



Standard Specification for Aluminum Bronze Sheet, Strip, and Rolled Bar¹

This standard is issued under the fixed designation B 169/B 169M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope *

1.1 This specification² establishes the requirements for Copper Alloy UNS Nos. C61300 and C61400 aluminum bronze sheet, strip, and rolled bar.

1.2 The products made to this specification are commonly used for drawing, forming, stamping, and bending applications and are not intended for electrical applications.

NOTE 1—The products produced under this general specification may be used in many applications in which the individual requirements may be too specific to be determined by normal physical or mechanical testing. Therefore, it may be advisable for the purchaser to submit samples or drawings to the manufacturer to be assured that the product furnished is suitable for the intended application.

NOTE 2—Refer to Specification B 171/B 171M for plate product.

1.3 The values stated in inch-pound or SI units are to be regarded separately as standard. The values in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

2. Referenced Documents

2.1 The following documents in the current Book of Standards form a part of this specification to the extent referenced herein:

2.2 ASTM Standards:

B 171/B 171M Specification for Copper Alloy Plate and Sheet for Pressure Vessels, Condensers and Heat Exchangers³

B 248 Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip and Rolled Bar³

B 248M Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip and Rolled Bar [Metric]³

B 601 Classification for Temper Designations for Copper

and Copper Alloys—Wrought and Cast³
B 846 Terminology for Copper and Copper Alloys³
E 8 Test Methods for Tension Testing of Metallic Materials⁴
E 8M Test Methods for Tension Testing of Metallic Materials [Metric]⁴
E 54 Test Methods for Chemical Analysis of Special Brasses and Bronzes⁵
E 62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric)⁵
E 290 Test Methods for Bend Testing for Ductility⁴
E 478 Test Methods for Chemical Analysis of Copper Alloys⁵

3. General Requirements

3.1 The following sections of Specifications B 248 or B 248M form a part of this specification:

- 3.1.1 Terminology,
- 3.1.2 Workmanship, Finish and Appearance,
- 3.1.3 Sampling,
- 3.1.4 Significance of Numerical Limits,
- 3.1.5 Inspection,
- 3.1.6 Rejection and Reheating,
- 3.1.7 Certification,
- 3.1.8 Mill Test Reports,
- 3.1.9 Packaging and Package Marking,
- 3.1.10 Supplementary Requirements.

3.2 In addition, when a section with a title identical to that referenced in 3.1 appears in this specification, it contains additional requirements which supplement those appearing in Specifications B 248 or B 248M.

4. Terminology

4.1 For definitions of terms related to copper and copper alloys, refer to Terminology B 846.

5. Ordering Information

5.1 Orders for products under this specification should include the following information:

5.1.1 ASTM designation and year of issue (for example, B 169/B 169M – 00),

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² For ASME Boiler and Pressure Vessel Code applications, see related Specification SB-169 in Section II of that code.

³ Annual Book of ASTM Standards, Vol 02.01.

⁴ Annual Book of ASTM Standards, Vol 03.01.

⁵ Annual Book of ASTM Standards, Vol 03.05.

*A Summary of Changes section appears at the end of this standard.

- 5.1.2 Copper Alloy UNS No. (for example, C61300),
- 5.1.3 Temper (for example, Section 8),
- 5.1.4 Dimensions, thickness, and width (for example, Section 12),
- 5.1.5 Length,
- 5.1.6 How furnished, flat or rolls,
- 5.1.7 Total weight, each size,
- 5.1.8 When product is purchased for *ASME Boiler and Pressure Vessel Code* Application, and
- 5.1.9 When product is purchased for agencies of the U.S. government.

5.2 The following options are available and should be specified when required:

- 5.2.1 Type of edge (for example, slit, sheared, sawed, and so forth),
- 5.2.2 Heat identification or traceability details,
- 5.2.3 Bend test,
- 5.2.4 Certification, and
- 5.2.5 Mill Test Report.

6. Materials and Manufacture

6.1 *Material:*

6.1.1 The material of manufacture shall be from cast slabs (also termed cakes or ingots) of Copper Alloy UNS Numbers C61300 or C61400 of such purity and soundness as to be suitable for processing into the products prescribed herein.

