



Designation: B248M – 22

Standard Specification for General Requirements for Wrought Copper and Copper- Alloy Plate, Sheet, Strip, and Rolled Bar (Metric)¹

This standard is issued under the fixed designation B248M; 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 general requirements common to several wrought product specifications. Unless otherwise specified in the purchase order or in an individual specification, these general requirements shall apply to copper and copper-alloy plate, sheet, strip, and rolled bar supplied under each of the following product specifications issued by ASTM: **B36/B36M**, **B96/B96M**, **B103/B103M**, **B121/B121M**, **B122/B122M**, **B130**, **B152/B152M**, **B169/B169M**, **B422/B422M**, **B534**, **B694**, **B888/B888M**, and **B936**.²

1.2 *Units*—This specification is the companion specification to inch-pound Specification **B248**.

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein:

2.2 *ASTM Standards*:³

B36/B36M Specification for Brass Plate, Sheet, Strip, And Rolled Bar

B96/B96M Specification for Copper-Silicon Alloy Plate,

Sheet, Strip, and Rolled Bar for General Purposes and Pressure Vessels

B103/B103M Specification for Phosphor Bronze Plate, Sheet, Strip, and Rolled Bar

B121/B121M Specification for Leaded Brass Plate, Sheet, Strip, and Rolled Bar

B122/B122M Specification for Copper-Nickel-Tin Alloy, Copper-Nickel-Zinc Alloy (Nickel Silver), and Copper-Nickel Alloy Plate, Sheet, Strip, and Rolled Bar

B130 Specification for Commercial Bronze Strip for Bullet Jackets

B152/B152M Specification for Copper Sheet, Strip, Plate, and Rolled Bar

B169/B169M Specification for Aluminum Bronze Sheet, Strip, and Rolled Bar

B193 Test Method for Resistivity of Electrical Conductor Materials

B248 Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar

B422/B422M Specification for Copper-Aluminum-Silicon-Cobalt Alloy, Copper-Nickel-Silicon-Magnesium Alloy, Copper-Nickel-Silicon Alloy, Copper-Nickel-Aluminum-Magnesium Alloy, and Copper-Nickel-Tin Alloy Sheet and Strip

B534 Specification for Copper-Cobalt-Beryllium Alloy and Copper-Nickel-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar

B694 Specification for Copper, Copper-Alloy, Copper-Clad Bronze (CCB), Copper-Clad Stainless Steel (CCS), and Copper-Clad Alloy Steel (CAS) Sheet and Strip for Electrical Cable Shielding

B820 Test Method for Bend Test for Determining the Formability of Copper and Copper Alloy Strip

B846 Terminology for Copper and Copper Alloys

B888/B888M Specification for Copper Alloy Strip for Use in Manufacture of Electrical Connectors or Spring Contacts

B936 Specification for Copper-Chromium-Iron-Titanium Alloy Plate, Sheet, Strip and Rolled Bar

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 The UNS system for copper and copper alloys (see Practice E527) is a simple expansion of the former standard designation system accomplished by the addition of a prefix “C” and a suffix “00.” The suffix can be used to accommodate composition variations of the base alloy.

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

E8/E8M Test Methods for Tension Testing of Metallic Materials
E18 Test Methods for Rockwell Hardness of Metallic Materials
E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
E50 Practices for Apparatus, Reagents, and Safety Considerations for Chemical Analysis of Metals, Ores, and Related Materials
E53 Test Method for Determination of Copper in Unalloyed Copper by Gravimetry (Withdrawn 2022)⁴
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
E75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys (Withdrawn 2010)⁴
E106 Test Methods for Chemical Analysis of Copper-Beryllium Alloys (Withdrawn 2011)⁴
E112 Test Methods for Determining Average Grain Size
E118 Test Methods for Chemical Analysis of Copper-Chromium Alloys (Withdrawn 2010)⁴
E121 Test Methods for Chemical Analysis of Copper-Tellurium Alloys (Withdrawn 2010)⁴
E255 Practice for Sampling Copper and Copper Alloys for the Determination of Chemical Composition
E478 Test Methods for Chemical Analysis of Copper Alloys
E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)
E1004 Test Method for Determining Electrical Conductivity Using the Electromagnetic (Eddy Current) Method

3. Terminology

3.1 For definitions of terms related to copper and copper alloys, refer to Terminology **B846**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *lengths, mill, n*—straight lengths, including ends, that can be conveniently manufactured in the mills. Full length pieces are usually 2400 mm, 3000 mm, or 3600 mm and subject to established length tolerances.

3.2.1.1 *lengths, stock, n*—straight lengths that are mill cut and stored in advance of orders. They are usually 2400 mm, 3000 mm, or 3600 mm and subject to established length tolerances.

