AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
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AMS4650D

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COPPER-BERYLLIUM ALLOY
98Cu - 1.9Be
Solution Treated

1. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

2. FORM: Rods, bars, forgings, and forging stock.

3. APPLICATION: Primarily for parts requiring high strength with good electrical conductivity or lack of magnetic susceptibility.

4. COMPOSITION:

Beryllium	1.8 - 2.05
Nickel + Cobalt	0.20 min
Nickel + Cobalt + Iron	0.60 max
Copper + Total Named Elements	99.5 min

5. CONDITION:

5.1 Rods and Bars: Solution heat treated, and cold finished if necessary, in a suitable condition for precipitation heat treatment.

5.1.1 The cross sectional area of rods and bars shall be less than one-half that of the ingots from which they are formed; i.e., rods and bars shall have been subjected to over 50% reduction of area during formation.

5.2 Forgings: Solution heat treated, in a suitable condition for precipitation heat treatment.

5.3 Forging Stock: As ordered by the forging manufacturer.

6. TECHNICAL REQUIREMENTS:

6.1 Hardness: Material shall have hardness as follows, or equivalent:

6.1.1 Rods and Bars:

Nominal Diameter or Distance Between Parallel Sides, inches	Hardness, Brinell
1.5 and under	160 - 233
Over 1.5	200 max

6.1.2 Forgings: Not higher than Brinell 200, or equivalent.

6.1.3 Requirements in 6.1.1 and 6.1.2 apply from surface to center of material, for determinations made using 1000 kg load.

6.2 Properties After Precipitation Heat Treatment: Material after being heated at 600 F ± 5 for 3 hr and cooled in air shall conform to the following requirements:

6.2.1 Rods and Bars:

Tensile Strength, psi	160,000 min
Yield Strength at 0.2% offset or at 0.0170 inch in 2 in. extension under load, psi	120,000 min
Elongation, % in 4D	3 min

6.2.2 Rods, Bars and Forgings: Shall have hardness of Rockwell C 35-42 or equivalent.

6.3 Hardness After Re-Solution and Precipitation Heat Treatment: Material after resolution heat treatment and then heating at 600 F ± 5 for 3 hr and cooling in air shall have hardness of Rockwell C 35-40.

6.4 Grain Size: Average grain size shall be not larger than the following as determined by ASTM E79-49T:

Nominal Diameter or Distance Between Parallel Sides, inches	Average Grain Size, mm, max
Under 1.5	0.050
1.5 and over	0.075

7. QUALITY: Material shall be uniform in quality and condition, clean, sound, smooth, and free from foreign materials and from internal and external defects detrimental to fabrication or to performance of parts.

8. TOLERANCES: Unless otherwise specified, tolerances shall conform to the latest issue of AMS 2221 as applicable. Diameter, thickness and width tolerances shall be as specified below:

8.1 Rounds, Hexagons and Octagons: Table I, Refractory.

8.2 Squares: Table IV.

8.3 Rectangles, Thickness: Table IV.

8.4 Rectangles, Width: Table VII, Refractory.