



AEROSPACE MATERIAL SPECIFICATION

AMS4873™**REV. G**

Issued 1946-01
Reaffirmed 2016-03
Revised 2024-09

Superseding AMS4873F

Aluminum Bronze Alloy, Sand Castings,
85Cu - 11Al - 3.6Fe,
Solution Heat Treated and Tempered
(Composition similar to UNS C95420)

RATIONALE

AMS4873G results from a Five-Year Review and update of this specification with changes to clarify that casting approval and reapproval actions are to be carried out by the cognizant engineering organization (see 4.2.3 and 4.4); update wording to prohibit unauthorized exceptions (see 3.8, 4.5.1, and 8.4); relocate Definitions (see 2.3); update the definition for heat-treat lot (see 2.3.3); update Applicable Documents (see Section 2), Composition (see 3.1), and Ordering Information (see 8.5); and allow the use of the immediate prior specification revision (see 8.3).

1. SCOPE

1.1 Form

This specification covers an aluminum bronze alloy in the form of sand castings (see 8.5).

1.2 Application

These castings have been used typically for parts requiring strength and corrosion resistance 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 +1 724-776-4970 (outside USA), www.sae.org.

AMS2175 Casting, Classification and Inspection of

AMS2360 Room Temperature Tensile Properties of Castings

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SAE WEB ADDRESS:

For more information on this standard, visit
<https://www.sae.org/standards/content/AMS4873G/>

AMS2694 In-Process Welding of Castings
AMS2804 Identification, Castings
AS7766 Terms Used in Aerospace Metals Specifications

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 E8 Tension Testing of Metallic Materials
ASTM E10 Brinell Hardness of Metallic Materials
ASTM E29 Using Significant Digits in Test Data to Determine Conformance with Specifications
ASTM E272 Reference Radiographics for High Strength-Copper-Base and Nickel-Copper Alloy Castings
ASTM E478 Chemical Analysis of Copper Alloys
ASTM E1417/E1417M Liquid Penetrant Testing
ASTM E1742 Radiographic Inspection

2.3 Definitions

Terms used in AMS are defined in AS7766 and as follows:

2.3.1 MELT

A single homogeneous batch of molten metal to which all melt additions and processing have been completed and from which castings are poured.

2.3.2 MELT LOT

Castings poured from a single melt.

2.3.3 HEAT-TREAT LOT

Castings of the same part number, poured from a single melt, and heat treated in the same batch.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined in accordance with ASTM E478 or by other analytical methods acceptable to the purchaser (see 3.4.1).

Table 1 - Composition

Element (see 3.1.1 and 3.1.2)	Min	Max
Copper (see 3.1.4)	83.5	--
Aluminum	10.5	12.0
Iron	3.0	4.3
Manganese	--	0.50
Nickel + Cobalt	--	0.50
Copper plus sum of named elements (see 3.1.3)	99.5	--

- 3.1.1 Test results may be rounded by the “rounding off” method of ASTM E29.
- 3.1.2 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.
- 3.1.3 When all named elements in Table 1 are analyzed, the sum shall be 99.5% minimum, but such determination is not required for routine acceptance of each lot.
- 3.1.4 Copper may be reported as “remainder,” or as the difference between the sum of results for all elements and 100%, or as the result of direct analysis.

3.2 Condition

Solution heat treated and tempered.

3.3 Castings

Castings shall be produced from metal conforming to 3.1 determined by analysis of a specimen (see 3.4.1) cast after the last melt addition.

3.4 Cast Test Specimens

Chemical analysis specimens and tensile specimens shall be cast as follows.

3.4.1 Chemical Analysis Specimen

Shall be cast from each melt after the last melt addition and shall be tested to qualify the melt lot as in 3.1. Additional samples shall be required for each additional 8 hours of holding time.

3.4.2 Tensile Specimens

- 3.4.2.1 Unless specimens cut from castings are specified by the purchaser, separately cast specimens, conforming to ASTM E8, shall be cast from each melt after the last melt addition. Specimens shall be cast in molds representing the mold formulation used for castings. Chills are not permitted on test specimen cavity except on the end face of the specimen when approved in accordance with 4.4.2. A tensile specimen shall be processed with each heat-treat lot and tested for conformance to 3.6.1.1.
- 3.4.2.2 When the purchaser specifies specimens cut from castings, such specimens shall be removed after heat treatment, shall be machined to conform to ASTM E8, 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, as required in 3.6.1.2 or 3.6.1.3.

3.5 Heat Treatment

Castings and representative tensile specimens shall be solution heat treated and tempered in accordance with the following; unless specimens cut from a casting are specified, one or more sets of separately cast tensile specimens 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 Castings and tensile specimens shall be heated to not lower than 1600 °F (871 °C), held at heat for the proper time for solution heat treatment, and quenched.
- 3.5.2 Castings and tensile specimens shall be heated to not lower than 1100 °F (593 °C), held at heat for the proper time for tempering, and cooled in air.

3.6 Properties

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

3.6.1.1 Separately Cast Specimens

Shall be as shown in Table 2.

Table 2 - Minimum tensile properties

Property	Value
Tensile Strength	85.0 ksi (586 MPa)
Yield Strength at 0.2% Offset	45.0 ksi (310 MPa)
Elongation in 4D	5%

3.6.1.2 Specimens Cut From Castings

The average of not less than four, and preferably ten, specimens shall be as shown in Table 2 for sections of castings 1 inch (25.4 mm) and under in nominal thickness. Tensile properties of castings over 1 inch (25.4 mm) in nominal thickness shall be as shown in Table 3 (see 8.5).

