



Standard Specification for Copper-Nickel-Tin Spinodal Alloy Rod and Bar¹

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1. Scope

1.1 This specification establishes the requirements for copper-nickel-tin alloy rod and bar. The following alloy is included:

Copper Alloy UNS No.	Nominal Composition, Weight %		
	Copper	Nickel	Tin
C72900	77	15	8

1.2 The following safety hazard caveat pertains only to the test method(s) described in this specification.

1.3 *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.

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

2. Referenced Documents

2.1 *ASTM Standards:*²

B 249/B 249 M Specification for General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, Shapes, and Forgings

B 846 Terminology for Copper and Copper Alloys

E 8 Test Methods for Tension Testing of Metallic Materials

E 8M Test Methods for Tension Testing of Metallic Materials [Metric]

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

E 53 Test Methods for Determination of Copper in Unalloyed Copper by Gravimetry

E 75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys

¹ This specification is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.02 on Rod, Bar, Wire, Shapes, and Forgings.

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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.

E 478 Test Methods for Chemical Analysis of Copper Alloys

3. General Requirements

3.1 The following sections of Specification **B 249/B 249M** constitute a part of this specification:

3.1.1 Dimensions, Mass and Permissible Variations,

3.1.2 Number of Tests and Retests,

3.1.3 Specimen Preparation,

3.1.4 Significance of Numerical Limits,

3.1.5 Inspection,

3.1.6 Rejection and Rehearing,

3.1.7 Certification,

3.1.8 Packaging and Package Marking, and

3.1.9 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 **B 249/B 249M**.

4. Terminology

4.1 *Definitions*—For definitions of terms related to copper and copper alloys, refer to Terminology **B 846**.

5. Ordering Information

5.1 Include the following information 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. C72900,

5.1.3 Temper (Section 8),

5.1.4 Dimensions—diameter or distance between parallel surfaces, width, thickness, and length,

5.1.5 How furnished—stock lengths or specific lengths, with or without ends, and

5.1.6 Quantity—total weight or total length or number of pieces of each size.

5.1.7 If product is purchased for agencies of the U.S. government (see the Supplementary Requirements section of **B 249/B 249M** for additional requirements, if specified).

5.2 The following options are available and should be specified at the time of placing of the order when required:

5.2.1 Type of edge on bar (square corners, rounded corners, rounded edge, full-rounded edge),



- 5.2.2 Certification (see Specification **B 249/B 249M**), and
 5.2.3 Mill Test Report (see Specification **B 249/B 249M**).

6. Materials and Manufacture

6.1 Materials:

6.1.1 The material of manufacture shall be a form of Copper Alloy UNS No. C72900, of such purity and soundness as to be suitable for processing 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 1—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.

7. Chemical Composition

7.1 The material shall conform to the chemical composition requirements in **Table 1** for the Copper Alloy UNS No. C72900.

7.1.1 Results of analysis on a product (check) sample shall conform to the composition requirements within the permitted analytical variance specified 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 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 results shall be 99.7 % minimum.

8. Temper

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

8.1.1 TX 00—Spinodal Hardened (AT).

9. Mechanical Property Requirements

9.1 Tensile Strength Requirements:

9.1.1 Product furnished under this specification shall conform to the tensile requirements prescribed in **Table 2**, when tested in accordance with Test Methods **E 8** or **E 8M**.

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

9.2 *Rockwell Hardness Requirement*—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 2—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.

10. Dimensions, Mass, and Permissible Variation

10.1 The dimensions and tolerances for product described by this specification shall be as specified in Specification **B 249/B 249M** with particular reference to the following tables and related paragraphs:

10.2 *Diameter or Distance Between Parallel Surfaces:*

10.2.1 *Rod: Round, Hexagonal, Octagonal*—Refer to **Table 5**.

10.3 *Width and Thickness:*

10.3.1 *Bar—Rectangular and Square*—Refer to **Tables 9** and **11**.

10.4 *Length*—Rod and Bar—Refer to **Tables 13** and **15**.

10.5 *Straightness*—Rod and Bar—Refer to **Table 16**, General Use section.

10.6 *Edge Contours*—Refer to section 6.5, Edge Contours.

11. Workmanship, Finish and Appearance

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

12. Sampling

12.1 Sampling shall be in accordance with Specification **B 249/B 249M**, except that the heat size is defined as 12 000 lb (5455 kg) or fraction thereof.

12.2 Sample pieces shall be taken from a heat and lot of material processed simultaneously in the same equipment, as follows:

12.3 *Heat*—A heat shall be the result of castings poured simultaneously from the same source of molten metal.

12.4 *Lot*—A lot shall be a heat or fraction thereof.

13. Number of Tests and Retests

13.1 Section 9 of Specification **B 249/B 249M** constitutes a part of this specification.

13.2 If any heat treat batch of material fails to conform to the requirements of this specification, new samples of material may be resubmitted for testing. Only two such retests shall be permitted.

14. Specimen Preparation

14.1 Section 10 of Specification **B 249/B 249M** constitutes a part of this specification.

TABLE 1 Chemical Composition^A

Composition, %									
Copper Alloy UNS No.	Previous Designation	Copper (including silver)	Iron, max	Zinc, max	Nickel, incl. Cobalt	Tin	Manganese, max	Niobium, max	Magnesium, max
C72900	Cu-15Ni-8Sn	Remainder	0.50	0.50	14.5–15.5	7.5–8.5	0.30	0.10	0.15

^A Lead 0.02 (0.005 maximum for hot rolling).

TABLE 2 Mechanical Property Requirements^A

Temper Designation	Tensile Strength, ksi	Yield Strength, (0.2% offset)	Elongation in 4 x D ^B , %	Hardness HRC
TX00	<4 in., 110–135	90–115	15 min	23 min
TX00	4 in. and over 110–135	90–115	12 min	23 min

^A The upper limits in the tensile strength and yield strength columns are for design guidance only.

^B 4 X D = 4 X diameter

14.2 Tension test specimens shall be prepared in a full cross-section area if practicable and in the direction of final working unless otherwise specified. Full cross section or machined specimens shall be as specified in Test Method 8.

15. Test Methods

15.1 Chemical Analyses:

15.1.1 In cases of disagreement, determine the composition using the following methods:

Element	Method
Copper	E 53
Iron	E 53
Zinc	E 478
Nickel	E 478
Tin	E 478
Manganese	E 75

15.1.2 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.

15.2 *Other Tests*—The product furnished shall conform to specified requirements when subjected to test in accordance with the following table:

Test	Method
Tensile Strength	E 8
Hardness	E 18

16. Significance of Numerical Limits

16.1 See Specification B 249/B 249M for this part of this specification.

17. Inspection

17.1 See Specification B 249/B 249M for this part of this specification.

18. Rejection and Rehearing

18.1 See Specification B 249/B 249M for this part of this specification.

19. Certification

19.1 See Specification B 249/B 249M for this part of this specification.

20. Test Report

20.1 When specified in the contract or purchase order, a report of test results shall be furnished.

21. Packaging and Package Marking

21.1 See Specification B 249/B 249M for this part of this specification.

22. Keywords

22.1 bar; Copper Alloy UNS No. C72900; rod

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