



Designation: B936 – 19

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

This standard is issued under the fixed designation B936; 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 Copper Alloy UNS No. C18080 for plate, sheet, strip, and rolled bar.

NOTE 1—Since Copper Alloy UNS No. C18080 is frequently used in a variety of applications where yield strength and stress-corrosion resistance may be critical, it is recommended that drawings or samples of the part to be fabricated and details of application be submitted for use in establishing temper and treatment of material.

NOTE 2—Copper Alloy UNS No. C18080 is covered by a patent. Interested parties are invited to submit information regarding the identification of an alternative(s) to this patented item to ASTM International headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.

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 *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:²

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)

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.

B846 Terminology for Copper and Copper Alloys

B950 Guide for Editorial Procedures and Form of Product Specifications 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

E75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys (Withdrawn 2010)³

E478 Test Methods for Chemical Analysis of Copper Alloys

E1473 Test Methods for Chemical Analysis of Nickel, Cobalt and High-Temperature Alloys

3. General Requirements

3.1 The following sections of Specifications **B248** and **B248M** 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 for chemical analysis;
- 3.1.8 Significance of Numerical Limits;
- 3.1.9 Inspection;
- 3.1.10 Rejection and Rehearing;
- 3.1.11 Certification;
- 3.1.12 Test Report;
- 3.1.13 Packaging and Package Marking; and
- 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 Specifications **B248** and **B248M**.

4. Terminology

4.1 *Definitions*—For definitions of terms related to copper and copper alloys, refer to Terminology **B846**.

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

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. (or other internationally recognized copper [alloy]) designation;
- 5.1.3 Temper (Section 8);
- 5.1.4 Dimensions, thickness, width, edges (see Section 11), and length, if applicable;
- 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,
- 5.2.2 If product is purchased for agencies of the U.S. Government, see the Supplementary Requirements section of Specifications B248 and B248M.

6. Materials and Manufacture

6.1 Materials:

6.1.1 The material of manufacture shall be a form (cast bar, cake, slab, etc.) of Copper Alloy UNS No. C18080 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 3—Due to the discontinuous nature of the processing of castings into wrought products, it is not always 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.

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 %. When all elements in Table 1 are determined, the sum of the results shall be 99.8 % min.

TABLE 1 Chemical Requirements

Element	Composition, % Copper Alloy UNS No. C18080
Copper	Remainder
Chromium	0.20–0.7
Silicon	0.01–0.10
Titanium	0.01–0.15
Silver	0.01–0.30
Iron	0.02–0.20

8. Temper

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

8.1.1 *Mill Hardened (TM)*—The standard tempers for mill-hardened material are as designated in Table 2 with the prefix “TM.”

8.1.2 *Precipitation Heat Treated, Cold Worked, and Thermal Stress Relieved (TR)*—The standard tempers for precipitation heat treated, cold worked, and thermal stress relieved material are designated in Table 2 with the prefix “TR.”

NOTE 4—The properties for product in special or nonstandard tempers are subject to negotiation between the manufacturer and the purchaser.

9. Physical Property Requirements

9.1 Electrical Resistivity Requirement:

9.1.1 The electrical mass resistivity and conductivity of Copper Alloy UNS No. C18080 is listed in Table 3 for information only.

10. Mechanical Property Requirements

10.1 Yield Strength Requirements:

10.1.1 Product furnished under this specification will conform to the 0.2 % offset yield strength requirements prescribed in Table 2 when tested in accordance with Test Methods E8/E8M.

10.1.2 Acceptance or rejection based upon mechanical properties shall depend only on 0.2 % offset yield strength.

10.2 Tensile Strength Requirements:

10.2.1 The approximate Tensile Strength values given in Table 2 are for general information and assistance in testing, and shall not be used as a basis for product rejection.

TABLE 2 Yield Strength Requirements and Approximate Tensile Strength and Rockwell Hardness Values for Copper Alloy UNS No. C18080

Temper Designation	Approximate Tensile Strength	Yield Strength at 0.2 % Offset	Approximate Rockwell Hardness	
	ksi ^A (MPa ^B)	ksi ^A (MPa ^B) min.	Rockwell B	Superficial 30T
TM04	70–81 (480–560)	65 (450)	76–86	67–74
TM08	78–91 (540–630)	75 (520)	80–89	70–76
TR08	75–91 (520–630)	72 (500)	78–89	69–76

^A ksi = 1000 psi.

