MANGANESE BRONZE

Manganese bronzes (high-strength yellow brass) are alloys of Copper and Zinc to which Aluminum is added, which has the greatest influence on tensile strength, along with Manganese and Iron that act as grain refiners. Tin and Nickel are primarily added to improve resistance to dezincification and corrosion, respectively. They are one of the Copper-based alloy families with the highest mechanical strength, hardness, toughness, yield strength (casting finish), and relatively good corrosion resistance. They maintain their mechanical properties at high temperatures, making them widely used in structural engineering.

During melting, it is crucial to maintain the correct Cu - Zn ratio and the main alloying elements, as even the slightest variation in the relationship of these elements significantly affects the high mechanical properties achievable in Manganese bronzes (with a low % Cu, elongation is very low, and with a high % Cu, tensile strength and yield strength are very low); therefore, the chemical composition must be strictly controlled, avoiding impurities that also negatively affect the material.

It is advised not to use Manganese bronzes with a single **β** phase in seawater, ammonia, acids, and liquid metals such as Tin, Lead, Mercury, Babbitt, and solder, as they crack when subjected to stress in contact with these corrosive environments. Manganese bronzes with a dual **α - β** phase are less susceptible to this phenomenon.

ALLOY: VM - 862 = UNS C86200 = SAE 430 A

An alloy with high mechanical strength, toughness, hardness, and very good resistance to fatigue, wear, impacts, and relatively good resistance to corrosion. It is preferred for structural parts subjected to heavy service and severe uses, especially for rolling and friction sliding.

As a bushing and sliding plate, it supports very high loads at low speeds, with reliable and clean lubrication; it requires hardened shafts (500 - 600 HB), fine machining, exact alignments, and loose tolerances.

Chemical Composition:

%Cu	% Sn	%Pb	%Zn	%Fe	% Ni	%Mn	%Al
60 - 66	0,2 máx.	0,2 máx.	22 - 28	2 - 4	1 max.	2,5 - 5,0	3,0 - 4,9

Mechanical and Physical Properties:

- **Tensile Strength,** *Kg/mm²*..... 63,3 - 66,8
- **Yield Strength,** *Kg/mm²*..... 31,6 - 33,7
- **Elongation,** *%*..... 25 - 15
- **Hardness,** *HB (10 mm / 500 Kg)*..... 150 - 180
- **Thermal Conductivity,** *W / m °C (20 °C)*..... 35,5
- **Coefficient of thermal Expansion,** *10^{-6} / °C (20 - 300 °C)*..... 21,6
- **Electrical Conductivity,** *% IACS (20 °C)*..... 8
- **Operating Temperature,** *°C*..... -233 - 304
- **Operating Load or Pressure,** *Kg/mm²*..... 3,1 - 5,1 (high)

Technical manufacturing standards:

- Chemical Composition and Mechanical Properties: UNS C 86200 = SAE 430 A = DIN 1709 CuZn23Al4
- Centrifugal Casting : ASTM B271 / 271M.
- Sand Mold Casting : ASTM B584 / SAE J462
- Continuous Casting : ASTM B505 / 505M

Main Uses and Application:

Bushings and rings for hydraulic cylinders ● Bearing cages, gear shift forks, butterflies, hooks, spray nozzles ● Plates for heat exchangers, condensers, and evaporators ● Valve stems, guides, and seats for large steam valves ● Structural components subjected to high mechanical stress.

✱ ***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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