



Designation: **B929—17** **B929 – 23**

## Standard Specification for Copper-Nickel-Tin Spinodal Alloy Rod and Bar<sup>1</sup>

This standard is issued under the fixed designation B929; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope\*

1.1 This specification ~~establishes~~covers the requirements for copper-nickel-tin alloy UNS No. C72900 rod and bar. ~~The following alloy is included:~~

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

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 method(s) described in this specification:~~

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 and health practices and to 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:<sup>2</sup>

- [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](#)
- [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](#)

<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 B05.02 on Rod, Bar, Wire, Shapes and Forgings.

Current edition approved ~~May 15, 2017~~ April 1, 2023. Published ~~June 2017~~ April 2023. Originally approved in 2005. Last previous edition approved in ~~2014~~ 2017 as ~~B929B929 – 17. – 05(2014)~~<sup>1</sup>. DOI: ~~10.1520/B0929-17.10.1520/B0929-23.~~

<sup>2</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.

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

- [E53 Test Method for Determination of Copper in Unalloyed Copper by Gravimetry \(Withdrawn 2022\)<sup>3</sup>](#)
- [E75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys \(Withdrawn 2010\)<sup>3</sup>](#)
- [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;~~Variations
- 3.1.2 ~~Number of Tests and Retests;~~Retests
- 3.1.3 ~~Specimen Preparation;~~Preparation
- 3.1.4 ~~Significance of Numerical Limits;~~Limits
- 3.1.5 ~~Inspection;~~Inspection
- 3.1.6 ~~Rejection and Rehearing;~~Rehearing
- 3.1.7 ~~Certification;~~Certification
- 3.1.8 Test Report
- 3.1.9 ~~Packaging and Package Marking; and~~Marking
- 3.1.10 ~~Supplementary Requirements;~~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 [B249/B249M](#).

### 4. Terminology

4.1 ~~Definitions~~—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 ~~product~~products under this specification, as applicable:

- 5.1.1 ASTM designation and year of ~~issue;~~issue,
- 5.1.2 Copper Alloy UNS No. ~~C72900;~~C72900,
- 5.1.3 Temper (Section ~~8~~);),
- 5.1.4 Dimensions—diameter or distance between parallel surfaces, width, thickness, and ~~length;~~length,
- 5.1.5 How furnished—stock lengths or specific lengths, with or without ~~ends;~~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 Specification B249/B249M for additional requirements, if specified).~~

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

5.2 The following options are available ~~but may not be included unless and, when required, shall be specified at the time of placing of the order, when required:~~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

~~5.2.2 Certification (see Specification **B249/B249M**),~~

~~5.2.3 Mill Test Report (see Specification **B249/B249M**), and~~

~~5.2.5 Heat identification or traceability details (see 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 In the event~~ 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.

**TABLE 1 Chemical Composition<sup>A</sup>**

Composition, %									
Copper Alloy UNS No.	Previous Designation	Copper (incl. 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 to 15.5	7.5 to 8.5	0.30	0.10	0.15

**TABLE 1 Chemical Requirements**

Composition, %										
Copper Alloy UNS No.	Designation	Copper, incl. silver	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

<sup>A</sup>Lead 0.02 (0.005 maximum for hot rolling).

7.1.1 Results of analysis on a ~~product (check)~~ 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 Requirements—Strength Requirements:* Product 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**.~~

9.1.1 ~~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—Requirement:* The 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.~~

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.~~

**TABLE 2 Mechanical Property Requirements**

Temper Designation	Nominal Dimension, in. (mm)	Tensile Strength, min, ksi <sup>A</sup> (MPa) <sup>B</sup>	Yield Strength, (0.2 % Offset), min, ksi <sup>A</sup> (MPa) <sup>B</sup>	Elongation in 4D, <sup>C</sup> 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 <sup>D</sup>
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 <sup>D</sup>
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	
	Over 0.4 to 0.75 (10 to 19), incl	165 (1135)		5	34
	Over 0.75 to 1.6 (19 to 41), incl			3	
	Over 1.6 to 3.25 (41 to 83), incl			160 (1100)	3
Over 3.25 to 6 (83 to 152), incl	148 (1020)				

<sup>A</sup> ksi = 1000 psi.

<sup>B</sup> See **Appendix X1**.

<sup>C</sup> 4D = Gage length is 4x gage diameter.

<sup>D</sup> May be reported as a conversion of HBW to HRC per Hardness Conversion Tables (**E140**).

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 purchaser, ~~product 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~~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 ~~product~~products described by this specification shall be as specified in Specification B249/B249M with particular reference to the following tables and related paragraphs:

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**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 <sup>A</sup> (40) <sup>A</sup>
TS04	0.75 to 1.6 (19 to 41), excl 1.6 to 3.25 (41 to 83), incl Over 3.25 to 6 (83 to 152), incl	15 (20) 12 (16) 11 <sup>B</sup> (15) <sup>B</sup>
TS06	0.75 to 6 (19 to 152), incl	5 (6)

<sup>A</sup> No single value less than 24 ft-lb (32 J).

<sup>B</sup> No single value less than 10 ft-lb (13 J).