AEROSPACE MATERIAL SPECIFICATION

AMS4871™	REV. H

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Superseding AMS4871G

Aluminum Bronze, Centrifugal and Chill Castings
85Cu - 11Al - 3.6Fe
Solution Heat Treated and Tempered
(Composition Similar to UNS C95420)

RATIONALE

AMS4871H stabilizes this document because it represents mature technology which is not expected to change in the future and thus no further revisions are anticipated.

STABILIZED NOTICE

AMS4871H has been declared “Stabilized” by AMS Committee D. This document will no longer be updated and may no longer represent standard industry practice. This document was stabilized because it contains mature technology that is not expected to change and thus no further revisions are anticipated. Previously this document was active. The last technical update of this document occurred in January, 2010. Users of this document should refer to the cognizant engineering organization for disposition of any issues with reports/certifications to this specification, including exceptions listed on the certification. NOTE: In many cases, the purchaser may represent a sub tier supplier and not the cognizant engineering organization.

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1. SCOPE

1.1 Form

This specification covers an aluminum bronze alloy in the form of centrifugal and chill castings.

1.2 Application

These castings have been used typically for parts requiring high strength at moderate temperatures, but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS2360	Room Temperature Tensile Properties of Castings
AMS2630	Inspection, Ultrasonic, Product Over 0.5 Inch (12.7 mm) Thick
AMS2694	In-Process Welding of Castings
AMS2750	Pyrometry
AMS2804	Identification, Castings

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM E 8/E 8M Tension Testing of Metallic Materials
ASTM E 10 Brinell Hardness of Metallic Materials
ASTM E 478 Chemical Analysis of Copper Alloys
ASTM E 1417 Liquid Penetrant Testing
ASTM E 1742 Radiographic Examination

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 478, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - COMPOSITION

Element (3.1.1)	min	max
Copper (3.1.2)	83.5	--
Aluminum	10.5	12.0
Iron	3.0	4.3
Manganese	--	0.50
Nickel + Cobalt (3.1.2)	--	0.50
Sum of Named Elements (3.1.3)	99.5	--

3.1.1 These composition limits do not preclude the presence of other elements. Limits may be established and analysis required for unnamed elements by agreement between the manufacturer or supplier and purchaser.

3.1.2 In determining copper minimum, copper may be calculated as copper plus nickel.

3.1.3 When all the elements in the table are analyzed, the sum shall be 99.5% minimum, but such determination is not required for routine acceptance of each lot.

3.2 Condition

Solution heat treated and tempered, TF50 temper (See 8.2).

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. 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 conforms to 3.1.

3.3.1 A melt shall be the metal withdrawn from a batch-furnace charge of 2000 pounds (907 kg) or less as melted for pouring castings or, when permitted by purchaser, a melt shall be 4000 pounds (1814 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 and solution heat treated and tempered in the same heat treatment batch.

3.4 Test Specimens

Chemical analysis specimens and tensile coupons shall be cast as follows:

3.4.1 Chemical Analysis Specimens

Shall be cast from each melt and shall be of any convenient size, shape, and form.

3.4.2 Tensile Coupons

Shall be cast from each melt of metal, in permanent molds, used for pouring castings. Coupons shall be of such size to allow machining tensile specimens conforming to ASTM E 8/E 8M with 0.500 inch (12.70 mm) diameter at the reduced parallel gage section. Metal for the coupons shall be part of the melt which is used for the castings and shall be poured at a temperature not lower than the temperature of the metal during pouring of the castings.

3.5 Heat Treatment

Castings and representative tensile coupons shall be heat treated as in 3.5.1 and 3.5.2; at least one set of tensile 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. Pyrometry shall be in accordance with AMS2750.

3.5.1 Solution Heat Treatment

Heat to a temperature within the range 1600 to 1700 °F (871 to 927 °C), hold at the selected temperature within ±25 °F (±14 °C) for not less than 2 hours, and quench in water.

3.5.2 Tempering

Heat to a temperature within the range 1100 to 1200 °F (593 to 649 °C), hold at the selected temperature within ±15 °F (±8 °C) for not less than 2 hours, and cool in air to room temperature.

3.6 Properties

Castings and representative tensile 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 E 8/E 8M; conformance to the requirements of 3.6.1.1 shall be used as the basis for acceptance of castings except when purchaser specifies that requirements of 3.6.1.2 apply:

3.6.1.1 Separately-Cast Coupons

Shall be shown in Table 2.

