



Designation: B929 – 23

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

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1. Scope*

1.1 This specification covers the requirements for copper-nickel-tin alloy UNS No. C72900 rod and bar.

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 The following safety hazard caveat pertains only to the test methods described in this specification: *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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
- [B249/B249M Specification for General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, Shapes and Forgings](#)
 - [B601 Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast](#)
 - [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](#)

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.

- [E10 Test Method for Brinell Hardness of Metallic Materials](#)
- [E18 Test Methods for Rockwell Hardness of Metallic Materials](#)
- [E23 Test Methods for Notched Bar Impact Testing of Metallic Materials](#)
- [E53 Test Method for Determination of Copper in Unalloyed Copper by Gravimetry \(Withdrawn 2022\)³](#)
- [E75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys \(Withdrawn 2010\)³](#)
- [E140 Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness](#)
- [E478 Test Methods for Chemical Analysis of Copper Alloys](#)
- [E1823 Terminology Relating to Fatigue and Fracture Testing](#)

3. General Requirements

3.1 The following sections of Specification [B249/B249M](#) 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 Test Report
- 3.1.9 Packaging and Package Marking
- 3.1.10 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 [B249/B249M](#).

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 products under this specification, as applicable:

³ 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,
- 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.

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

- 5.2.1 Heat identification or traceability details,
- 5.2.2 Certification,
- 5.2.3 Test Report,
- 5.2.4 Type of edge on bar (square corners, rounded corners, rounded edge, full-rounded edge), and
- 5.2.5 If product is purchased for agencies of the U.S. Government see the Supplementary Requirements section of Specification **B249/B249M** for additional requirements, if specified.

6. Materials and Manufacture

6.1 Materials:

6.1.1 The material of manufacture shall be a cast and hot worked form of Copper Alloy UNS No. C72900, 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 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, with intermediate heat treatments, when required, and final spinodal hardening 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 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**. (See Classification **B601**.)

8.1.1 *TX00, TX02*—Spinodally Hardened (AT). Solution annealed and spinodally hardened to different minimum yield strength levels, respectively.

8.1.2 *TS02, TS04, TS06, TS08*—Suitably cold worked and spinodally hardened to respectively increasing strength levels.

9. Mechanical Property Requirements

9.1 Tensile Strength Requirements:

9.1.1 Products furnished under this specification shall conform to the tensile requirements prescribed in **Table 2**, when tested at room temperature in accordance with Test Methods **E8/E8M**.

9.2 Rockwell Hardness Requirement:

9.2.1 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 2—The Rockwell hardness test offers a quick and convenient method of checking for general conformity to the specification requirements for temper and tensile strength.

9.3 Charpy V-Notch (CVN) Impact Requirements:

9.3.1 When specified by the contract or purchase order, products furnished under this specification shall conform to the minimum average absorbed energy values prescribed in **Table 3** when tested at room temperature using averaged results of triplicate full-size Charpy (simple-beam) (Type A) impact specimens tested in accordance with Test Methods **E23**.

9.3.2 Any temper not represented in **Table 3** may be impact tested when requested by the purchaser; however, the average CVN absorbed energy value shall be for information only.

10. Dimensions, Mass, and Permissible Variation

10.1 The dimensions and tolerances for products described by this specification shall be as specified in Specification **B249/B249M** with particular reference to the following tables and related paragraphs:

TABLE 1 Chemical Requirements

Copper Alloy UNS No.	Designation	Copper, incl. silver	Composition, %							
			Lead, max	Tin	Zinc, max	Iron, max	Nickel, incl. Cobalt	Manganese, max	Magnesium, max	Niobium, max
C72900	Cu-15Ni-8Sn	Remainder	0.02	7.5 to 8.5	0.50	0.50	14.5 to 15.5	0.30	0.15	0.10