3.2.2 *rolled bar, n*—a rolled flat product over 5 mm thick and up to and including 300 mm wide, with sheared, sawed, or machined edges, in straight lengths or coils (rolls).

4. Materials and Manufacture

4.1 *Materials:*

4.1.1 The material of manufacture shall be a cast bar, cake, slab of such purity and soundness as to be suitable for processing into the products to the product specification listed in Section 1.

4.1.2 When specified in the contract or purchase order that the heat identification or traceability is required, the purchaser shall specify the details desired.

4.2 *Manufacture:*

4.2.1 The product shall be manufactured by such hot-working, cold-working, and annealing process as to produce a uniform wrought structure in the finished product.

4.2.2 The product shall be hot- or cold-worked to the finished size and subsequently annealed, when required, to meet the temper properties specified.

4.3 *Edges*—The edges shall be slit, shared, sawed, or rolled edges, as specified. Slit edges shall be furnished unless otherwise specified in the contract or purchase order. See **5.6** for edge descriptions and corresponding tables for tolerances.

5. Dimensions, Mass, and Permissible Variations

5.1 *General*—For the purpose of determining conformance with the dimensional requirements prescribed in this specification, any measured value outside the specified limiting values for any dimension may be cause for rejection.

NOTE 1—Blank spaces in the tolerance tables indicate either that the material is not available or that no tolerances have been established.

5.2 *Thickness*—The standard method of specifying thickness shall be in decimal fractions of a millimetre. For material 0.50 mm and under in thickness, it is recommended that the nominal thicknesses be stated not closer than the nearest 0.01 mm. A list of preferred thicknesses is shown in **Appendix X1**. The thickness tolerances shall be those shown in **Tables 1-3** for the product specification indicated:

5.2.1 **Table 1**—Thickness tolerances applicable to Specifications **B36/B36M**, **B103/B103M**, **B121/B121M**, **B152/B152M**, and **B888/B888M**.

5.2.2 **Table 2**—Thickness tolerances applicable to Specifications **B96/B96M**, **B122/B122M**, **B169/B169M**, **B422/B422M**, and **B534**.

5.2.3 **Table 3**—Special thickness tolerances applicable to Copper Alloy UNS No. C72500 when ordered to Specification **B122/B122M**, and to Specification **B534** as noted in the table.

5.3 *Width*—The width tolerances shall be those shown in **Tables 4-6** depending on the type of edge required (see **5.3.1**, **5.3.2**, and **5.3.3**):

5.3.1 **Table 4**—Width tolerances for slit metal and slit metal with rolled edges.

5.3.2 **Table 5**—Width tolerances for square-sheared metal.

5.3.3 **Table 6**—Width tolerances for sawed metal.

5.4 *Length*—The material shall be furnished in coils or straight lengths of plate, sheet, strip, or rolled bar as specified. The length tolerances for straight lengths shall be those shown in **Tables 7-10** depending on the method of cutting required (see **5.4.1 – 5.4.4**). When ends are permitted, the length and quantity of the ends shall be in accordance with the schedule in **Table 8**.

5.4.1 **Table 7**—Length tolerances for straight lengths.

5.4.2 **Table 8**—Schedule of minimum length and maximum weight of ends for mill lengths, specific lengths with ends, and stock lengths with ends.

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

TABLE 1 Thickness Tolerances

 (Applicable to Specifications **B36/B36M**, **B103/B103M**, **B121/B121M**, **B152/B152M**, **B888/B888M**, and **B936**)

Thickness, mm		Thickness Tolerances, Plus and Minus, mm						
Over	Through	Strip			Sheet			
		Up to 200 mm, incl, in Width	Over 200 mm to 300 mm, incl, in Width	Over 300 mm to 600 mm, incl, in Width	Over 600 mm to 700 mm, incl, in Width	Over 700 mm to 900 mm, incl, in Width	Over 900 mm to 1200 mm, incl, in Width	Over 1200 mm to 1600 mm, incl, in Width
0.10	0.10	0.007	0.015	...	...	...	...	...
0.10	0.20	0.01	0.02	0.03	...	...	...	...
0.20	0.30	0.015	0.025	0.035	...	...	...	...
0.30	0.40	0.02	0.03	0.045	0.06	0.08	0.09	0.10
0.40	0.50	0.025	0.035	0.05	0.06	0.08	0.09	0.11
0.50	0.60	0.03	0.04	0.05	0.08	0.09	0.10	0.12
0.60	0.70	0.035	0.05	0.06	0.08	0.09	0.10	0.12
0.70	1.0	0.045	0.05	0.06	0.09	0.10	0.12	0.15
1.0	1.3	0.05	0.06	0.07	0.10	0.12	0.15	0.17
1.3	2.0	0.06	0.07	0.08	0.12	0.15	0.17	0.20
2.0	3.5	0.07	0.08	0.10	0.15	0.17	0.20	0.25
3.5	5.0	0.08	0.10	0.11	0.17	0.20	0.25	0.30
		Rolled Bar			Plate			
5.0	8.0	0.10	0.11	0.12	0.22	0.25	0.30	0.35
8.0	13.0	0.11	0.12	0.15	0.30	0.35	0.40	0.45
13.0	20.0	0.13	0.17	0.22	0.40	0.45	0.50	0.60
20.0	30.0	0.17	0.22	0.27	0.45	0.55	0.60	0.75
30.0	40.0	0.55	0.55	0.55	0.55	0.65	0.75	0.90
40.0	60.0	0.65	0.65	0.65	0.65	0.75	0.90	1.1

