



**Designation: B122/B122M – 11**

# Standard Specification for Copper-Nickel-Tin Alloy, Copper-Nickel-Zinc Alloy (Nickel Silver), and Copper-Nickel Alloy Plate, Sheet, Strip, and Rolled Bar<sup>1</sup>

This standard is issued under the fixed designation B122/B122M; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

*This standard has been approved for use by agencies of the Department of Defense.*

## 1. Scope\*

1.1 This specification establishes the requirements for copper-nickel-tin alloy, copper-nickel-zinc alloy (nickel silver), and copper-nickel alloy plate, sheet, strip, and rolled bar. The following alloys are covered:

Copper Alloy UNS No. <sup>2</sup>	Previously Used Designation	Nominal Composition, %				
		Copper	Nickel	Zinc	Tin	Chro- mium
C70600	...	90	10	...	...	...
C70620	...	86	10	...	...	...
C71000	6	80	20	...	...	...
C71500	5	70	30	...	...	...
C71520	...	65	31	...	...	...
C72200	...	85	15	...	...	0.5
C72500	...	89	9	...	2	...
C73500	1	72	18	10	...	...
C74000	9	70	10	20	...	...
C74500	3	65	10	24	...	...
C75200	2	65	18	17	...	...
C76200	8	59	12	29	...	...
C77000	4	55	18	27	...	...

NOTE 1—Plates of copper-nickel alloy Copper Alloy UNS Nos. C70600, C70620, C71500, C71520, and C72200 for use as tube plates in surface condensers and heat exchangers are covered by Specification B171/B171M.

1.2 The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

<sup>1</sup> 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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<sup>2</sup> 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.

1.2.1 When the product is ordered in inch-pound units, the inch-pound units are to be regarded as the standard except grain size is always specified in millimetres.

1.2.2 When the product is ordered in SI units, the SI units are to be regarded as the standard.

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>3</sup>

- B171/B171M Specification for Copper-Alloy Plate and Sheet for Pressure Vessels, Condensers, and Heat Exchangers
- 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 Test Methods for Tension Testing of Metallic Materials
- E8M Test Methods for Tension Testing of Metallic Materials [Metric] (Withdrawn 2008)<sup>4</sup>
- E112 Test Methods for Determining Average Grain Size
- E255 Practice for Sampling Copper and Copper Alloys for the Determination of Chemical Composition
- E478 Test Methods for Chemical Analysis of Copper Alloys
- E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

## 3. General Requirements

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

<sup>3</sup> 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.

<sup>4</sup> 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

- 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 4.1 appears in this specification, it contains additional requirements, which supplement those appearing in Specification B248.

#### 4. Terminology

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

#### 5. Ordering Information

5.1 Orders for products under this specification should include the following information:

- 5.1.1 ASTM designation and year of issue (B122/B122M – XX),
- 5.1.2 Copper (alloy) UNS number designation,
- 5.1.3 Temper (Section 8),
- 5.1.4 Dimensions: thickness and width (see Section 12),
- 5.1.5 Type of edge, if required: slit, sheared, sawed, square corners, rounded corners, rounded edges, or full rounded edges,
- 5.1.6 How furnished: flat or rolls,
- 5.1.7 Length (see Section 12), and
- 5.1.8 Weight: total for each size.

5.2 In addition, when material is purchased for agencies of the U.S. government, it shall conform to the Supplementary Requirements as defined in Specification B248 when specified in the contract or purchase order.

#### 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. C70600, C70620, C71000, C71500, C71520, C72200, C72500, C73500, C74000, C74500, C75200, C76200, or C77000 as specified in the ordering information.

6.1.2 In the event that heat identification or traceability is required, the purchaser shall specify the details desired.

NOTE 2—Because of 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 in the ordering information.

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 prescribed in Table 1.

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

7.2.1 For copper alloys for which copper is specified as a remainder, copper may be taken as the difference between the

**TABLE 1 Chemical Requirements**

Copper Alloy UNS No.	Composition, %								
	Copper, incl Silver	Nickel, incl Cobalt	Lead, max	Iron, max	Manganese, max	Zinc	Tin	Chromium	Other Named Elements
C70600	remainder	9.0–11.0 <sup>A</sup>	0.05 <sup>B</sup>	1.0–1.8	1.0	1.0 <sup>B</sup> max	...	...	<i>B</i>
C70620	86.5 min	9.0–11.0	0.02	1.0–1.8	1.0	0.50 max	...	...	<i>C</i>
C71000	remainder	19.0–23.0	0.05 <sup>B</sup>	1.0 max	1.0	1.0 <sup>B</sup> max	...	...	<i>B</i>
C71500	remainder	29.0–33.0 <sup>A</sup>	0.05 <sup>B</sup>	0.40–1.0	1.0	1.0 <sup>B</sup> max	...	...	<i>B</i>
C71520	65.0 min	28.0–33.0	0.02	0.40–1.0	1.0	0.50 max	...	...	<i>C</i>
C72200	remainder	15.0–18.0	0.05 <sup>B</sup>	0.50–1.0	1.0	1.0 <sup>B</sup>	...	0.30–0.70	<i>B</i>
C72500	remainder	8.5–10.5	0.05	0.6	0.2	0.5 max	1.8–2.8	...	<i>D</i>
C73500	70.5–73.5	16.5–19.5	0.09	0.25 max	0.50	remainder	...	...	...
C74000	69.0–73.5	9.0–11.0	0.05	0.25 max	0.50	remainder	...	...	...
C74500	63.5–66.5	9.0–11.0	0.09	0.25 max	0.50	remainder	...	...	...
C75200	63.5–66.5	16.5–19.5	0.05	0.25 max	0.50	remainder	...	...	...
C76200	57.0–61.0	11.0–13.5	0.09	0.25 max	0.50	remainder	...	...	...
C77000	53.5–56.5	16.5–19.5	0.05	0.25 max	0.50	remainder	...	...	...