6.2 *Manufacture:*

6.2.1 The products shall be manufactured by such hot-working, cold-working, and annealing processes as to produce a uniform wrought structure in the finished product. The product shall be hot or cold rolled to finish gage and subsequently annealed, if required, to meet the temper properties invoked.

6.2.2 *Edges:*

6.2.2.1 Slit edges shall be furnished unless otherwise specified in the contract or purchase order.

7. Chemical Composition

7.1 The specified copper alloy shall conform to the requirements of Table 1.

7.1.1 These composition limits do not preclude the presence of unnamed elements. Limits may be established and analysis

required for unnamed elements by agreement between the supplier and the purchaser.

7.2 When all elements in Table 1 for the specified alloy are determined, the sum of the results shall be:

Copper Alloy UNS No.	Sum of Results % min.
C61300	99.8
C61400	99.5

8. Temper

8.1 Products in both alloys are available in the following tempers as defined in Practice B 601: annealed tempers O25, O60, and hot-rolled temper M20.

NOTE 3—Inquiry should be made to the supplier concerning the availability of the specific temper required.

9. Mechanical Property Requirements

9.1 The product furnished shall conform to the requirements of Table 2 for the specified alloy, temper, and dimensions prescribed.

10. Bending Requirements

10.1 When specified in the contract or purchase order, the test specimen shall withstand being bent cold perpendicular to the direction of rolling (rightway bend) through 120° around a mandrel whose radius is equal to the thickness of the product. When the outside surface of the bend is examined with an unaided eye, no sign of fracturing shall be observed.

11. Purchases for U.S. Government Agencies

11.1 When specified in the contract or purchase order, product purchased for agencies of the U.S. government shall conform to the special government stipulations in the Supplementary Requirements section of Specifications B 248 or B 248M.

12. Dimensions, Mass, and Permissible Variations

12.1 The dimensions and tolerances for material described by this specification shall be as specified in the current edition of Specifications B 248 or B 248M.

12.1.1 *Thickness*

12.1.2 *Width:*

12.1.2.1 *Slit Metal and Slit Metal with Rolled Edges*

12.1.2.2 *Square Sheared Metal*

12.1.2.3 *Sawed Metal*

12.1.3 *Length:*

12.1.3.1 *Length Tolerances for Straight Lengths*

12.1.3.2 *Schedule for Minimum Lengths and Maximum Weights of Ends for Specific Lengths with Ends, and Stock Lengths with Ends*

12.1.3.3 *Length Tolerance for Square Sheared Metal*

12.1.3.4 *Length Tolerances for Sawed Metal*

12.1.4 *Straightness:*

12.1.4.1 *Slit Metal or Slit Metal Either Straightened or Edge Rolled*

12.1.4.2 *Square Sheared Metal*

12.1.4.3 *Sawed Metal*

12.1.5 *Edges:*

TABLE 1 Chemical Requirements

Element	Composition, %	
	Copper Alloy UNS No.	
	C61300 ^A	C61400
Copper (including silver)	remainder	remainder
Lead, max	0.01	0.01
Iron	2.0–3.0	1.5–3.5
Zinc, max	0.10	0.20
Aluminum	6.0–7.5	6.0–8.0
Manganese, max	0.20	1.0
Phosphorus, max	0.015	0.015
Silicon, max	0.10	...
Tin	0.20–0.50	...
Nickel (including cobalt), max	0.15	...

^A When the product is for subsequent welding applications and is so specified by the purchaser, chromium shall be 0.05 % max, cadmium 0.05 % max, zirconium 0.05 % max, and zinc 0.05 % max.

TABLE 2 Tensile Requirements

Copper Alloy UNS No.	Temper Designation ^A		Thickness, in. [mm]	Width, in.	Tensile Strength min, ksi ^B [MPa]	Yield Strength at 0.5 % Extension Under Load, min, ksi ^B [MPa]	Yield Strength at 0.2 % Extension Under Load, min, ksi ^B [MPa]	Elongation in 2 in., min, %
	Standard	Former						
C61300	O25, O60, or M20	soft	½ and under [12.0 and under]	all widths	75 [515]	36 [255]	34 [235]	35
			Over ½ to 2, incl [Over 12.0 to 50.0, incl]	all widths	72 [495]	32 [220]	30 [210]	35
			Over 2 to 5, incl [Over 50.0 to 140 incl]	all widths	65 [450]	28 [195]	26 [180]	35
C61400	O25, O60, or M20	soft	½ and under [12.0 and under]	all widths	72 [495]	32 [220]	30 [205]	35
			Over ½ to 2, incl [Over 12.0 to 50.0, incl]	all widths	70 [485]	30 [205]	28 [195]	35
			Over 2 to 5, incl [Over 50.0 to 140 incl]	all widths	65 [450]	28 [195]	26 [180]	35

^A Standard designations defined in Practice B 601.

