



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 reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

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

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*:³

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

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

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

B 601 Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast

B 846 Terminology for Copper and Copper Alloys

E 8 Test Methods for Tension Testing of Metallic Materials

E 8M Test Methods for Tension Testing of Metallic Materials [Metric]

E 54 Test Methods for Chemical Analysis of Special Brasses and Bronzes⁴

E 62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods)

E 290 Test Methods for Bend Testing of Material for Ductility

E 478 Test Methods for Chemical Analysis of Copper Alloys

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 Rehearing,
- 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.

¹ This specification is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.01 on Plate, Sheet, and Strip.

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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 For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

⁴ Withdrawn.

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

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 – 05),

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*—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*—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.

6.2.1 *Edges*—Slit edges shall be furnished unless otherwise specified in the contract or purchase order.

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.

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 Classification **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** or **Table 3** for the specified alloy, temper, and dimensions prescribed.

TABLE 2 Tensile Requirements (Inch-Pound)

Copper Alloy UNS No.	Temper Designation ^A		Thickness, in.	Width, in.	Tensile Strength min, ksi ^B	Yield Strength at 0.5 % Extension Under Load, min, ksi ^B	Yield Strength at 0.2 % Extension Under Load, min, ksi ^B	Elongation in 2 in., min, %
	Standard	Former						
C61300	O25, O60, or M20	soft	½ and under	all widths	75	36	34	35
			Over ½ to 2, incl	all widths	72	32	30	35
			Over 2 to 5, incl	all widths	65	28	26	35
C61400	O25, O60, or M20	soft	½ and under	all widths	72	32	30	35
			Over ½ to 2, incl	all widths	70	30	28	35
			Over 2 to 5, incl	all widths	65	28	26	35

^A Standard designations defined in Classification **B 601**.

^B ksi = 1000 psi.



TABLE 3 Tensile Requirements (SI)

Copper Alloy UNS No.	Temper Designation ^A		Thickness, mm	Width, mm	Tensile Strength min, MPa	Yield Strength at 0.5 % Extension Under Load, min, MPa	Yield Strength at 0.2 % Extension Under Load, min, MPa	Elongation in 2 in., min, %
	Standard	Former						
C61300	O25, O60, or M20	soft	12.0 and under	all widths	515	250	235	35
			Over 12.0 to 50.0, incl	all widths	495	220	205	35
			Over 50.0 to 140 incl	all widths	450	195	180	35
C61400	O25, O60, or M20	soft	12.0 and under	all widths	495	220	205	35
			Over 12.0 to 50.0, incl	all widths	485	205	195	35
			Over 50.0 to 140 incl	all widths	450	195	180	35

^A Standard designations defined in Classification B 601.

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:

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

13.1.3 *Bending Requirements*—Two specimens shall be tested and both shall pass.

13.2 Retests:

13.2.1 *Chemical Analysis*—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*—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*—Refer to section entitled “Rejection and Rehearing” in Specifications B 248 or B 248M.

14. Specimen Preparation

14.1 *Chemical Analysis*—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*—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	Bending	E 290
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

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 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].

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 last issue (B 169/B 169M – 01) that may impact the use of this standard. (Approved Oct. 1, 2005.)

(1) For clarity, the table on mechanical properties (Tensile Requirements) was broken up into two tables, Table 2 and Table 3. Table 2 is for the inch-pound system, and Table 3 is for the SI system.

(2) Two rationalized metric values for C61300 were changed in Table 3. The 0.5 % Extension Yield Strength for “soft” 12.0

and under was changed from 225 to 250 MPa. Also, 12.0 to 50.0 “soft” 0.2 % Offset Yield Strength was changed from 210 to 205 MPa. These values are more consistent with other rationalized metric values in the specification.

(3) Minor editorial changes were made throughout, which do not impact the usage of this standard.

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