<sup>A</sup> Copper plus elements with specific limits, 99.5 % min.

<sup>B</sup> When the product is for subsequent welding applications and so specified by the purchaser, zinc shall be 0.50 % max, lead 0.02 % max, phosphorus 0.02 % max, sulfur 0.02 % max, and carbon 0.05 % max.

<sup>C</sup> Phosphorus at 0.02 % max, sulfur at 0.02 % max, and carbon at 0.05 % max.

<sup>D</sup> Silicon and titanium each at 0.03 % max.



sum of all the elements analyzed and 100 %. When all the elements in Table 1 are analyzed, their sum shall be as follows:

Copper Alloy UNS No.	Copper Plus Named Elements, % min
C70600	99.5
C70620	99.5
C71000	99.5
C71500	99.5
C71520	99.5
C72200	99.8
C72500	99.8

7.2.2 For copper alloys for which zinc is specified as a remainder, either copper or zinc may be taken as the difference between the sum of all elements analyzed and 100 %. When all elements in Table 1 are analyzed, their sum shall be as follows:

Copper Alloy UNS No.	Copper Plus Named Elements, % min
C73500	99.5
C74000	99.5
C74500	99.5
C75200	99.5
C76200	99.5
C77000	99.5

### 8. Temper

8.1 As Hot-Rolled (M20) Tempers—The standard temper of sheet and plate produced by hot rolling and is as designated in Table 2.

8.2 Cold Rolled (H) Tempers—The standard tempers of cold rolled tempers are as designated in Table 2 with the prefix “H.” Former designations and the standard designations as defined in Classification B601 are shown. Special or nonstandard tempers are subject to negotiation between manufacturer and purchaser (See 5.1.2).

8.3 Annealed Tempers—The standard tempers are indicated in Table 3.

### 9. Grain Size for Annealed Tempers

9.1 Grain size shall be the standard requirement for all products in the annealed tempers.

9.2 Acceptance or rejection based upon grain size shall depend only on the average grain size of test specimens taken from each of two sampling portions and each specimen shall be within the limits prescribed in Table 3 when determined in accordance with Test Methods E112.

9.3 Grain size shall be determined on a plane parallel to the flat surfaces of the product.

### 10. Mechanical Property Requirements

#### 10.1 Tensile Strength Requirements :

10.1.1 Products ordered to this specification in inch-pound units shall be tested in accordance with Test Methods E8 and shall conform to tensile strength requirements prescribed in ksi units in Table 2.

10.1.2 Products ordered to this specification in SI units shall be tested in accordance with Test Methods E8M, and shall conform to tensile strength requirements prescribed in MPa units in Table 2.

10.1.3 Acceptance or rejection based on mechanical properties shall depend only on the tensile strength.

10.1.4 The tension test specimens shall be taken so the longitudinal axis of the specimens is parallel to direction of rolling.

#### 10.2 Rockwell Hardness:

10.2.1 The approximate Rockwell hardness values given in Tables 2 and 4 are for general information and assistance in testing and shall not be used as a basis for product rejection.

NOTE 3—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 B248.

### 12. Dimensions, Mass, and Permissible Variations

12.1 The inch-pound dimensions and tolerances for products covered by this specification shall be as prescribed in the current edition of Specification B248, and the SI dimensions and tolerances covered by this specification shall be as prescribed in the current edition of Specification B248M.

12.2 Thickness—When special thickness tolerances for Copper Alloy UNS No. C72500 are required, see appropriate table.

#### 12.3 Width:

- 12.3.1 Slit Metal and Slit Metal with Rolled Edges.
- 12.3.2 Square-Sheared Metal.
- 12.3.3 Sawed Metal.

#### 12.4 Length:

- 12.4.1 Specific and Stock Lengths With and Without Ends.
- 12.4.2 Schedule of Lengths (Specific and Stock) with Ends.
- 12.4.3 Length Tolerances for Square-Sheared Metal.
- 12.4.4 Length Tolerances for Sawed Metal.

#### 12.5 Straightness:

- 12.5.1 Slit Metal or Slit Metal Either Straightened or Edge-Rolled.
- 12.5.2 Square-Sheared Metal.
- 12.5.3 Sawed Metal.

#### 12.6 Edges.

- 12.6.1 Square Edges.
- 12.6.2 Rounded Corners.
- 12.6.3 Rounded Edges.
- 12.6.4 Full-Rounded Edges.

### 13. Workmanship, Finish, and Appearance

13.1 The product shall be free of defects, but blemishes of a nature that does not interfere with the intended application are acceptable.

### 14. Sampling

14.1 Chemical Analysis: