
Bronze 932 SAE 660 Bearing Bronze – Technical Material Specification

1.0 Material Overview & Common Uses

Bronze 932, also known as SAE 660 or C93200, is a high-leaded tin bronze alloy widely used for bearing and bushing applications. It contains approximately 83% copper, 7% tin, 7% lead, and 3% zinc, providing excellent machinability, good wear resistance, and moderate strength. The lead content acts as a solid lubricant, making it ideal for applications with boundary lubrication or intermittent motion.

- Commonly used for: plain bearings, bushings, thrust washers, wear plates, pump impellers, and valve guides.
- Preferred in: industrial machinery, agricultural equipment, automotive components, and hydraulic systems.
- Available forms: continuous cast rods, tubes, rectangles, and custom extrusions.

2.0 Core Technical Properties & Sizing

- Density: 8.93 g/cm³ (0.323 lb/in³)
- Melting point: 854°C (1570°F) liquidus; 763°C (1405°F) solidus
- Tensile strength (as cast): 310 MPa (45,000 psi) minimum
- Yield strength (0.5% offset): 165 MPa (24,000 psi) minimum
- Elongation in 2 inches: 20% minimum
- Hardness: Brinell 65–85 (3000 kg load)
- Machinability rating: 70% (free-cutting brass = 100%)
- Standard diameter tolerances (continuous cast rod): ±0.005 inch for diameters up to 2 inches; ±0.010 inch for diameters 2–6 inches
- Standard length: 12-foot random mill lengths (tolerance ±1 inch)
- Straightness tolerance: 0.030 inch per foot maximum deviation

3.0 Processing, Machinability & Application

Bronze 932 is one of the most machinable bearing bronzes due to its lead content. It produces short, broken chips and can be machined at high speeds with excellent surface finish. Carbide tooling is recommended for high-volume production, but high-speed steel (HSS) tools are acceptable for lower volumes.

- Turning: Use carbide inserts with a positive rake angle; recommended cutting speed 200–400 SFM (surface feet per minute) for carbide, 100–200 SFM for HSS.
- Drilling: Use high-speed steel or carbide drills with a 118° point angle; peck drilling recommended for depths greater than 3× diameter.
- Threading: Use single-point threading or thread rolling; avoid carbide taps due to risk of chipping.
- Welding: Not recommended for structural applications; if necessary, use silicon bronze filler rod (ERCuSi-A) with TIG process and preheat to 200°C (400°F).

- Brazing: Silver brazing is preferred for joining; use flux-coated filler metals with a melting range of 620–700°C (1150–1300°F).
- Press fitting: Allow 0.001–0.002 inch interference per inch of shaft diameter for bushing installation.

4.0 Common Defects & Quality Control

- Reject if surface porosity exceeds 0.010 inch depth or 0.030 inch diameter on any face.
- Reject if internal shrinkage cavities are visible on cut surfaces or detected by ultrasonic inspection (ASTM E1001).
- Reject if lead segregation (visible as dark streaks or patches) covers more than 10% of the cross-section.
- Reject if cracks or cold shuts are visible under 5× magnification.
- Reject if out-of-round exceeds 0.003 inch for diameters under 2 inches; 0.005 inch for diameters 2–6 inches.
- Reject if hardness falls outside Brinell 65–85 range (test per ASTM E10).
- Reject if chemical composition deviates from C93200 limits: Cu 81–84%, Sn 6.3–7.5%, Pb 6.0–8.0%, Zn 2.0–4.0%, Ni max 1.0%, Fe max 0.35%, Sb max 0.35%, P max 0.15%.

5.0 Storage, Handling & WHMIS Guidelines

- Store in a dry, indoor environment with relative humidity below 60% to prevent tarnishing and corrosion.
- Shelf life: indefinite under proper storage conditions; no FIFO rotation required for solid stock.
- Do not store in direct contact with aluminum, magnesium, or zinc to avoid galvanic corrosion.
- WHMIS classification: Not classified as a hazardous material in solid form. Machining dust and fumes may contain lead and copper particulates.
- Mandatory PPE during machining: safety glasses with side shields, hearing protection, and cut-resistant gloves for handling sharp edges.
- Respiratory protection: Use N95 or P100 respirator if airborne lead dust exceeds 0.05 mg/m³ (OEL).
- Ventilation: Use local exhaust ventilation (LEV) to capture dust and fumes at the source.
- Wash hands thoroughly after handling; do not eat, drink, or smoke in work areas.
- Dispose of machining waste as hazardous waste if lead content exceeds regulatory thresholds (check provincial regulations).

Regulatory Disclaimer: This document is a generic technical material specification provided for educational purposes. The end-user assumes all liability for reviewing, adapting, and validating all tolerances, properties, and safety protocols against specific OEM data sheets and local regulations before deployment.