Table 3 - 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%

3.6.1.2.1 When properties other than those specified in 3.6.1.2 are required, specimens machined from locations indicated on the drawing from a casting chosen at random to represent the lot shall have the properties indicated on the drawing for such specimens. Property requirements may be designated in accordance with AMS2360.

3.6.2 Castings shall have hardness of 200 to 235 HB or equivalent, determined in accordance with ASTM E10.

3.7 Quality

Castings, as received by the 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 When acceptance standards are not specified, Grade C of AMS2175 shall apply. ASTM E272 may be used to define radiographic acceptance standards.

3.7.2 Methods of inspection and frequency of inspection shall be as agreed upon by the purchaser and producer. A "Casting Class" of AMS2175 may be selected to specify the method and frequency of inspection (see 8.5).

3.7.3 Castings shall be produced under radiographic control. This control shall consist of 100% radiographic inspection of castings until process control factors (see 4.4.2) have been established to ensure production of acceptable castings. Unless otherwise specified by the purchaser, continued radiographic inspection of production castings shall be performed at a frequency determined by the producer to assure continued maintenance of internal quality.

3.7.3.1 Radiographic inspection shall be conducted in accordance with ASTM E1742, unless otherwise specified by the purchaser.

- 3.7.4 When specified by the purchaser, castings shall be fluorescent penetrant inspected using a method specified by the purchaser or, if not specified, a method in accordance with ASTM E1417/E1417M (see 8.5).
- 3.7.5 Castings shall not be peened, plugged, impregnated, or welded unless authorized by the purchaser.
- 3.7.5.1 When authorized by the purchaser, welding in accordance with AMS2694 or other welding program approved by the purchaser may be used.

3.8 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.5.1.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of castings shall supply all samples for the producer's tests and shall be responsible for the performance of all required tests. The 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 (see 3.1), tensile properties of separately cast specimens (see 3.6.1.1) or, when specified, tensile properties of specimens cut from a casting (see 3.6.1.2), hardness (see 3.6.2), and quality (see 3.7) are acceptance tests and shall be performed to represent each melt or heat-treat lot as applicable.

- 4.2.1.1 Tensile properties of specimens cut from a casting shall be determined when specified by the 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 a casting are determined.

4.2.2 Periodic Tests

Radiographic inspection (see 3.7.3) following the establishment of process control (see 4.4.2) are periodic tests and shall be performed at a frequency selected by the producer unless frequency of testing is specified by the purchaser.

4.2.3 Preproduction Tests

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

4.3 Sampling and Testing

Shall be in accordance with the following:

- 4.3.1 One or more chemical analysis specimens in accordance with 3.4.1 from each melt for conformance to 3.1.
- 4.3.2 Three separately cast tensile specimens in accordance with 3.4.2 from each heat-treat lot except when the purchaser requires properties of specimens cut from castings as in 4.3.4.
- 4.3.3 One or more preproduction castings in accordance with 4.4.1 of each part number.

- 4.3.4 One or more castings from each heat-treat lot when tensile properties of specimens are machined from a casting. For determining conformance to the requirements of 3.6.1.2.1, if specimen locations are not shown on the drawing, two specimens from the thickest section and two specimens from the thinnest section shall be cut from a casting or castings from each lot.

4.4 Approval

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

- 4.4.2 The producer shall establish, for production of sample castings of each part number, parameters for the process control factors that will produce acceptable castings; these shall constitute the approved casting procedure and shall be used for producing production castings. The producer shall also establish a single procedure for production of separately cast tensile specimens. The method for production of separately cast tensile specimens shall be consistent for all material cast to this specification. Control factors for producing separately cast tensile specimens need not be the same as those used for production of castings. If necessary to make any change in parameters for the process control factors, the producer shall submit for reapproval to the cognizant engineering organization a statement of the proposed changes in processing and, when requested, sample castings and/or test specimens. Production castings incorporating the revised operations shall not be shipped prior to receipt of reapproval by the cognizant engineering organization.

- 4.4.2.1 Unless otherwise specified by the purchaser, one casting from each lot shall be tested for hardness to determine conformance with 3.6.2.

- 4.4.2.2 Control factors for producing castings and separately cast tensile specimens include, but are not limited to, the following. The supplier's procedures shall identify tolerances, ranges, and/or control limits, as applicable. Control factors for separately cast tensile specimens must generally represent, but need not be identical to, those factors used for castings:

Type of furnace
Furnace atmosphere
Alloy additions, fluxing, deoxidation, and gas removal procedures
Gating and risering practices
Mold composition and molding practice
Core composition and fabrication method, when applicable
Melt hold time
Metal pouring temperature
Solidification and cooling procedures
Solution heat-treat and stabilization cycles
Straightening procedure, when applicable
Cleaning operations
Methods of inspection
Radiographic inspection sampling plan, if used

- 4.4.2.2.1 Any of the above process control factors for which parameters are proprietary by the producer may be assigned a code designation. Each variation in such parameters shall be assigned a modified code designation.

4.5 Reports

The producer of castings shall furnish with each shipment a report showing the results of tests for chemical composition of each melt and the results of tests for tensile properties of separately cast specimens representing each heat-treat lot or, when specified, of specimens cut from a casting from each lot and the results of tests for hardness of castings from each heat-treat lot. This report shall include the purchase order number, melt and heat-treat lot numbers, AMS4873G, part number, and quantity.