



Designation: **B570—16 B570 – 22**

Standard Specification for Copper-Beryllium Alloy Forgings and Extrusions (UNS Nos. C17000 and C17200) ~~Forgings and Extrusions~~¹

This standard is issued under the fixed designation B570; 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 (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope*

1.1 This specification establishes the requirements for copper-beryllium alloy forgings and extrusions produced from the following alloys: Copper Alloy UNS

Copper Alloy UNS No.	Nominal % Composition Beryllium
C17000	1.7
C17200	1.9

Nos. C17000 and C17200.

NOTE 1—Requirements for copper-beryllium alloy rod and bar appear in Specification **B196/B196M** (Section 2).

1.2 Unless otherwise specified, Copper Alloy UNS No. C17200 shall be the alloy furnished whenever Specification B570 is specified without ~~any~~an alloy designation.

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 ~~which~~that are provided for information only and are not considered standard.

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

1.4.1 *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~~ safety, health, and health environmental practices and ~~to~~ determine the applicability of regulatory limitations prior to use.*

1.5 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

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.

Current edition approved Oct. 1, 2016 Oct. 1, 2022. Published November 2016 October 2022. Originally approved in 1972. Last previous edition approved in 2010 2016 as B570-06(2010)-B570-16. DOI: 10.1520/B0570-16.10.1520/B0570-22.

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~~ standard's Document Summary page on the ASTM website.

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

[B194 Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar](#)
[B196/B196M Specification for Copper-Beryllium Alloy Rod and Bar](#)
[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](#)
[E8/E8M Test Methods for Tension Testing of Metallic Materials](#)
[E18 Test Methods for Rockwell Hardness of Metallic Materials](#)
[E112 Test Methods for Determining Average Grain Size](#)

3. General Requirements

3.1 The following sections of Specification [B249/B249M](#) ~~form~~constitute a part of this specification.

3.1.1 ~~Terminology~~Terminology

3.1.2 Materials and ~~Manufacture~~Manufacture

3.1.3 ~~Sampling~~Sampling

3.1.4 Number of Tests and ~~Retests~~Retests

3.1.5 ~~Sample Preparation~~Specimen Preparation

3.1.6 Test ~~Methods~~Methods

3.1.7 Significance of Numerical ~~Limits~~Limits

3.1.8 ~~Inspection~~Inspection

3.1.9 Rejection and ~~Rehearing~~Rehearing

3.1.10 ~~Certification~~Certification

3.1.11 ~~Mill Test Report~~Report

3.1.12 ~~Packaging, Marking, Shipping and Preservation~~Packaging and Package Marking

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 that supplement those appearing in Specification [B249/B249M](#).

4. Terminology

4.1 *Definitions:*

4.1.1 For definitions of terms related to copper and copper alloys, refer to Terminology [B846](#).

4.1.2 *forging, n*—a metal part worked to a predetermined shape by one or more such processes as hammering, upsetting, pressing, rolling, and so forth.

5. Ordering Information

5.1 Include the following specified choices when placing orders for products under this specification, as applicable:

5.1.1 ASTM designation and year of ~~issue~~issue;

5.1.2 Copper [~~Alloy~~Alloy] UNS No. ~~designation~~ (~~Section designation~~1);

5.1.3 Temper (Section [8](#)) or condition (Section [12](#));

5.1.4 ~~Drawing showing the shape, dimensions, and tolerances, if required;~~ Dimensions: thickness, width, length, and edges for flat products; diameter, length, distance between flat surfaces, if any, and edges for all other products. Dimensions may be specified on a drawing;

5.1.5 For extrusions: diameter, length (or mass), and straightness as required;

5.1.6 Dimensional tolerances shall be as agreed upon between the manufacturer or supplier and purchaser;

5.1.7 Quantity—total weight, or total length, or number of pieces of each ~~size~~; size.

~~5.1.6 If an extrusion: the length (or mass) required, straightness as required;~~

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 ~~Tension tests~~ test or hardness (Section 11),

5.2.2 ~~Finish (see Section~~ (Section 1514),

5.2.3 ~~Grain size (see Section~~ (Section 9), and

5.2.4 Inspection report,

5.2.5 Test report,

5.2.6 Certification,

5.2.7 Special marking or packaging,

5.2.8 ~~If product is purchased for agencies of the U.S. Government (see the Supplementary Requirements~~ government, see the general requirements section of this specification) Specification B249/B249M for additional requirements, if specified.

6. Material and Manufacture

6.1 *Material:*

6.1.1 The material of manufacture shall be cast or wrought billet of Copper Alloy UNS No. C17000 or C17200 of such purity and soundness as to be suitable for processing into the products prescribed herein.

6.1.2 The product heat number shall appear on the certification or test report.

6.2 *Manufacture:*

6.2.1 ~~The product shall be manufactured by such hot working and heat ~~treating, when required, to meet the temper properties specified;~~ treating processes as to produce a uniform wrought structure in the finished product.~~

6.2.2 The product shall be hot worked to the finish size and subsequently heat treated 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]~~ alloy UNS No. ~~designation~~ specified in the ordering information.

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**.

TABLE 1 Chemical Requirements

Element	Composition, %	
	Copper Alloy UNS No. C17000	Copper Alloy UNS No. C17200
Beryllium	1.60–1.85	1.80–2.00
Additive elements:		
Nickel + cobalt, min	0.20	0.20
Nickel + cobalt + iron, max	0.6	0.6
Aluminum, max	0.20	0.20
Silicon, max	0.20	0.20
Copper	remainder	remainder

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 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 the elements given in **Table 1** are determined, the sum of the results shall be 99.5 % minimum.

