



Designation: B96/B96M – 11

Standard Specification for Copper-Silicon Alloy Plate, Sheet, Strip, and Rolled Bar for General Purposes and Pressure Vessels¹

This standard is issued under the fixed designation B96/B96M; 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.

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

1. Scope*

1.1 This specification establishes the requirements for copper-silicon alloy plate, sheet, strip, and rolled bar for drawing, forming, stamping, bending, and general engineering applications, and for pressure vessel applications. The alloys involved are copper alloys UNS Nos. C65100, C65400, and C65500.

1.2 When product is ordered for ASME Boiler and Pressure Vessel Code applications, consult the Code² for applicable alloys.

1.3 *Units*—The values stated in either inch-pound or SI units are to be regarded separately as standard. Within the text, SI units are shown in brackets. The values 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 specification.

2. Referenced Documents

2.1 *ASTM Standards*:³

[B248 Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar](#)

[B248M Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar \(Metric\)](#)

[B601 Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast](#)

[B846 Terminology for Copper and Copper Alloys](#)

[E54 Test Methods for Chemical Analysis of Special Brasses](#)

[and Bronzes \(Withdrawn 2002\)⁴](#)

[E62 Test Methods for Chemical Analysis of Copper and Copper Alloys \(Photometric Methods\) \(Withdrawn 2010\)⁴](#)

[E118 Test Methods for Chemical Analysis of Copper-Chromium Alloys \(Withdrawn 2010\)⁴](#)

[E478 Test Methods for Chemical Analysis of Copper Alloys](#)

3. General Requirements

3.1 The following sections of either Specification [B248](#) or [B248M](#) constitute a part of this specification:

3.1.1 Terminology (see also Terminology [B846](#)),

3.1.2 Materials and Manufacture,

3.1.3 Dimensions, Mass, and Permissible Variations,

3.1.4 Workmanship, Finish, and Appearance,

3.1.5 Sampling,

3.1.6 Number of Tests and Retests,

3.1.7 Test Specimens,

3.1.8 Test Methods,

3.1.9 Significance of Numerical Limits,

3.1.10 Inspection,

3.1.11 Rejection and Reheating,

3.1.12 Certification,

3.1.13 Mill Test Report,

3.1.14 Product Identification

3.1.15 Packing and Package Marking, and

3.1.16 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 either Specification [B248](#) or [B248M](#).

4. Terminology

4.1 For definitions of terms related to copper and copper alloys, refer to Terminology [B846](#).

5. Ordering Information

5.1 Include the following specified choices when placing orders for product under this specification, as applicable:

⁴The last approved version of this historical standard is referenced on www.astm.org.

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.

Current edition approved Oct. 1, 2011. Published November 2011. Originally approved in 1934. Last previous edition approved in 2006 as B96/B96M – 06. DOI: 10.1520/B0096_B0096M-11.

² For ASME Boiler and Pressure Vessel Code applications, see related Specification SB-96 in Section 11 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.

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

- 5.1.1 ASTM designation and year of issue,
- 5.1.2 Copper Alloy UNS No. designations (Section 1),
- 5.1.3 Temper (Section 7),
- 5.1.4 Dimensions: Thickness, Width, and Length (Section 11),
- 5.1.5 Finish (section 12.2),
- 5.1.6 Type of edge, if required: slit, sheared, sawed, square corners, rounded corners, rounded edges or full rounded edges (11.6),
- 5.1.7 How furnished (straight lengths or coils),
- 5.1.8 Weight (11.7),
- 5.1.9 Intended application.

5.2 The following options are available, but may not be included unless specified at the time of placing the order, when required.

- 5.2.1 Mill test (Section 18),
- 5.2.2 Certification (Section 17),
- 5.2.3 Product identification for ASME Boiler and Pressure Vessel Code applications (Specifications B248 or B248M),
- 5.2.4 If product is ordered for ASME Boiler and Pressure Vessel Code application, (1.2, 11.1, 11.2.1, and 11.7.1),
- 5.2.5 Whether 0.2 % yield strength is required (Table 3),
- 5.2.6 If product is purchased for agencies of the U.S. Government (Section 10).
- 5.2.7 If specification number must be shown on package marking (Section 19.2.2).

6. Chemical Composition

6.1 The material shall conform to the chemical composition requirements prescribed in Table 1 for the copper alloy UNS No. designation specified in the ordering information.

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

6.2.1 For alloys in which copper is listed as “remainder”, copper is the difference between the sum of the results of all the elements determined and 100 %.

6.2.2 When all the elements in Table 1 are determined, the sum of results shall be 99.5 % min.

7. Temper

7.1 The standard tempers for products described in this specification are in Tables 2-5.

7.2 Tempers, as defined in Classification B601 available under this specification are:

- 7.2.1 O61 (annealed),
- 7.2.2 O50 (light anneal),
- 7.2.3 H01 (quarter hard),
- 7.2.4 H02 (half-hard),
- 7.2.5 H03 (three-quarter hard),
- 7.2.6 H04 (hard),
- 7.2.7 H06 (extra-hard),
- 7.2.8 H08 (spring),
- 7.2.9 H10 (extra-spring),
- 7.2.10 H14 (super-spring),
- 7.2.11 M20 (as hot-rolled), and
- 7.2.12 M25 (as hot-rolled and rerolled).

8. Grain Size for Annealed Tempers

8.1 The approximate grain size values for annealed tempers given in Tables 2-5 are for general information and shall not be used as a basis for product rejection.

9. Mechanical Property Requirements

9.1 *Tensile Strength Requirements* —The tension test shall be the standard test for all tempers of rolled, annealed, and hot-rolled materials. Acceptance or rejection based on mechanical properties shall depend only on the tensile properties, which shall conform to the requirements prescribed in Table 2, Table 3, Table 4 or Table 5. Tension test specimens shall be taken so the longitudinal axis of the specimen is parallel to the direction of rolling.

9.1.1 For Pressure Vessel Code Applications, the tensile requirements are prescribed in Tables 4 and 5.

9.1.2 For general purpose applications, the tensile requirements are prescribed in Tables 2 and 3.

9.2 *Rockwell Hardness Requirements* —The approximate Rockwell hardness values given in Tables 2-5 are for general information and assistance in testing and shall not be used as a basis for product rejection.

10. Purchases for U.S. Government Agencies

10.1 If the product ordered is for an agency of the U.S. Government, when specifically stipulated in the contract or purchase order, the product furnished shall conform to the conditions specified in the Supplementary Requirements section of Specifications B248 or B248M.

11. Dimensions, Mass, and Permissible Variations

11.1 The dimensions and tolerances for product described by this specification shall be as specified in Specifications B248 or B248M with particular reference to the following tables and related paragraphs in that specification (exceptions for ASME Pressure Vessel Code applications are noted):

11.2 *Thickness*—Table 2.

11.2.1 *Pressure Vessel Code Applications*—The thickness of any place or sheet shall not be more than 0.01 in. under the thickness specified.

11.3 *Width*:

11.3.1 *Slit Metal and Slit Metal with Rolled Edges*—Table 4.

TABLE 1 Chemical Requirements

Element	Composition, %		
	Copper Alloy UNS No.		
	C65100	C65400	C65500
Copper, incl silver	remainder	remainder	remainder
Silicon	0.8–2.0	2.7–3.4	2.8–3.8
Manganese	0.7 max	...	0.50–1.3
Tin	...	1.2–1.9	...
Chromium	...	0.01–0.12	...
Zinc, max	1.5	0.50	1.5
Iron, max	0.8	...	0.8
Nickel, max ^A	0.6
Lead, max	0.05	0.05	0.05

^A Incl cobalt.