TABLE 2 - MINIMUM TENSILE PROPERTIES

Property	Value
Tensile Strength	90.0 ksi (621 MPa)
Yield Strength at 0.2% Offset	45.0 ksi (310 MPa)
Elongation in 4D	5%

3.6.1.2 Specimens Cut From Castings

Specimens as in 4.3.4 shall meet the requirements shown in Table 3 or Table 4 as applicable.

3.6.1.2.1 Castings 1.0 Inch (25.4 mm) and Under in Nominal Cross-Section

TABLE 3 - MINIMUM TENSILE PROPERTIES

Property	Value
Tensile Strength	90.0 ksi (621 MPa)
Yield Strength at 0.2% Offset	40.0 ksi (276 MPa)
Elongation in 4D	5%

3.6.1.2.2 Castings Over 1.0 Inch (25 mm) in Nominal Cross-Section

TABLE 4 - MINIMUM TENSILE PROPERTIES

Property	Value
Tensile Strength	72.0 ksi (496 MPa)
Yield Strength at 0.2% Offset	36.0 ksi (248 MPa)
Elongation in 4D	5%

3.6.1.2.3 When properties other than those specified in 3.6.1.2.1 or 3.6.1.2.2 are required, tensile specimens as in 4.3.4, machined from locations indicated on the drawing from a casting or castings chosen at random to represent each lot, shall have the properties indicated on the drawing for such specimens. Tensile property requirements may be designated in accordance with AMS2360.

3.6.2 Hardness

Castings shall have hardness of 200 to 235 HB/10/3000/15, or equivalent, determined in accordance with ASTM E 10.

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 imperfections detrimental to usage of the castings.

3.7.1.1 Castings shall have smooth surfaces and shall be cleaned sufficiently to permit nondestructive inspection.

3.7.2 Castings shall be produced under radiographic control. This control shall consist of radiographic examination of castings in accordance with ASTM E 1742 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 AMS2630 and/or to fluorescent penetrant testing in accordance with ASTM E 1417.

3.7.4 Radiographic, ultrasonic, fluorescent penetrant, and other quality standards may be agreed upon by purchaser and vendor.

3.7.5 Castings shall not be reworked 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 welded in accordance with AMS2694.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of castings shall supply all samples for vendor's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the castings conform to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Except as specified in 4.2.1.1, composition (3.1), tensile properties of separately-cast specimens (3.6.1.1) or, when specified, tensile properties of specimens cut from castings (3.6.1.2), hardness (3.6.2), and quality (3.7) are acceptance tests and shall be performed to represent each melt or lot as applicable.

4.2.1.1 Tensile properties of specimens cut from castings shall be determined only when specified by purchaser or when separately-cast specimens are not available. Tensile properties of separately-cast specimens need not be determined when tensile properties of specimens cut from castings are determined.

4.2.2 Preproduction Tests

All technical requirements are preproduction tests and shall be performed prior to or on the first-article shipment of a casting to a purchaser, when a change in material and/ or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.3 Sampling and Testing

Shall be in accordance with the following:

4.3.1 One chemical analysis specimen in accordance with 3.4.1 from each melt or a casting from each lot.

4.3.2 Two separately-cast tensile coupons in accordance with 3.4.2 representing each lot except when properties of specimens cut from castings are required.

4.3.3 Sufficient preproduction castings of each part number in accordance with 4.4.1 as required to satisfy dimensional, mechanical property, and quality evaluations

4.3.4 One or more castings from each lot when properties of specimens machined from castings are required. Tensile specimens shall conform to ASTM E 8/E 8M and shall be either 0.500 inch (12.70 mm) diameter at the reduced parallel gage section, subsize specimens proportional to the standard, or standard sheet-type specimens. For determining conformance to the requirements of 3.6.1.2, if specimen locations are not shown on the drawing, not less than two tensile specimens, one from the thickest section and one from the thinnest section, shall be cut from a casting or castings from each lot.

4.3.5 One or more castings from each lot for hardness evaluation.

4.4 Approval

4.4.1 Sample castings from new or reworked patterns or molds and the casting procedure shall be approved by purchaser before castings for production use are supplied, unless such approval be waived by purchaser.

4.4.2 Vendor shall establish, for production of sample castings of each part number, parameters for the process control factors which will produce acceptable castings; these shall constitute the approved casting procedure and shall be used for producing production castings. If necessary to make any change in parameters for the process control factors, vendor shall submit for reapproval a statement of the proposed changes in processing and, when requested, test specimens, sample castings, or both. Production castings incorporating the revised operations shall not be shipped prior to receipt of reapproval.