



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

This standard is issued under the fixed designation B 936; 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 in alloy.

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.

2. Referenced Documents

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

2.2 *ASTM Standards*:²

B 248 Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar

B 248M Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar (Metric)

B 601 Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast

B 846 Terminology for Copper and Copper Alloys

E 8/E 8M Test Methods for Tension Testing of Metallic Materials

E 62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods)

E 76 Test Methods for Chemical Analysis of Nickel-Copper Alloys³

E 255 Practice for Sampling Copper and Copper Alloys for the Determination of Chemical Composition

E 478 Test Methods for Chemical Analysis of Copper Alloys

E 1473 Test Methods for Chemical Analysis of Nickel, Cobalt, and High-Temperature Alloys

3. General Requirements

3.1 The following sections of Specification **B 248** constitute a part of this specification:

- 3.1.1 Terminology—Definitions,
- 3.1.2 Materials and Manufacturing,
- 3.1.3 Workmanship, Finish, and Appearance,
- 3.1.4 Sampling, except for chemical analysis,
- 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 Reports (Mill),
- 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 appears in this specification, it contains additional requirements which supplement those appearing in Specification **B 248**.

4. Terminology

4.1 *Definitions*—For definitions of terms used in this specification, refer to Terminology **B 846**.

5. Ordering Information

5.1 Contracts or purchase orders for product under this specification should include the following information:

³ Withdrawn.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

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

5.1.1 ASTM designation and year of issue (for example, B 936 – XX),

5.1.2 Copper Alloy UNS No. designation (for example, C18080),

5.1.3 Temper (see Section 8),

5.1.4 Dimensions, that is, thickness, width, length, and so forth (see Section 13),

5.1.5 Form, that is, plate, sheet, strip, or rolled bar,

5.1.6 How furnished, that is, coils, specific lengths or stock lengths, with or without ends,

5.1.7 Quantity, that is, total weight each form, temper, and size, and

5.1.8 Whether material is purchased for agencies of the U.S. government (see Section 12).

5.2 The following options are available under this specification and should be specified in the contract or purchase order when required:

5.2.1 Type of edge, that is, slit, sheared, sawed, square corners, round corners, rounded edges, or full rounded edges, and

5.2.2 Width and straightness tolerances (see Section 13).

6. Materials and Manufacture

6.1 Material:

6.1.1 The material of manufacture shall be a cast bar, cake, slab, and so forth, of Copper Alloy UNS No. C18080 of such purity and soundness as to be suitable for process in to the products prescribed herein.

6.1.2 In the event 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.

6.2.3 Edges—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 specified in Table 1.

7.2 These composition limits do not preclude the presence of other elements. Limits may be established and analysis

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

required for unnamed elements by agreement between the manufacturer and the purchaser.

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 equal at least 99.8 %.

8. Temper

8.1 Products fabricated from these alloys are available in the tempers listed in Table 2 as defined in Classification B 601.

8.1.1 *Mill Hardened (TM)*—The standard tempers for mill-hardened material are as designated in Table 2 with the prefix “TM”. Former designations and the standard designations as defined in Classification B 601 are shown.

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.” Former designations and the standard designations as defined in Classification B 601 are shown.

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

9. Physical Properties

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

9.2 The density of Copper Alloy UNS No. C18080 is given in Specifications B 248 and B 248M.

10. Mechanical Properties

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 E 8/E 8M.

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 shall not be used as a basis for product rejection.

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.

TABLE 2 Yield Strength Requirements 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
	min.	max.			
TM04	70 (480)	81 (560)	65 (450)	76-86	67-74
TM08	78 (540)	91 (630)	75 (520)	80-89	70-76
TR08	75 (520)	91 (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 20°C (68° F), Ω·g/m	Equivalent Conductivity at 20°C (68° F), % IACS
TM04, TM08, TR08	0.19165 nominal	80 nominal

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. Other Requirements

11.1 *Purchases for U.S. Government Agencies*—When identified in the contract or purchase order, product purchased for agencies of the U.S. government shall conform to the special government requirements stipulated in the supplemental requirements given in Specification B 248.

