AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
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AMS 4890

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COPPER-BERYLLIUM ALLOY CASTINGS, PRECISION INVESTMENT
2Be - 0.4Co - 0.3Si

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

2. APPLICATION: Primarily for small parts of intricate design requiring good corrosion resistance and high strength.

3. COMPOSITION: Castings shall conform to the following:

Beryllium	1.85 - 2.15
Cobalt	0.20 - 0.65
Silicon	0.20 - 0.35
Iron	0.35 max
Nickel	0.20 max
Aluminum	0.15 max
Chromium	0.10 max
Tin	0.10 max
Zinc	0.10 max
Lead	0.02 max
Copper	remainder

4. CONDITION: Solution heat treated, unless otherwise specified.

5. TECHNICAL REQUIREMENTS:

5.1 Castings: Castings shall be poured either from remelted master heat metal or directly from a master heat. A master heat is refined metal of a single furnace charge. Gates, sprues, risers, and rejected castings shall be used only in preparation of master heats; they shall not be remelted directly, without refining, for pouring of castings.

5.2 Test Specimens:

5.2.1 Tensile Test Specimens: Unless otherwise specified, tensile test specimens shall be cast to represent each lot of castings. A lot shall consist of not more than 800 lb of cast metal, including gates, sprues, and risers, produced in a period of not more than 8 consecutive hr from a single master heat. When requested by the purchaser, test specimens shall be supplied with the castings. The specimens shall be of standard proportions with 0.25 in. diameter at the reduced parallel section, shall be cast to size in molds made of the same refractory and heated to the same temperature as the molds for castings, and shall be cooled at approximately the same rate as the castings. Center gating may be used, but if specimens are so gated, the gate shall be completely removed before testing. If the metal for castings is given any treatment such as fluxing or cooling and reheating, metal for the specimens shall be so treated.

5.3 Heat Treatment: All castings and tensile test specimens representing them shall be heat treated as follows:

5.3.1 Tensile test specimens from each heat, together with production castings, shall be heated to 1475 F ± 10, held at heat for 1 hr per inch of cross section but in no case for less than 30 min., and quenched in cold water. At least one set of tensile test specimens shall be put into a batch-type furnace with each load of castings or into a continuous furnace at intervals of not longer than 3 hours.

5.4 Hardness: Castings shall have hardness not higher than Rockwell B 80 or equivalent.

5.5 Microstructure: Shall reveal no continuous stringers of beta phase constituent.

5.6 Grain Size: Shall be 0.045 mm or smaller average diameter, ASTM E79.

5.7 Properties After Precipitation Heat Treatment: Castings and tensile test specimens after being heated to 650 F ± 10, held at heat for 3 hr, and air cooled shall be capable of meeting the following requirements:

5.7.1 Tensile Properties:

Tensile Strength, psi	150,000 min
Yield Strength at 0.2% Offset or at 0.0085 in. in 1 in. Extension Under Load (E = 18,500,000), psi	120,000 min
Elongation, % in 1 in.	2 min

5.7.2 Hardness: Shall be not lower than Rockwell C 36.

6. QUALITY:

6.1 Castings shall be uniform in quality and condition, sound, and free from foreign materials, and from internal and external imperfections detrimental to fabrication or to performance of parts. Castings shall have smooth surfaces and shall be well cleaned. Unless otherwise specified, metallic shot or grit shall not be used for final cleaning.

6.2 When castings are broken for fracture test, the fracture shall have uniform color and be substantially free from oxides and other imperfections.

6.3 Radiographic and other quality standards shall be as agreed upon by purchaser and vendor.

6.4 Unless otherwise specified, castings shall be produced under radiographic control. This control shall consist of radiographic examination of castings until proper foundry technique, which will produce castings free from harmful internal imperfections, is established for each part number, and of production castings as necessary to ensure maintenance of satisfactory quality.

6.5 Castings shall not be repaired by plugging, welding, or other methods without written permission from purchaser.