



Designation: B465 – 16

Standard Specification for Copper-Iron Alloy Plate, Sheet, Strip, and Rolled Bar¹

This standard is issued under the fixed designation B465; 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-iron alloy plate, sheet, strip, and rolled bar for Copper [Alloy] UNS Nos. C19200, C19210, C19400, C19500, C19700, and C19720.

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, which are provided for information only and are not considered standard.

2. Referenced Documents

2.1 *ASTM Standards*:²

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

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

E54 Test Methods for Chemical Analysis of Special Brasses and Bronzes (Withdrawn 2002)³

E62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods) (Withdrawn 2010)³

E75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys (Withdrawn 2010)³

E112 Test Methods for Determining Average Grain Size

E478 Test Methods for Chemical Analysis of Copper Alloys

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.

³ The last approved version of this historical standard is referenced on www.astm.org.

3. General Requirements

3.1 The following sections of Specification B248 constitute a part of this specification:

3.1.1 Terminology

3.1.2 Materials and Manufacture

3.1.3 Workmanship, Finish, and Appearance

3.1.4 Sampling

3.1.5 Number of Tests and Retests

3.1.6 Specimen Preparation

3.1.7 Test Methods (except chemical analysis)

3.1.8 Significance of Numerical Limits

3.1.9 Inspection

3.1.10 Rejection and Reheating

3.1.11 Certification

3.1.12 Test Reports

3.1.13 Packaging and Package Marking

3.1.14 Supplementary Requirements.

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 which supplement those appearing in Specification B248.

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:

5.1.1 ASTM designation and year of issue,

5.1.2 Copper [Alloy] UNS No. designation,

5.1.3 Temper (Section 8),

5.1.4 *Dimensions*—Thickness, width, length, and edges (Section 12),

5.1.5 *How Furnished*—Straight lengths or coils,

5.1.6 *Quantity*—total weight or total length or number of pieces of each size, and

5.1.7 Intended application.

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

5.2.1 Heat identification or traceability details,

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

- 5.2.2 Certification,
- 5.2.3 Test Report,
- 5.2.4 Type of edge (slit, sheared, sawed, square corners, round corners, rounded edges, or full-rounded edges),
- 5.2.5 Width and straightness tolerances (appropriate tables in Specification **B248**), and
- 5.2.6 If product is purchased for agencies of the U.S. Government (see the Supplemental section of Specification **B248** for additional requirements, if specified).

6. Materials and Manufacture

6.1 Materials:

6.1.1 The material of manufacture shall be a form (cast bar, cake, slab, et cetera), of Copper Alloy UNS No. C19200, C19210, C19400, C19500, C19700, or C19720 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 that heat identification or traceability is required, the purchaser shall specify the details desired.

NOTE 1—Due to the discontinuous nature of the processing of castings into wrought products, it is not practical to identify a specific casting analysis with a specific quantity of finished material.

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 finished size, and subsequently annealed, 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.

7.2 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 listed as “remainder,” copper is the difference between the sum of results of all elements determined and 100 %.

7.4 When all elements in **Table 1** are determined, the sum of results shall be 99.8 % min, except for C19720 which shall be 99.5 % min.

8. Temper

8.1 The standard tempers for products described in this specification are given in **Tables 2 and 3**.

8.1.1 Cold-rolled tempers H01 to H14.

8.1.2 Annealed tempers O50, O60, or O82.

8.1.3 Cold-worked and stress-relieved tempers HR02 to HR06.

NOTE 2—The purchaser should confer with the manufacturer or supplier for the availability of product in a specific alloy, temper, and form, since all tempers are subject to manufacturing limitations.

NOTE 3—Properties of special tempers not listed in this specification are subject to agreement between the manufacturer and purchaser.

9. Grain Size for Annealed Tempers

9.1 *Grain Size*—No grain size requirements have been established for tempers O50, O60, and O61; however, the product material shall be fully recrystallized when examined in accordance with Test Methods **E112**.

10. Physical Property Requirements

10.1 Electrical Resistivity Requirement:

10.1.1 The product furnished shall conform to the electrical mass resistivity requirement prescribed in **Table 2** when tested in accordance with Test Method **B193**.

10.1.2 Products produced in temper O60 from Copper Alloy UNS No. C19400 are not required to conform to the electrical mass resistivity requirements of **Table 2**.

11. Mechanical Property Requirements

11.1 Tensile Strength Requirements:

11.1.1 Product furnished under this specification shall conform to the tensile requirements prescribed in **Table 3** when tested in accordance with Test Methods **E8/E8M**.

11.1.2 Acceptance or rejection based upon mechanical properties shall depend only on tensile strength.

TABLE 1 Chemical Requirements

Element	Composition, %					
	Copper Alloy UNS No.					
	C19200	C19210	C19400	C19500	C19700	C19720
Copper	98.5 min	remainder	97.0 min	96.0 min	remainder	remainder
Iron	0.8–1.2	0.05–0.15	2.1–2.6	1.0–2.0	0.30–1.2	0.05–0.50
Phosphorus	0.01–0.04	0.025–0.04	0.015–0.15	0.01–0.35	0.10–0.40	0.05–0.15
Zinc	0.20 max	...	0.05–0.20	0.20 max	0.20 max	0.20 max
Lead, max	0.03	...	0.03	0.02	0.05	0.05
Tin	...	...	...	0.10–1.0	0.20 max	0.20 max
Cobalt	...	...	...	0.30–1.3	0.05 max	...
Aluminum	...	...	...	0.02 max	...	...
Magnesium	...	...	...	...	0.01–0.20	0.06–0.20
Nickel, max	...	...	...	...	0.05	0.10 ^A
Manganese, max	...	...	...	...	0.05	0.05

^A Includes cobalt.