Properties and Benefits

Hardial[®] Key Features & Benefits

- High strength & hardness
- Low friction
- Excellent lubricity
- Corrosion & Erosion resistant
- Excellent wear resistance
- Excellent machinability
- Non-sparking
- 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 (-125°C to 300°C)
- Dimensional stability

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

Hardial[®] Physical Properties

Electrical Conductivity at 68 °F (20°C)	7,5	% IACS
Thermal Conductivity at 68 °F (20°C)	22 (38)	Btu/ft/hr/°F (W/mK)
Coefficient of Thermal Expansion at 68 °F to 392 °F (20 to 200°C)	9,1x10 ⁻⁶ (16,4x10 ⁻⁶)	Per °F (Per °C)
Density	0,323 (8,95)	lb/in ³ (g/cm ³)

Hardial[®] Key Industrial Applications

Industrial Wear Components

Hardial[®] is used in many friction applications, especially with metal-to-metal contacts occurring under high loads. Hardial[®] has demonstrated strong performance against traditional friction materials when operating at low rotational speeds, whilst remaining excellent at high speeds too.

Typical components are metal bushings, sleeves, linear and plain bearings, gears, high pressure seals, pistons, backing and back-up rings subject to high wear through repeated motions.

For such applications, Hardial[®] demonstrates outstanding **friction wear, mechanical strength, corrosion to various media, high pressure and temperature resistance.** Thanks to its anti-sparking properties this grade also allows a safe use in sensitive environments like **H2**, and other **ATEX** environments.

By demonstrating an **excellent resistance to metal-to-metal wear**, Hardial[®] reduces **failures** and hence very costly **maintenance downtimes.** This leads to a **longer service life** and an **optimized total cost of ownership (TCO)** compared to Steels, Casted Aluminum Bronzes and Manganese Bronzes .

For these applications Lebronze alloys integrated supply chain is able to propose ready-to-use products.

Hardial® Products Portfolio

Hardial® is available in various tempers and grades differing from their mechanical properties. The following table indicates Hardial® products available for industrial applications

Mechanical Properties of Hardial® Alloys*						
LBA Designation	Minimal Yield Strength 0.2% offset ksi (MPa)	Minimal UTS ksi (MPa)	Minimal Elongation 4D %	Typical Hardness HRC	Available forms	Available sizes
Wrought and spinodally hardened Hardial® rods						
Hardial TX 105	105 (724)	110 (760)	4	30	Rods	$3/4" \leq \varnothing < 4"$ ($19 \leq \varnothing < 101.6$ mm)
	94.5 (652)	99 (683)	4	30	Rods	$\varnothing \geq 4"$ ($\varnothing \geq 101.6$ mm)
Hardial TX 110	110 (760)	132 (910)	10	30	Rods	$3/4" \leq \varnothing < 4"$ ($19 \leq \varnothing < 101.6$ mm)
	110 (760)	127 (875)	6	30	Rods	$\varnothing \geq 4"$ ($\varnothing \geq 101.6$ mm)
Wrought hot worked cold finished and spinodally hardened Hardial® rods						
Hardial TS 160U	150 (1035)	160 (1105)	3	34	Rods	$1.57" \leq \varnothing < 3.25"$ ($40 \leq \varnothing < 82$ mm)
	148 (1020)	160 (1100)	3	32	Rods	$3.25" \leq \varnothing < 3.54"$ ($82 \leq \varnothing < 90$ mm)
Wrought and spinodally hardened Hardial® hollow bars/tubes (length max 39,37")						
Wall thickness: 10 to 20 % of \varnothing						
Hardial TX 105	105 (724)	110 (760)	4	30	Tubes	$2.36" \leq \varnothing < 4"$ ($60 \leq \varnothing < 101.6$ mm)
	94.5 (652)	99 (683)	4	30	Tubes	$\varnothing \geq 4"$ ($\varnothing \geq 101.6$ mm)
Hardial TX 110	110 (760)	130 (895)	10	30	Tubes	$2.36" \leq \varnothing < 4"$ ($60 \leq \varnothing < 101.6$ mm)
	110 (760)	130 (895)	6	30	Tubes	$4" \leq \varnothing < 8"$ ($101.6 \leq \varnothing < 203$ mm)
	110 (760)	130 (895)	5	30	Tubes	$\varnothing \geq 8"$ ($\varnothing \geq 203$ mm)

*Measurements made in laboratory conditions. Non contractual. TS 160U refers to 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 consumer goods.

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.