



Designation: **B768–11 (Reapproved 2016) B768 – 22**

Standard Specification for Copper-Cobalt-Beryllium Alloy and Copper-Nickel-Beryllium Alloy Strip and Sheet¹

This standard is issued under the fixed designation B768; 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-cobalt-beryllium and copper-nickel-beryllium strip and sheet of the following alloys:

Copper Alloy UNS No.	Beryllium	Nominal Composition, % Cobalt	Nickel
C17410	0.3	0.5	...
C17450	0.3	...	0.8
C17460	0.3	...	1.2

1.2 ~~Units—Values~~—The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are mathematical conversions to SI units, which units that are provided for information only and are not considered standard.

1.3 The following safety hazard caveat pertains only to the test methods described in this specification:

1.3.1 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and ~~health~~environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 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:*²

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 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**

[B194](#) Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar

[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

[E8/E8M](#) Test Methods for Tension Testing of Metallic Materials

[E18](#) Test Methods for Rockwell Hardness of Metallic Materials

[E255](#) Practice for Sampling Copper and Copper Alloys for the Determination of Chemical Composition

[E527E1004](#) Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS) 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](#).

4. General Requirements

4.1 The following sections of Specification [B248](#) ~~constitutes~~ or [B248M](#) constitute a part of this ~~specification~~ specification:

4.1.1 ~~Terminology~~:Terminology

4.1.2 ~~Materials and Manufacture~~:Manufacture

4.1.3 ~~Workmanship, Finish, and Appearance~~:Appearance

4.1.4 ~~Sampling~~:Sampling

4.1.5 ~~Number of Tests and Retests~~:Retests

4.1.6 ~~Specimen Preparation~~:Preparation

4.1.7 ~~Test Methods~~:Methods

4.1.8 ~~Significance of Numerical Limits~~:Limits

4.1.9 ~~Inspection~~:Inspection

4.1.10 ~~Rejection and Rehearing~~:Rehearing

4.1.11 ~~Certification~~:Certification

4.1.12 ~~Test Report~~:Report

4.1.13 Product Identification

4.1.14 ~~Packaging and Marking~~:Package Marking

4.1.15 ~~Supplementary Requirements~~:Requirements

4.2 In addition, when a section with a title identical to that referenced in [5.14.1](#) appears in this specification, it contains additional requirements which supplement those appearing in Specification [B248](#) or [B248M](#).

5. Ordering Information

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

5.1.1 ASTM designation and year of ~~issue~~:issue;

- 5.1.2 ~~Copper alloy~~ Alloy UNS No. designation ~~(designation; 1.1);~~
 - 5.1.3 Form of material: strip or ~~sheet;~~ sheet;
 - 5.1.4 ~~Temper (Section Temper; 8);~~
 - 5.1.5 ~~Tension test, if required (Section 9);~~
 - 5.1.5 Dimensions: thickness and width, and length, as applicable ~~(Section applicable; 11);~~
 - 5.1.6 How furnished: rolls, ~~stock straight~~ lengths with or without ends, specific lengths with or without ends ~~(Section or coils; 11);~~
 - 5.1.7 Type of edge, if required: slit, sheared, sawed, square corners, rounded corners, rounded edges, or full rounded edges (see Quantity – total weight or total length, as applicable; 11.6);
 - 5.1.9 ~~Special thickness tolerances, if required (Section 11);~~
 - 5.1.10 ~~Hardness test, if required;~~
 - 5.1.11 ~~Special marking or packaging, if required;~~
 - 5.1.12 ~~Mill test report, if required;~~
 - 5.1.8 ~~Special tests or exceptions, if any, and~~ Tension test or hardness, as applicable, in accordance with Section 10.
 - 5.1.14 ~~Certification, if required.~~
- 5.2 If product is purchased for agencies of the U.S. Government (see the Supplementary Requirements as defined in the current issue of Specification) The following options are available and, when required, shall be specified at the time of placing B248 for additional requirements, if specified): the order:
- 5.2.1 Type of edge: slit, sheared, sawed, square corners, rounded corners, rounded edges, or full rounded edges;
 - 5.2.2 Special thickness tolerances;
 - 5.2.3 Special width or straightness tolerances;
 - 5.2.4 Special tests or exceptions;
 - 5.2.5 Heat identification;
 - 5.2.6 Test report;
 - 5.2.7 Certification;
 - 5.2.8 Special marking or packaging.
 - 5.2.9 If product is purchased for agencies of the U.S. government, see the Supplementary Requirements section of Specification B248 or B248M for additional requirements.

6. Materials and Manufacture

6.1 ~~Materials~~ Materials: The material of manufacture shall be cast billets or slabs of one of the alloys cited in Section 1 of this specification. The cast material shall be of such soundness and purity as to be suitable for processing into the products prescribed herein.

