TIN-LEAD BRONZES (Anti-friction)

These are copper alloys with up to 34% Pb, 14% Sn, 4% Zn, and 2.5% Ni, featuring a highly complex metallurgical structure influenced by their chemical composition, melting process, casting, cooling, and other factors. Their load-bearing capacity varies with the copper, tin, and nickel content.

The Pb, which is insoluble in Cu and its alloys, can be mixed with it through agitation in the liquid state and, with the presence of nickel (Ni has a greater affinity for Cu, reducing the Sn retained in the first crystallization phase α and allowing more Sn into the second phase δ, forming smaller nucleation centers and interdendritic spaces, resulting in finer grains), is finely dispersed, solidifying at the end (327°C) in the form of irregular, isolated fine globules between the grain boundaries of the cast piece. Thus, the harder elements Cu and Sn, which make up the eutectoid phase δ, bear the load, while Pb forms the soft matrix of α crystals, providing plasticity.

Tin bronzes with a high lead content (> 7% Pb) are considered the most resistant to fatigue and capable of withstanding heavy loads at medium and high speeds, performing well under proper service conditions and adequate lubrication. The lead particles, due to their high plasticity and greasy nature, provide a smooth surface and excellent anti-friction qualities to the bearing. This allows it to adjust to misalignment, deformation, or flexing of the shafts, while also helping to maintain the lubricant film intact during the critical startup period and preventing shaft seizure in case of a momentary interruption in the lubricant supply.

ALLOY: VP - 937 = UNS C93700 = SAE 64

Bronze with excellent anti-friction qualities and mechanical strength, capable of withstanding heavy work, wear, pressure, moderate impacts, fatigue, vibrations, and abrupt starts. It is an excellent material for situations of borderline or uncertain lubrication, with medium resistance to corrosion from seawater, sulfuric acid (at concentrations below 78%), hydrochloric acid, and fatty acids; acidic mine waters, mineral waters, and sulfite liquors in paper mills.

As a bushing and sliding plate, it operates under moderate to high loads and speeds (500 to 1000 rpm), on semi-hardened shafts (heat-treated) with normal lubrication.

Chemical Composition:

%Cu	% Sn	%Pb	%Zn	%Fe	% Ni
78 - 82	9 - 11	8 - 11	0,8 max.	0,7 max.	0,5 max.

Mechanical and Physical Properties:

- **Tensile Strength,** *Kg/mm²*..... 21,1 - 28,1
- **Yield Strength,** *Kg/mm²*..... 8,4 - 14,1
- **Elongation,** *%*..... 20 - 10
- **Hardness,** *HB (10 mm / 500 Kg)*..... 65
- **Thermal Conductivity,** *W / m °C (20 °C)*..... 46,9
- **Coefficient of thermal Expansion,** *10^{-6} / °C (20 - 300 °C)*..... 18,5
- **Electrical Conductivity,** *% IACS (20 °C)*..... 10
- **Operating Temperature,** *°C*..... -233 - 260
- **Operating Load or Pressure,** *Kg/mm²*..... 3,1 - 5,1 (high)

Technical manufacturing standards:

- Chemical Composition and Mechanical Properties: UNS C 93700 = SAE 64 = DIN 1716 CuPb10Sn
- Sand Mold Casting : ASTM B584 / SAE J462
- Continuous Casting : ASTM B505 / 505M

Main Uses and Application:

Bushings and sliding plates for: cement kilns, mechanical shovels, and other heavy earthmoving equipment ● Bearings and guides for calenders, water pumps, speed reducers, rubber mills, eccentric presses, compressors, and machine tools ● Backing for metal-backed bearings.

✱ ***Referential Specifications for Chemical Composition, Mechanical, and Physical Properties based on the Unified Numbering System (UNS-C) of the Copper Development Association (CDA) for cast and forged copper alloys; subject to written confirmation by VULCANO METALS***

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