

The Ultimate Guide to CuSn8 (C52100) Bronze Bearing Bushings: Strength, Durability, and Performance									
CuSn8 C52100 Bronze Bearing Bushing Material									
When it comes to high-load, high-wear applications, not all bearing materials are created equal. In the world of bronze alloys, one contender consistently rises to the top for demanding environments: CuSn8 Phosphor Bronze, also known by its international designation UNS C52100. If you're designing machinery for automotive, marine, or heavy industrial use, you need a bearing bushing that won't just survive—it will thrive. This deep dive will explain why CuSn8 (C52100) is the go-to material for high-performance bearing bushings, moving beyond superficial claims to explore the science behind its success.									
Cross-Reference Standards:			UNS: C52100 EN: CW453K						
What Exactly is CuSn8 Bronze? The Power of Tin									
Description	CuSn8 is a solid solution strengthened copper alloy. In simple terms, its core is copper (Cu), but it's fortified with approximately 8% tin (Sn). This isn't just a simple mix; the tin atoms dissolve into the copper's crystal structure, distorting it and making it significantly harder and stronger than pure copper. The small but crucial addition of phosphorus (P) acts as a deoxidizing agent during production, which further enhances its wear resistance and stiffness, earning it the common name Phosphor Bronze. This combination results in an alloy with a powerful trifecta of properties: high strength, excellent wear resistance, and superior corrosion resistance.								
Composition	Cu	Tin (Sn)	Phosphorus (P)	Zinc (Zn)	Fe	Ni		Pb	
	[%]	[%]	[%]	[%]	[%]	[%]		[%]	
	rem	7.5-8.5	0.01-0.4	0.2 max	0.1 max	0.2 max		0.02 max	
Role in the Alloy	The base metal, providing excellent thermal conductivity and ductility.	The star player. Adds significant strength, hardness, and wear resistance. Crucial for creating a low-friction surface.	A critical deoxidizer that improves fluidity during casting and significantly boosts hardness and fatigue resistance.	Minor element, can improve castability.	Impurity, kept low to maintain properties.	Impurity, kept low.		Kept extremely low to comply with RoHS and ELV environmental standards for automotive and electronics.	
Physical properties	Melting Point	Density	c _p @ 20°C	Young's modulus	Thermal Conductivity	Electrical Conductivity		Thermal Expansion (α) @20-300°C	
	[°C]	[g/cm³]	[kJ/kgK]	[GPa]	[W/mK]	[MS/m]	[%IACS]	[10 ⁻⁶ /K]	
	1040	8.8	0.377	115	67	≥ 7.5	≥13	18.5	
Why This Matters for a Bearing Bushing	High-temperature stability ensures the bushing maintains its integrity even when friction generates significant heat.	A key parameter for calculating the weight of components in automotive and aerospace designs.			Excellent. This allows the bushing to quickly dissipate heat away from the rotating shaft, preventing overheating, lubricant breakdown, and seizure. This is a critical performance metric.	While primarily a mechanical component, its adequate conductivity makes it suitable for electrical connectors and spring contacts that also serve a structural role.		Predictable expansion and contraction with temperature changes, essential for maintaining precise clearances in assemblies.	
Mechanical properties	Key Application Insight	Tensile Strength	Yield Strength	Elongation A ₅₀	Hardness HV	Bend ratio 90° [r]		Bend ratio 180° [r]	
		[MPa]	[MPa]	[%]	[-]	GW	BW	GW	BW
	Most formable state. Ideal for creating complex bushing shapes before they are work-hardened.	370-450	≤ 300	≥ 50	90-120	0	0	0	0
	A good balance of strength and formability. A common choice for general-purpose bushings.	450-550	≥ 280	≥ 20	135-175	0	0	0	0
	Harder temper, offering better wear resistance for moderately high loads.	540-630	≥ 460	≥ 13	170-200	0	0.5	1	2
	High-strength temper for demanding applications with significant pressure and wear.	600-690	≥ 530	≥ 5	190-220	0.5	1.5	2	3
	Peak performance for heavy-duty slide bearings. This temper provides maximum resistance to	660-750	≥ 620	≥ 3	210-240	1	2.5	3	4
	ypically used for spring applications, but illustrates the alloy's incredible potential for strength.	≥ 740	≥ 700	≥ 2	≥ 230	-	-	-	-
Fabrication properties	Fabrication and Machinability: Know Before You Go								
	How easy is it to work with CuSn8? Its properties dictate the best manufacturing processes.								
	Fabrication Process	Rating	Implication for Manufacturing						
	Cold Formability	Excellent	Can be readily stamped, drawn, and formed into precise bushing shapes without heat. This is a cost-effective and efficient production method.						
	Hot Formability	Not Recommended	This alloy is not designed for forging or hot working.						
	Soldering / Brazing	Excellent	Can be easily joined to other components if the design requires it.						
	Welding	Fair to Good	Can be welded, but specific techniques (Gas Shielded Arc) are required for best results.						
	Machinability	Not Recommended	This is a critical point. Compared to "free-machining" brass or leaded bronzes, CuSn8 is tough and gummy. It requires sharp tools, slower speeds, and proper lubrication to achieve a good surface finish. Its rating is often around 20%.						
Environmental Resistance: Built to Last	A bearing's environment is often as challenging as its mechanical load. This is another area where CuSn8 C52100 shines.								
Highly Resistant To:	Seawater and marine atmospheres (making it a top choice for shipbuilding). Industrial atmospheres and acid rain. Most non-oxidizing acids and alkaline solutions. Drinking water and service water (provided flow rates aren't excessive). Not Resistant To: Ammonia and ammonium compounds. Oxidizing acids (e.g., nitric acid). Cyanides and hydrogen sulfide. This robust corrosion resistance ensures longevity in applications from paper mills and chemical plants to offshore equipment.								
Typical Uses: Where CuSn8 C52100 Bushings Excel	Combining all these properties, you can see why CuSn8 C52100 is specified for a wide range of critical components: Automotive: Transmission bushings, wrist pin bushings, suspension system bearings. Heavy Machinery: High-load slide bearings in construction equipment, presses, and earth-movers. Marine & Shipbuilding: Rudder and propeller shaft bushings that are constantly exposed to seawater. Electrical Engineering: High-strength connectors, relay springs, and conductor elements that require both mechanical strength and electrical conductivity. General Engineering: Anywhere a durable, low-friction, corrosion-resistant bearing surface is needed, from textile machinery to chemical processing equipment.								
The Verdict: Is CuSn8 C52100 Right for Your Application?									
If your application demands a bearing bushing that can handle heavy loads, resist wear, dissipate heat effectively, and withstand corrosive environments, then CuSn8 (C52100) is not just a good choice—it's one of the best.									
While it may be tougher to machine than other alloys, its superior performance and extended service life provide a total cost of ownership that often surpasses cheaper, less durable materials. When reliability is non-negotiable, CuSn8 bronze delivers.									
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