6.1.1 The material of manufacture shall be cast billets or slabs of one of the alloys cited in Section 1 of this specification. The cast material shall be of such purity and soundness as to be suitable for processing into the products prescribed herein.

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

6.2 *Manufacture:*

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

6.2.2 The product shall be hot or cold worked to the finish size, and subsequently heat-treated when required, to meet the temper properties specified.

6.3 *Edges:*

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

7. Chemical Composition

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

7.1.1 Results of analysis on a check sample shall conform to the composition requirements within the permitted analytical variance specified in **Table 1**.

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

7.3 For alloys in which copper is given listed as remainder, "remainder," copper is the difference between the sum of results of all the elements analyzed/determined and 100 %. When all the elements in **Table 1** are analyzed/determined, the sum of results shall be 99.5 % minimum.

8. Temper

8.1 The standard tempers for products described in this specification are given in **Table 2**.

8.1.1 Copper Alloy UNS No. C17410 Strip and Sheet is offered in the TH02 (½ HT) and TH04 (HT) tempers.

8.1.2 Copper Alloy UNS No. C17450 Strip and Sheet is offered in TH02 (½ HT) Temper.

TABLE 1 Chemical Requirements

Element	Composition, %		
	Copper Alloy UNS NumberNo.		
	C17410	C17450	C17460
Beryllium	0.15–0.50	0.15–0.50	0.15–0.50
Cobalt	0.35–0.6
Nickel	...	0.50–1.0	1.0–1.4
Iron, max	0.20	0.20	0.20
Zirconium, max	...	0.50	0.50
Tin, max	...	0.25	0.25
Silicon, max	0.20	0.20	0.20
Aluminum, max	0.20	0.20	0.20
Copper	remainder	remainder	remainder
Copper	remainder	remainder	remainder
Copper + sum of named elements	99.5 % min	99.5 % min	99.5 % min

TABLE 2 Mechanical Property Requirements for Strip and Sheet Precipitation Heat Treated

Copper Alloy UNS No.	Temper Designation		Tensile Strength, ksi (MPa)	Yield Strength, ksi (MPa), 0.2 % offset	Elongation, 2 in. (50 mm), %	Rockwell Hardness	
	Code	Name				B	30T
Copper Alloy UNS No.	Standard	Former	ksi (MPa)	ksi (MPa), 0.2 % offset	(50 mm), %	B	30T
C17410	TH02	½ HT	95-115	80-100	10-20	89-98	76-81
C17410	TH02	½ HT	95-115 (655-790)	80-100 (550-690)	10-20	89-98	76-81
	TH04	HT	110-130 (760-895)	100-120 (690-830)	7-17	95-100	79-86
	TH04	HT	110-130 (760-895)	100-120 (690-830)	7-17	95-100	79-86
C17450	TH02	½ HT	95-115	80-100	12 min	88-99	75-82
C17450	TH02	½ HT	95-115 (655-790)	80-100 (550-690)	12 min	88-99	75-82
			95-115 (655-790)	80-100 (550-690)			
C17460	TH03	¾ HT	115-135	95-115	11 min	98-105	81-88
C17460	TH03	¾ HT	115-135 (790-930)	95-115 (655-790)	11 min	98-105	81-88
	TH04	HT	120-140 (825-965)	105-125 (720-860)	10 min	99-106	82-89
	TH04	HT	120-140 (825-965)	105-125 (720-860)	10 min	99-106	82-89

8.1.3 Copper Alloy UNS No. C17460 Strip and Sheet is offered in the TH03 (¾ HT) and TH04 (HT) tempers.

9. Physical Properties Property Requirements

9.1 Electrical Conductivity: Conductivity Requirement:

9.1.1 The product furnished shall conform to the electrical conductivity prescribed in [Table 3](#), when tested in accordance with Test Method [E1004](#).

10. Mechanical Properties Property Requirements

10.1 Tensile Strength Requirements:

10.1.1 Tensile strength for product less than 0.075 in. (1.905 mm) in thickness shall be an accept/reject requirement when tested in accordance with Test Methods [E8/E8M](#).

10.1.2 The tensile strength requirements are given in [Table 2](#).

10.2 Tensile Yield Strength Requirements:

10.2.1 Product under Yield strength for product less than 0.075 in. (1.905 mm) in thickness furnished under this specification shall conform to the tensile requirements prescribed in [Table 2](#), when tested in accordance with Test Methods [E8/E8M](#).

10.2.2 Tensile test specimens shall be taken so The yield strength requirements are given in [Table 2](#) that their longitudinal axis is parallel to the direction of rolling.

10.2.3 Acceptance or rejection, under rejection for product less than 0.075 in. (1.905 mm) in thickness, based upon mechanical properties thickness shall depend only on tensile strength and yield strength.

TABLE 3 Electrical Conductivity

Copper Alloy UNS No.	Temper	Percent IACS, min
C17410	TH02, TH04	45
C17450	TH02	50
C17460	TH03, TH04	50