# AMS 4597-C72900 (Hardiall®)

✓ STANDARD-STOCKED PRODUCT

**Extruded and Drawn**

lebronze alloys

| | |
|---|---|
| **Product Description:** | Copper Nickel-Tin Bronze |
| **Tempers:** | TX TS Solution Annealed, Cold Finished and Spinodal Hardened |
| **Solids:** | 0.75" to 3.54" (19.05 mm to 89.92 mm) O.D.* |
| | *Consult mill for other shapes/sizes |

## Typical Uses

| | |
|---|---|
| **Aerospace** | brakes, compression fit airframe fasteners, control surface and actuator bushings and bearings, door hardware, electronic system connectors, helicopter controls, hydraulic actuators, landing gear bushings and bearings, steering joints, valves, wheel bearings, wing flap bearings |
| **Electrical** | connectors, contacts, controls, miniaturized sockets, relay elements, switches |
| **Industrial** | springs, wire |
| **Marine** | marine components |
| **Oil and Gas** | bearings, bushings, drilling components, sucker rod, valve guide bushing couplings |

## Chemical Composition

| Ni + Co% | Sn% | Fe% | Zn% | Mn% | Cb% | Mg% | Pb% | Cu% |
|---|---|---|---|---|---|---|---|---|
| 14.50-15.50 | 7.50-8.50 | 0.50 | 0.50 | 0.30 | 0.10 | 0.15 | 0.02 | Rem. |

Chemical Composition according to AMS 4597

Note: Copper + Sum of Named Elements, 99.5% min. Single values represent maximums.

## Machinability

| AMS | Machinability Rating | Density (lb/in$^3$) | Density (g/cm$^3$) |
|---|---|---|---|
| AMS 4597-C72900 | | 0.323 | 8.94 |

CONCAST METAL PRODUCTS CO.

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## Mechanical Properties

Mechanical properties according to AMS 4597
TX TS Solution Annealed, Cold Finished and Spinodal Hardened

**SIZE RANGE: UP TO 1.60" (40 MM) EXCLUSIVE NOMINAL THICKNESS BETWEEN PARALLEL SIDES (BARS, RODS); NOMINAL WALL THICKNESS (TUBING)**

| Ultimate Tensile Strength, min | | Yield Strength, at 0.2% Offset, min | | Elongation, in 4D, min | Rockwell "C" Hardness | Remarks |
|---|---|---|---|---|---|---|
| ksi | MPa | ksi | MPa | % | min HRC | |
| 165 | 1137 | 155 | 1069 | 6 | 34 | |

**SIZE RANGE: 1.60" TO 3.25" (40 TO 83 MM) INCLUSIVE NOMINAL THICKNESS BETWEEN PARALLEL SIDES (BARS, RODS); NOMINAL WALL THICKNESS (TUBING)**

| Ultimate Tensile Strength, min | | Yield Strength, at 0.2% Offset, min | | Elongation, in 4D, min | Rockwell "C" Hardness | Remarks |
|---|---|---|---|---|---|---|
| ksi | MPa | ksi | MPa | % | min HRC | |
| 156 | 1075 | 148 | 1020 | 3 | 34 | |

## Physical Properties

| | US Customary | Metric |
|---|---|---|
| Melting Point – Liquidus | 2039 ˚F | 1115 ˚C |
| Melting Point – Solidus | 1742 ˚F | 950 ˚C |
| Density | 0.323 lb/in$^3$ at 68 ˚F | 8.94 gm/cm$^3$ at 20 ˚C |
| Specific Gravity | 8.94 | 8.94 |
| Electrical Conductivity | 7.8% IACS at 68 ˚F | 0.045 MegaSiemens/cm at 20 ˚C |
| Thermal Conductivity | 17 Btu/sq ft/ft hr/˚F at 68 ˚F | 29.4 W/m at 20 ˚C |
| Coefficient of Thermal Expansion 68-572 | 9.1 · 10$^{-6}$ per ˚F (68-572 ˚F) | 15.8 · 10$^{-6}$ per ˚C (20-300 ˚C) |
| Specific Heat Capacity | 0.09 Btu/lb/˚F at 68 ˚F | 377.1 J/kg at 293 ˚C |
| Modulas of Elasticity in Tension | 18500 ksi | 127554 MPa |
| Modulus of Rigidity | 7500 ksi | 51711 MPa |

Physical Properties provided by CDA

## Fabrication Properties

| Technique | Suitability |
|---|---|
| Soldering | Excellent |
| Brazing | Excellent |
| Oxyacetylene Welding | Good |
| Gas Shielded Arc Welding | Excellent |
| Coated Metal Arc Welding | Excellent |
| Spot Weld | Excellent |
| Seam Weld | Excellent |
| Butt Weld | Excellent |
| Capacity for Being Cold Worked | Excellent |
| Capacity for Being Hot Formed | Good |

Fabrication Properties provided by CDA

## Thermal Properties

| Treatment | Minimum* | Maximum* |
|---|---|---|
| Annealing | 1515 | |
| Hot Treatment | 1200 | 1600 |

Thermal Properties provided by CDA

*Temperature is measured in Fahrenheit.

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