Designation: B534 – 20

Standard Specification for Copper-Cobalt-Beryllium Alloy and Copper-Nickel-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar[1]

This standard is issued under the fixed designation B534; 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 specification establishes the requirements for plate, sheet, strip, and rolled bar. The following alloys are included:[2]

Copper Alloy UNS No.	Previously Used Designation	Nominal Composition, %			
		Beryllium	Cobalt	Nickel	Iron
C17500	Alloy 10	0.6	2.5	...	...
C17510	Alloy 3 or 14	0.4	...	1.8	...
C71700	...	0.5	...	31.0	0.70

1.2 *Units*—The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI 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:

1.4 *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 environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *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 *ASTM Standards:*[3]

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

E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

3. General Requirements

3.1 The following sections of Specifications B248 or B248M constitute a part of this specification:

3.1.1 Terminology;
3.1.2 Materials and Manufacture;
3.1.3 Dimensions 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 Specimen Preparation;
3.1.8 Test Methods;
3.1.9 Significance of Numerical Limits;
3.1.10 Inspection;
3.1.11 Rejection and Rehearing;
3.1.12 Certification;
3.1.13 Test Report;
3.1.14 Packaging and Package Marking; and
3.1.15 Heat Identification.

3.2 In addition, when a section with a title identical to that referenced in 3.1, above, appears in this specification, it contains additional requirements that supplement those appearing in Specifications B248 or B248M.

[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**

4. Terminology

4.1 For definitions of terms relating 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:

5.1.1 ASTM designation and year of issue;

5.1.2 Quantity;

5.1.3 Copper Alloy UNS Number designation (1.1);

5.1.4 Form of material: plate, sheet, strip, or rolled bar;

5.1.5 Temper (8.1);

5.1.6 Dimensions: thickness and width, and length if applicable;

5.1.7 How furnished: rolls, stock lengths with or without ends, specific lengths with or without ends; and

5.1.8 When material is ordered for agencies of the U.S. Government.

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 Type of edge, if required: slit, sheared, sawed, square corners, rounded corners, rounded edges, or full-rounded edges (12.6);

5.2.2 Type of width and straightness tolerances, if required: slit-metal tolerances, square-sheared-metal tolerances, sawed-metal tolerances, straightened or edge-rolled-metal tolerances (12.5);

5.2.3 Special thickness tolerances, if required (12.2);

5.2.4 Tension test or hardness as applicable (Section 10);

5.2.5 Certification if required (see Specifications B248 or B248M);

5.2.6 Test Report, if required (see Specifications B248 or B248M);

5.2.7 Specification number and year of issue; and

5.2.8 Special tests or exceptions, if any.

6. Materials and Manufacture

6.1 *Material:*

6.1.1 The material of manufacture shall be Copper Alloy UNS Nos. C17500, C17510, or C71700 cast and worked, and of such purity and soundness as to be suitable for processing into the products prescribed herein.

6.1.2 Heat traceability shall be maintained and reported on the Mill Test Report or Certification.

6.2 *Manufacture:*

6.2.1 The product shall be produced with a combination of hot working, cold working, and thermal processing to produce a uniform wrought structure, and the specified temper.

7. Chemical Composition

7.1 The material shall conform to the chemical composition requirements specified in Table 1.

7.2 These composition limits do not preclude the presence of other elements. Limits for unnamed elements may be established by agreement between the manufacturer or supplier and purchaser.

TABLE 1 Chemical Requirements

Element	Composition, %		
	Copper Alloy UNS No. C17500	Copper Alloy UNS No. C17510	Copper Alloy UNS No. C71700
Beryllium	0.4–0.7	0.2–0.6	0.30-0.7
Cobalt	2.4–2.7	0.3 max	...
Silicon, max	0.20	0.20	...
Nickel	...	1.4–2.2	29.0-33.0 (Incl Co)
Iron	0.10 max	0.10 max	0.40–1.0
Aluminum, max	0.20	0.20	...
Manganese, max	...	...	1.0
Zinc, max	...	...	1.0
Copper	balance	balance	balance

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

7.4 When all the elements in Table 1are analyzed, their sum shall be 99.5 % minimum.

8. Temper

8.1 The standard tempers for product described in this specification are given in Tables 2-6.

8.1.1 Annealed temper TB00 (solution heat-treated),

8.1.2 Cold rolled tempers TD02 and TD04 (varying degrees of cold work),

8.1.3 Precipitation heat-treated tempers TF00 or TH02 and TH04 (precipitation heat-treated from the appropriate tempers),

8.1.4 Mill hardened tempers TM02 and TM04.

9. Precipitation Heat-Treatment Requirements

9.1 Solution heat-treated or solution heat-treated and cold-worked material is normally precipitation hardened by the purchaser after forming or machining. For the purpose of determining conformance to specified mechanical properties of Table 3, a sample of this material shall be heat-treated as shown in Table 6. Other heat-treating temperatures and times may be preferred for end products of this material.

TABLE 2 Mechanical Property Requirements for Material in the Solution Heat-Treated or Solution Heat-Treated and Cold-Worked Condition

Temper Designation		Tensile Strength		Elongation[A] in 2 in. (50 mm), %	Rockwell Hardness[B]	
Code[C]	Name	ksi[D]	MPa[E]		B	30T
Copper Alloy UNS Nos. C17500 and C17510						
TB00	A	35–55	(240–380)	20–35	45 max	45 max
TD02	½ H	60–75	(415–520)	5–10	65–77	60–68
TD04	H	70–85	(480–585)	2–8	78–88	69–75
Copper Alloy UNS No. C71700						
TD04	H	84–112	(580–770)	2–8	85–100	73–83

[A] Elongation requirement applies only to material 0.004 in. (0.102 mm) and thicker.
[B] The thickness that may be tested in the case of the Rockwell hardness scales is as follows:
B Scale 0.045 in. (1.14 mm) and over.
30 T Scale 0.032 in. to 0.045 in. (0.812 mm to 1.14 mm), excl.
Hardness values shown apply only to direct determinations, not converted values.
[C] Standard designations defined in Classification B601.
[D] ksi = 1000 psi.
[E] See Appendix X1.