^B ksi = 1000 psi.

- 12.1.5.1 *Square Edges*
- 12.1.5.2 *Rounded Corners*
- 12.1.5.3 *Rounded Edges*
- 12.1.5.4 *Full Rounded Edges*

13. Number of Tests and Retests

13.1 Tests:

13.1.1 Chemical Analysis:

13.1.1.1 Composition shall be determined as the average of at least two replicate determinations for each element in Table 1 for the specified alloy.

13.1.2 Mechanical Properties:

13.1.2.1 Tensile strength, yield strength, and elongation shall be reported as the average of results from at least two specimens.

13.1.3 Bending Requirements:

13.1.3.1 Two specimens shall be tested and both shall pass.

13.2 Retests:

13.2.1 Chemical Analysis:

13.2.1.1 Should the results for one or more of the elements in the specified alloy fail to conform with the requirements in Table 1, a retest may be made with a new composite made up from the pieces originally selected.

13.2.2 Mechanical Properties:

13.2.2.1 Should the test results obtained from the specified product fail to conform to the requirements of Table 2, a retest shall be permitted on two specimens made from the remaining pieces selected.

13.2.3 Referee (Umpire) Tests:

13.2.3.1 Refer to section entitled “Rejection and Rehearing” in Specifications B 248 or B 248M.

14. Specimen Preparation

14.1 Chemical Analysis:

14.1.1 Preparation of the analytical specimen shall be the responsibility of the reporting laboratory.

14.2 Mechanical Properties:

14.2.1 Tensile and yield test specimens shall be prepared in accordance with Test Methods E 8 or E 8M.

14.2.1.1 The tensile test specimen shall be taken so that the longitudinal axis is parallel to the direction of rolling.

14.3 Bend Test:

14.3.1 Bend test specimens shall be prepared as directed in Test Method E 290.

15. Test Methods

15.1 Chemical Analysis:

15.1.1 The chemical composition shall be determined, in case of disagreement, as follows:

Element	ASTM Method
Copper	E 478
Iron	E 478
Lead	E 478 (AA)
Zinc	E 478 (titrimetric)
Aluminum	E 478
Manganese	E 62
Phosphorus	E 62
Silicon	E 54 (sulfuric acid)
Tin	E 478 (photometric)
Nickel	E 478 (photometric)

15.1.2 Test method(s) for the determination of element(s) required by contractual or purchase order agreement shall be as agreed upon between the supplier and purchaser.

15.2 Other Tests:

15.2.1 The product furnished shall conform with the mechanical and other requirements enumerated in this specification when tested in accordance with the following appropriate method:



Test	Method
Tensile strength	E 8
Yield strength	E 8
Elongation	E 8
Bending	E 290

rate of stressing to the yield strength should not exceed 100 ksi/min [690 MPa/min.]. Above the yield strength, the movement per minute of the testing machine head under load should not exceed 0.5 in./in [0.5 mm/mm].

15.2.1.1 Yield strength shall be determined in accordance with the “Extension-Under Load Method” of Test Methods E 8.

15.2.1.2 Elongation shall be determined as specified in the first two subsections of the section of Test Methods E 8, or E 8M, entitled “Elongation.”

15.2.1.3 Test results are affected by variations in speed of testing. A considerable range of testing speed is permitted. The

16. Certification

16.1 When the contract or purchase order specifies the product to be for ASME Boiler and Pressure Vessel application, certification is mandatory.

17. Keywords

17.1 aluminum bronze; aluminum bronze rolled bar; aluminum bronze sheet; aluminum bronze strip

SUMMARY OF CHANGES

Committee B05 has identified the location of selected changes to this standard since the March 1995 publication that may impact the use of this standard.

- (1) A section on Keywords has been added. specification.
- (2) B 169 and B 169M have been combined into one

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