12. Dimension, Mass, and Permissible Variations

12.1 The dimensions and tolerances for product described by this specification shall be as specified in Specification B 248 with particular reference to the following tables and related paragraphs in that specification:

12.1.1 *Thickness*—Tolerances, Table 1.

12.1.2 *Width*:

12.1.2.1 *Tolerances for Slit Metal and Slit Metal with Rolled Edges*—Table 4.

12.1.2.2 *Tolerances for Square Sheared Metal*—Table 5.

12.1.2.3 *Tolerances for Sawed Metal*—Table 6.

12.1.3 *Length*:

12.1.3.1 *Tolerances for Straight Lengths*—Table 7.

12.1.3.2 *Schedule of Minimum Lengths with Ends*—Table 8.

12.1.3.3 *Tolerances for Square Sheared Metal*—Table 9.

12.1.3.4 *Tolerances for Sawed Metal*—Table 10.

12.1.4 *Straightness*:

12.1.4.1 *Tolerances for Slit Metal or Slit Metal Either Straightened or Edge Rolled*—Table 11,

12.1.4.2 *Tolerances for Squared-Sheared Metal*—Table 12.

12.1.4.3 *Tolerances for Sawed Metal*—Table 13.

12.1.5 *Edges*:

12.1.5.1 *Tolerances for Radius of Square Edges*—Table 14.

12.1.5.2 *Tolerances for Radius of Round Corners*—Table 15.

12.1.5.3 *Tolerances for Radius of Rounded Edges*—Table 16.

12.1.5.4 *Tolerances for Radius of Full-Rounded Edges*—Table 17.

13. Sampling

13.1 Chemical Analysis:

13.1.1 The sample for chemical analysis shall be taken from the pieces selected and combined into one composite sample in accordance with Practice E 255 for product in its final form. The minimum weight of the composite sample shall be 150 g.

13.1.2 Instead of sampling in accordance with Practice E 255, the manufacturer shall have the option of taking samples at the time the castings are poured or by taking samples from the semi-finished product.

13.1.2.1 When composition of the material has been determined during the course of manufacture, sampling of the finished product by the manufacturer is not required.

13.1.3 The number of samples to be taken for determination of chemical composition shall be as follows:

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

13.1.3.2 When sampled from the semi-finished product, at least one sample shall be taken to represent each 10 000 lb, or fraction thereof, except that not more than one sample shall be required per piece.

13.1.3.3 Only one sample need be taken from the semi-finished product of one cast bar from a single furnace melt charge continuously processed.

14. Test Methods

14.1 *Chemical Analysis*—Chemical composition shall, in case of disagreement, be determined as follows:

Element	ASTM Test Method
Chromium	E 1473
Titanium	E 1473
Copper	E 478
Iron	E 76 (AA)
Silicon	E 62
Silver	E 478

14.1.1 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 and the purchaser.

15. Keywords

15.1 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 (B 936 – 04^{e1}) that may impact the use of this standard. (Approved Oct. 1, 2008.)

- (1) Corrected typographical errors throughout the standard.
- (2) A definition that is now in B 846 was removed from Section 4.
- (3) The TR Temper designation was added in paragraph 8.1.2.
- (4) Mechanical Properties (paragraphs 10.1.1 and 10.1.2) were revised to show that product furnished under this specification will conform to 0.2 % offset yield strength and not tensile strength.
- (5) The Cr range was revised from 0.20 – 0.70 to 0.20 – 0.7 to

be consistent with CDA.

- (6) Table 2 was revised to show it is for Yield Strength Requirements, TR08 temper values were added, 0.2 % offset yield strength values were added for all tempers, and the tensile strength ranges were modified for TM04 and TM08 tempers.
- (7) Table 3 was revised to add TR08 temper, the electrical resistivity value was modified, and the electrical conductivity value was modified.

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