TABLE 2 Thickness Tolerances

 (Applicable to Specifications **B96/B96M**, **B122/B122M**, **B169/B169M**, **B422/B422M**, and **B534**)

Thickness, mm		Thickness Tolerances, Plus and Minus, mm						
Over	Through	Strip			Sheet			
		Up to 200 mm, incl, in Width	Over 200 mm to 300 mm, incl, in Width	Over 300 mm to 600 mm, incl, in Width	Over 600 mm to 700 mm, incl, in Width	Over 700 mm to 900 mm, incl, in Width	Over 900 mm to 1200 mm, incl, in Width	Over 1200 mm to 1600 mm, incl, in Width
0.10	0.10	0.01	0.02	...	...	...	...	...
0.10	0.20	0.015	0.025	0.035	...	...	...	...
0.20	0.30	0.02	0.03	0.05	...	...	...	...
0.30	0.40	0.025	0.035	0.06	...	...	...	...
0.40	0.50	0.03	0.05	0.06	...	...	...	...
0.50	0.60	0.035	0.06	0.07	...	...	...	...
0.60	0.70	0.05	0.06	0.07	0.10	0.13	0.15	0.18
0.70	1.0	0.06	0.07	0.08	0.13	0.15	0.18	0.20
1.0	1.3	0.07	0.08	0.10	0.15	0.18	0.20	0.25
1.3	2.0	0.08	0.10	0.11	0.18	0.20	0.25	0.30
2.0	3.5	0.10	0.11	0.12	0.20	0.25	0.30	0.35
3.5	5.0	0.11	0.13	0.15	0.25	0.30	0.35	0.40
		Rolled Bar			Plate			
5.0	8.0	0.13	0.15	0.18	0.30	0.35	0.40	0.45
8.0	13.0	0.15	0.18	0.20	0.40	0.45	0.50	0.60
13.0	20.0	0.20	0.25	0.30	0.50	0.55	0.60	0.75
20.0	30.0	0.30	0.40	0.50	0.60	0.65	0.75	0.95
30.0	40.0	0.70	0.70	0.70	0.70	0.80	0.95	1.2
40.0	60.0	0.85	0.85	0.85	0.85	0.95	1.1	1.4

5.4.3 **Table 9**—Length tolerances for square-sheared metal in all widths 3000 mm and under.

5.4.4 **Table 10**—Length tolerances for sawed metal.

5.5 *Straightness*—The straightness tolerances which are the maximum edgewise curvature (depth of arc) in any 1800 mm portion of the total length, shall be those shown in **Tables 11-13** depending on the type of edge required.

5.5.1 **Table 11**—Straightness tolerances for metal as slit, or as slit and straightened, or as slit and edge-rolled, or metal with drawn edges.

5.5.2 **Table 12**—Straightness tolerances for square-sheared metal.

5.5.3 **Table 13**—Straightness tolerances for sawed metal.

5.6 *Edges*—When rolled edges are required, they may be produced by either rolling or drawing to one of the following specified edge contours:

5.6.1 *Square Edges (Square Corners)*—Edges shall have commercially-squared corners with a permissible maximum radius as prescribed in **Table 14**.

TABLE 3 Special Thickness Tolerances

Thickness, mm	Tolerances Applicable to Copper Alloy UNS No. C72500, Specifications B122/B122M	Tolerances Applicable to Specification B534 Tolerances, Plus and Minus, ^A mm for Strip 100 mm and Under in Width
	Tolerances, Plus and Minus, ^A mm for Strip 200 mm and Under in Width	
0.10 and under	0.005	0.005
Over 0.10 to 0.16, incl	0.008	0.008
Over 0.16 to 0.22, incl	0.010	0.013
Over 0.22 to 0.35, incl	0.013	0.015
Over 0.35 to 0.45, incl	0.018	0.018
Over 0.45 to 0.55, incl	0.020	0.020
Over 0.55 to 0.60, incl	0.025	0.025
Over 0.65 to 0.80, incl	0.033	0.025
Over 0.80 to 1.2, incl	0.038	...