TABLE 2 Mechanical Property Requirements

Temper Designation	Nominal Dimension, in. (mm)	Tensile Strength, min, ksi ^A (MPa) ^B	Yield Strength, (0.2 % Offset), min, ksi ^A (MPa) ^B	Elongation in 4D, ^C min, %	Hardness, min, HRC	
TX00	1 to 4.25 (25 to 108), excl 4.25 to 9 (108 to 229), incl	110 (755)	90 (620)	15 12	23 ^D	
TX02	0.595 to 4.25 (15 to 108), excl 4.25 to 9 (108 to 229), incl	132 (910) 127 (875)	110 (755)	10 6	30 ^D	
TS02	0.75 to 3.25 (19 to 83), incl Over 3.25 to 6 (83 to 152), incl	106 (730) 105 (720)	95 (655)	18	93 HRB	
TS04	0.75 to 3.25 (19 to 83), incl Over 3.25 to 6 (83 to 152), incl	120 (825)	110 (755)	15	24 22	
TS06	0.75 to 6 (19 to 152), incl	140 (965)	130 (895)	10	24	
TS08	0.25 (6), incl	160 (1100)	150 (1030)	5	32	
	Over 0.25 to 0.4 (6 to 10), incl			7	36	
	Over 0.4 to 0.75 (10 to 19), incl	165 (1135)		5	34	
	Over 0.75 to 1.6 (19 to 41), incl			160 (1100)	3	32
	Over 1.6 to 3.25 (41 to 83), incl				148 (1020)	
Over 3.25 to 6 (83 to 152), incl						

^A ksi = 1000 psi.

^B See Appendix X1.

^C 4D = Gage length is 4x gage diameter.

^D May be reported as a conversion of HBW to HRC per Hardness Conversion Tables (E140).

TABLE 3 CVN Impact Requirements

Temper	Nominal Dimension, in (mm)	Average CVN Absorbed Energy, min, ft-lb (J)
TX00	1 to 9 (25 to 229), incl	4 (5)
TX02	0.595 to 9 (15 to 229), incl	4 (5)
TS02	0.75 to 6 (19 to 152), incl	30 ^A (40) ^A
TS04	0.75 to 1.6 (19 to 41), excl	15 (20)
	1.6 to 3.25 (41 to 83), incl	12 (16)
	Over 3.25 to 6 (83 to 152), incl	11 ^B (15) ^B
TS06	0.75 to 6 (19 to 152), incl	5 (6)

^A No single value less than 24 ft-lb (32 J).

^B No single value less than 10 ft-lb (13 J).

10.2 Diameter or Distance Between Parallel Surfaces:

10.2.1 Rod: Hexagonal, Octagonal—Table 5.

10.2.2 Rod: Round—Diameter—Exception to Specification B249/B249M—Refer to Table 4 (below).

10.3 Width and Thickness:

10.3.1 Bar: Rectangular and Square—Tables 9 and 11.

TABLE 4 Diameter Tolerance for Round Rod

Temper	Diameter, in (mm)	Tolerance, Plus and Minus, in (mm)
TX00, TX02	0.595 to 1 (15 to 25), incl	+0.04/-0 (+1.0/-0)
	Over 1 to 2 (25 to 51), incl	+0.06/-0 (+1.5/-0)
	Over 2 to 3 (51 to 76), incl	+0.10/-0 (+2.5/-0)
	Over 3 to 3.5 (76 to 89), incl	+0.14/-0 (+3.6/-0)
	Over 3.5 to 4.25 (89 to 108), excl 4.25 to 9 (108 to 229), incl	+0.24/-0 (+6.1/-0) +0.05/-0 ^A (+1.3/-0) ^A
TS08	0.25 to 0.4 (6 to 10), excl	±0.002 (±0.05)
	0.4 to 0.75 (10 to 19), excl	+0.005/-0 (+0.13/-0)
TS02, TS04, TS06, TS08	0.75 to 1.6 (19 to 41), incl	+0.02/+0.08 (+0.5/+2.0)
	Over 1.6 to 2.75 (41 to 70), incl	+0.02/+0.10 (+0.5/+2.5)
	Over 2.75 to 3.25 (70 to 83), incl Over 3.25 to 6 (83 to 152), incl	+0.02/+0.145 (+0.5/+3.7) +0.02/+0.187 (+0.5/+4.7)

^A Rough turned.

10.4 Length: Rod and Bar—Tables 13 and 15.

10.5 Straightness: Rod and Bar—Table 16, General Use.

10.6 Edge Contours—Subsection 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 B249/B249M, except that the heat size may be up to 100 000 lb (45 360 kg) or fraction thereof.

12.2 Sample pieces shall be taken from a heat and lot of material processed simultaneously in the same equipment.

13. Number of Tests and Retests

13.1 Section 9 of Specification B249/B249M constitutes a part of this specification.

13.2 If any lot of material fails to conform to the requirement of this specification following heat treatment, the product may be subjected to additional heat treatment, and new samples of material may be resubmitted for testing. Only two such reheat treatments shall be permitted.

14. Specimen Preparation

14.1 Section 10 of Specification B249/B249M constitutes a part of this specification.

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 Methods E8/E8M.

14.3 When specified by the purchaser, triplicate, full size, Charpy (simple beam) (Type A) impact specimens shall be taken from the Test Methods E8/E8M designated testing