Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 4871C
Superseding AMS 4871B
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ALUMINUM BRONZE CASTINGS, CENTRIFUGAL AND CHILL
85Cu - 11Al - 3.6Fe
Heat Treated

1. SCOPE:

1.1 Form: This specification covers one type of aluminum bronze in the form of centrifugal and chill castings.

1.2 Application: Primarily for parts requiring high strength at moderate temperatures.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods
AMS 2630 - Ultrasonic Inspection
AMS 2635 - Radiographic Inspection
AMS 2645 - Fluorescent Penetrant Inspection
AMS 2646 - Contrast Dye Penetrant Inspection
AMS 2804 - Identification, Castings

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM E8 - Tension Testing of Metallic Materials
ASTM E10 - Brinell Hardness of Metallic Materials
ASTM E478 - Chemical Analysis of Copper Alloys

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

2.3.2 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

Printed in U.S.A.

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E478, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other analytical methods approved by purchaser:

	min	max
Copper (See 3.1.1)	83.5	--
Aluminum	10.3	11.5
Iron	3.0	4.25
Manganese	--	0.50
Nickel	--	0.50
Other Elements, each	--	0.10
Other Elements, total	--	0.30

3.1.1 If composition is determined by instrumental methods, such as spectrographic, X-ray, or atomic absorption, copper may be reported as "remainder."

3.2 Condition: Solution heat treated and tempered.

3.3 Casting: Castings shall be produced in lots from metal conforming to 3.1. Metal remelted from previously analyzed ingot may be poured directly into castings. Unless otherwise agreed upon by purchaser and vendor, molten metal taken from alloying furnaces, with or without additions of foundry operating scrap (gates, sprues, risers, and rejected castings), shall not be poured into castings unless first converted to ingot, analyzed, and remelted or unless the composition of a sample taken after the last addition to the melt has been found to conform to 3.1.

3.3.1 A melt shall be the metal withdrawn from a batch-furnace charge of 2000 lb (908 kg) or less as melted for pouring castings or, when permitted by purchaser, a melt shall be 4000 lb (1816 kg) or less of metal withdrawn from one continuous furnace in not more than 8 consecutive hours.

3.3.2 A lot shall be all castings poured from a single melt in not more than 8 consecutive hours.

3.4 Test Specimens: Chemical analysis specimens and tensile test coupons shall be cast as follows and, when requested, shall be supplied with the castings:

3.4.1 Chemical Analysis Specimens: Shall be cast from each melt and shall be of any convenient size, shape, and form for vendor's tests. When chemical analysis specimens are required by purchaser, specimens shall be cast to a size, shape, and form agreed upon by purchaser and vendor.

3.4.2 Tensile Test Coupons: Shall be cast in permanent molds from each melt of metal used for pouring castings. Coupons shall be of such size as to allow machining tensile test specimens conforming to ASTM E8 with 0.500 in. (12.50 mm) diameter at the reduced parallel gage section. Metal for the coupons shall be part of the melt which is used for castings.

3.5 Heat Treatment: Castings and representative tensile test coupons shall be heat treated as follows; at least one set of tensile test coupons shall, during each stage of heat treatment, 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:

3.5.1 Solution Heat Treatment: Heat to a temperature within the range 1600° - 1700°F (870° - 925°C), hold at the selected temperature within ±25°F (±15°C) for not less than 2 hr, and quench in water.

3.5.2 Tempering: Heat to a temperature within the range 1100° - 1200°F (595° - 650°C), hold at the selected temperature within ±15°F (±8°C) for not less than 2 hr, and cool in air to room temperature.

3.6 Properties: Castings and representative tensile test coupons produced in accordance with 3.4.2 shall conform to the following requirements:

3.6.1 Tensile Properties: Shall be as follows, determined in accordance with ASTM E8:

3.6.1.1 Separately-Cast Coupons:

Tensile Strength, min	90,000 psi (621 MPa)
Yield Strength at 0.2% Offset, min	45,000 psi (310 MPa)
Elongation in 4D, min	5%

3.6.1.2 Specimens Cut From Castings: Test specimens as in 4.3.4 cut from any area of a casting shall meet the following requirements:

3.6.1.2.1 Castings 1.0 In. (25 mm) and Under in Nominal Cross-Section:

Tensile Strength, min	90,000 psi (621 MPa)
Yield Strength at 0.2% Offset, min	40,000 psi (276 MPa)
Elongation in 4D, min	5%

3.6.1.2.2 Castings Over 1.0 In. (25 mm) in Nominal Cross-Section:

Tensile Strength, min	72,000 psi (496 MPa)
Yield Strength at 0.2% Offset, min	36,000 psi (248 MPa)
Elongation in 4D, min	5%

3.6.2 Hardness of Castings: Should be 200 - 235 HB/10/3000/15 or equivalent, determined in accordance with ASTM E10, but the castings shall not be rejected on the basis of hardness if the tensile property requirements of 3.6.1.2 are met.

3.7 Quality:

3.7.1 Castings, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections detrimental to usage of the castings.

3.7.1.1 Castings shall have smooth surfaces and shall be well cleaned.

3.7.2 Castings shall be produced under radiographic control, unless otherwise specified. This control shall consist of radiographic examination of castings in accordance with AMS 2635 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.

3.7.3 When specified, castings shall be subjected to ultrasonic inspection in accordance with AMS 2630, to fluorescent penetrant inspection in accordance with AMS 2645, and/or to contrast dye penetrant inspection in accordance with AMS 2646.

3.7.4 Radiographic, ultrasonic, fluorescent penetrant, contrast dye penetrant, and other quality standards shall be as agreed upon by purchaser and vendor.

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

3.7.5.1 When permitted in writing by purchaser, defects in castings may be removed and the castings repaired by welding provided the weld repair area has properties comparable to those of the parent metal. Repair welds shall be subjected to the same inspection procedures and acceptance standards required of the castings. Weld repair areas shall be suitably marked to facilitate inspection. Repair welding shall be performed prior to any heat treatment and nondestructive testing specified herein.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of castings shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the castings conform to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for the following are classified as acceptance tests and shall be performed at the frequency specified:

4.2.1.1 Composition (3.1) of each melt.

4.2.1.2 Tensile properties of separately-cast specimens (3.6.1.1) and hardness (3.6.2) and quality (3.7) of castings from each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for tensile properties of specimens cut from castings (3.6.1.2) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.2.3 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed on the first-article shipment of a casting to a purchaser, when a change in material or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.3.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be in accordance with the following:

4.3.1 Two chemical analysis specimens in accordance with 3.4.1 from each melt and/or a casting from each lot.

4.3.2 Three tensile test coupons in accordance with 3.4.2 from each lot.

4.3.3 Two preproduction castings in accordance with 4.4.1 of each part number.