^A If tolerances are specified as all plus or all minus, double the values given.

5.6.2 Rounded Corners—Edges shall have rounded corners as shown in **Fig. 1** with a radius as prescribed in **Table 15**.

5.6.3 Rounded Edges—Edges shall be rounded as shown in **Fig. 2** with a radius as prescribed in **Table 16**.

5.6.4 Full-Rounded Edges—Edges shall be full-rounded as shown in **Fig. 3** with a radius as prescribed in **Table 17**.

5.7 Weight Tolerances for Hot-Rolled Material:

5.7.1 Table 18—Lot weight tolerances for hot-rolled sheet and plate applicable to Specifications **B36/B36M**, **B96/B96M** (Copper Alloy UNS No. C65500), **B103/B103M**, **B122/B122M**, and **B152/B152M**.

5.7.2 The weight of each lot of five or more plates or sheets of the same type and the same specified dimensions, when ordered to thickness, shall not vary from the theoretical by more than the amount prescribed in **Table 18** for the product specification indicated. The weight of any individual plate or sheet may vary from the nominal by not more than one third in excess of the tolerances prescribed in **Table 18** for the product specification indicated. The tolerances for lots of less than five plates or sheets shall be governed by the tolerances for individual plates or sheets.

5.7.3 For the purpose of calculation, the densities of the materials covered by these specifications are listed in **Appendix X2**.

6. Workmanship, Finish, and Appearance

6.1 The product shall be free of defects, but blemishes of a nature that do not interfere with the intended application are acceptable. A superficial film of residual light lubricant is normally present and is acceptable unless otherwise specified.

7. Sampling

7.1 Sampling—The lot size, portion size, and selection of sample pieces shall be as follows:

7.1.1 Lot Size—An inspection lot shall be 5000 kg or less material of the same mill form, alloy, temper and nominal dimensions, subject to inspection at one time, or shall be the product of one cast bar from a single melt charge, whose weight shall not exceed 12 000 kg that has been continuously processed and subject to inspection at one time.

7.1.2 Portion Size—A portion shall be two representative samples taken from the product of one cast bar that has been continuously processed to the finished temper and dimensions.

7.1.2.1 Chemical Analysis—A sample for chemical analysis shall be taken in accordance with Practice **E255** for product in its final form. Unless required otherwise by the purchaser at the time the order is placed, the manufacturer shall have the option of determining conformance to chemical composition by analyzing samples taken at the time the castings are poured or samples taken from the semi-finished product, if heat identity can be maintained throughout all operations. If the manufacturer determines the chemical composition of the material during the course of manufacture, he shall not be required to sample and analyze the finished product. The minimum weight of the composite sample in accordance with Practice **E255** shall be as follows:

ASTM Designation	Weight of Sample, min, g
B36/B36M , B96/B96M , B103/B103M , B121/B121M , B122/B122M , B152/B152M , B169/B169M , B422/B422M , B534 , B888/B888M , and B936	150

7.1.2.2 Samples for All Other Tests—Samples for all other tests shall be taken from the sample portion in **7.1.2** and be of a convenient size to accommodate the test and comply with the requirements of the appropriate ASTM standard and test methods.

8. Number of Tests and Retests

8.1 Chemical Requirements:

8.1.1 When samples are taken at the time the castings are poured, at least one sample shall be analyzed for each group of castings poured simultaneously from the same source of molten metal.

8.1.2 When samples are taken from the semi-finished or finished product, at least one sample representative of the product of each cast bar from a single melt charge continuously processed with heat identity maintained shall be analyzed.

8.1.3 When samples are taken from the semi-finished or finished product and heat identity has not been maintained, a single sample representative of each 5000 kg lot, or fraction thereof, shall be analyzed. When the product piece is greater than 5000 kg, one sample to be representative of the product piece shall be analyzed.

8.2 Mechanical and Electrical Requirements and Grain Size—Unless otherwise provided in the product specification, test specimens shall be taken from each of the two sample pieces selected in accordance with **7.1.2**. The required tests shall be made on each of the specimens. In the case of copper alloy Specification **B534**, one specimen shall be tested without further treatment, and the other specimen shall be tested after precipitation hardening.

8.3 Retests:

8.3.1 When requested by the manufacturer or supplier, a retest shall be permitted when results of tests obtained by the purchaser fail to conform to the requirements of the product specification.