^B See Appendix X1.

TABLE 3 Electrical Resistivity

Temper	Copper Alloy UNS No. C18080	
	Electrical Resistivity at 68 °F (20 °C), Ω·g/m	Equivalent Conductivity at 68 °F (20 °C), % IACS
TM04, TM08, TR08	0.19165 nominal	79 nominal

10.3 Rockwell Hardness Requirements:

10.3.1 The approximate Rockwell hardness values given in Table 2 are for general information and assistance in testing, and shall not be used as a basis for product rejection.

NOTE 5—The Rockwell hardness test offers a quick and convenient method of checking for general conformity to the specification requirements for temper, tensile strength, and grain size.

11. Dimensions, Mass, and Permissible Variation

11.1 The dimensions and tolerances for product described by this specification shall be as specified in Specifications B248 and B248M with particular reference to the following tables and related paragraphs:

11.2 Thickness—Table 1.

11.3 Width:

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

11.3.2 Square Sheared Metal—Table 5.

11.3.3 Sawed Metal—Table 6.

11.4 Length:

11.4.1 Length Tolerance for Straight Lengths—Table 7.

11.4.2 Schedule for Minimum Lengths with Ends—Table 8.

11.4.3 Length Tolerance for Square Sheared Metal—Table 9.

11.4.4 Length Tolerance for Sawed Metal—Table 10.

11.5 Straightness:

11.5.1 Slit Metal or Slit Metal Either Straightened or Edge Rolled—Table 11.

11.5.2 Square Sheared Metal—Table 12.

11.5.3 Sawed Metal—Table 13.

11.6 Edges Contours:

11.6.1 Square Corners—Table 14.

11.6.2 Rounded Corners—Table 15.

11.6.3 Rounded Edges—Table 16.

11.6.4 Full-Rounded Edges—Table 17.

12. Sampling

12.1 Refer to the Sampling sections in Specifications B248 and B248M.

13. Test Methods

13.1 Chemical Analysis:

13.1.1 In cases of disagreement, test methods for chemical analysis shall be subject to agreement between the manufacturer or supplier and purchaser. The following table is a list of published methods, some of which may no longer be viable, which along with others not listed, may be used subject to agreement.

Element	ASTM Test Method
Chromium	E1473
Titanium	E1473
Copper	E478
Iron	E75 (AA)
Silicon	E54
Silver	E54

13.1.2 Test method(s) to be followed for the determination of element(s) resulting from contractual or purchase order agreement shall be as agreed upon between the manufacturer or supplier and purchaser.

14. Keywords

14.1 copper-chromium-iron-titanium alloy plate; copper-chromium-iron-titanium alloy rolled bar; copper-chromium-iron-titanium alloy sheet; copper-chromium-iron-titanium alloy strip; UNS No. C18080

APPENDIX

(Nonmandatory Information)

X1. METRIC EQUIVALENTS

X1.1 The SI unit for strength properties now shown is in accordance with the International System of Units (SI). The derived SI unit for force is the newton (N), which is defined as that force which when applied to a body having a mass of one kilogram gives it an acceleration of one metre per second squared ($N = \text{kg} \cdot \text{m}/\text{s}^2$). The derived SI unit for pressure or

stress is the newton per square metre (N/m^2), which has been named the pascal (Pa) by the General Conference on Weights and Measures. Since $1 \text{ ksi} = 6\,894\,757 \text{ Pa}$ the metric equivalents are expressed as megapascal (MPa), which is the same as MN/m^2 and N/mm^2 .

SUMMARY OF CHANGES

Committee B05 has identified the location of selected changes to this standard since the last issue (B936–13) that may impact the use of this standard. (Approved April 1, 2019.)

- (1) Updated to correct Form and Style per ASTM Guide **B950**. (2) Changed conductivity from 80 nominal to 79 nominal.

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