8. Temper

8.1 The standard tempers for products described in this specification are given in as follows: **Tables 2 and 3**.

8.1.1 *M30*—As Hot Extruded.

8.1.2 *TB00*—The standard temper designations Solution Heat Treated (A), **Table 2** available under this specification and as prescribed in Classification **B601** are *TB00* solution heat-treated (A) and *TF00* precipitation heat-treated (AT).

8.1.3 *TF00*—Precipitation Hardened (AT), **Table 3**.

8.2 The standard temper designations available under this specification are as prescribed in Classification **B601**.

9. Grain Size

9.1 The grain size, if required, shall be as agreed upon between the purchaser and the manufacturer and shall be determined in accordance with Test Methods **E112**.

10. Physical Property Requirements

10.1 *Microstructure*:

10.1.1 The product in the *TF00* (precipitation-hardened (AT)) condition shall have a microstructure with a minimum of second phase (beta) constituents. When present, beta shall be fine and well dispersed.

11. Mechanical Property Requirements

11.1 *Hardness—Tensile Strength Requirements*: The product furnished under this specification shall conform to the hardness requirements prescribed in **Table 2** for the solution heat-treated condition and **Table 3** after precipitation heat treatment, unless tensile properties are required by the purchase order. Rockwell hardness shall be determined in accordance with Test Methods **E18**.

TABLE 2 Mechanical Properties as Solution Heat Treated

Standard Code	Temper Designation Former Name	Diameter or Thickness, in. (mm)	Copper Alloy UNS No.		Rockwell Hardness, max B Scale
			C17000	C17200	
			Tensile Strength, ksi (MPa), ^{A, B} max		
<i>TB00</i>	solution heat-treated (A)	all sizes	85 (590)	85 (590)	85

^A ksi = 1000 psi.

^B See **Appendix X1**.

TABLE 3 Mechanical Properties After Precipitation Heat Treatment

Standard	Former	Temper Designation		Copper Alloy UNS No.	Tensile Strength, ksi ^A (MPa) ^{B, C}	Yield Strength, ksi (MPa), 0.2-% Offset, min	Elongation in 4xD, ^D min, %	Rockwell
		in.	mm					
TF00	precipitation hardened (AT)	G-Grade		UNS C17000	150–190 (1030–1310)	120 (820)	3	32–
TF00	precipitation hardened (AT)	Up to 8, incl	up to 200;	UNS C17200	165–200 (1140–1380)	130 (890)	3	36–
		Over 8 to 12, incl;	over 200 to 300;		155–190 (1070–1310)	130 (890)	3	34–
		Over 12	over 300	145–180 (1000–1240)	125 (860)	3	34–	

TABLE 3 Mechanical Properties After Precipitation Heat Treatment

Code	Name	Diameter or Thickness		Copper Alloy UNS No.	Tensile Strength, ksi ^A (MPa) ^{B, C}	Yield Strength, ksi (MPa), 0.2 % Offset, min	Elongation in 4xD, ^D min, %	Rockwell C Scale, min
		in.	mm					
TF00	precipitation hardened (AT)	all sizes	all sizes	UNS C17000	150–190 (1030–1310)	120 (820)	3	32
TF00	precipitation hardened (AT)	Up to 8, incl	up to 200	UNS C17200	165–200 (1140–1380)	130 (890)	3	34
		Over 8 to 12, incl	Over 200 to 300		155–190 (1070–1310)	130 (890)	3	34
		Over 12	Over 300		145–180 (1000–1240)	125 (860)	3	34

^A ksi = 1000 psi.

^B See Appendix X1.

^C The upper limits in the tensile strength column are for design guidance only.

^D 4xD = 4xDiameter.

iTech Standards
(<https://standards.itih.ai>)
Document Preview

ASTM B570-22

11.1.1 When specified in the contract or purchase order, the tensile properties of the product furnished shall conform to the properties in [Table 2](#) or [Table 3](#) depending upon temper required. Tensile properties shall be determined in accordance with Test Methods [E8/E8M](#).

11.2 *Tensile—Rockwell Hardness Requirements:* When specified in the contract or purchase order, the tensile properties of the product furnished shall conform to the properties in [Table 2](#) or [Table 3](#) depending upon temper required. Tensile properties shall be determined in accordance with Test Methods [E8/E8M](#).

11.2.1 When specified in the contract or purchase order, the product shall conform to the Rockwell hardness requirements prescribed in [Table 2](#) for the solution heat-treated condition and [Table 3](#) after precipitation heat treatment. When tensile properties are required by the purchase order, hardness values are for reference only. Rockwell hardness shall be determined in accordance with Test Methods [E18](#).

12. Heat Treatment

12.1 *Solution Heat Treatment—Temper TB00 (A)*—The product shall be heated to a uniform temperature, nominally 1450°F (788°C) 1450 °F (788 °C) and quenched commensurate with the required property and structural integrity of the configuration.

12.2 *Precipitation Heat Treatment—Temper TF00 (AT)*—The product shall be heat treated to a uniform temperature in the range from 600/600 °F to 700°F (316/700 °F (316 °C to 370°C) 370 °C) for a minimum of 22 h to 3 h and then air cooled. This is the heat treatment for the acceptance tests shown in [Table 3](#).

12.3 Special combinations of properties may be obtained by special precipitation heat treatments. The requirements for these special heat treatments shall be agreed upon by the manufacturer or supplier and purchaser.