



Designation: ~~B16/B16M—10 (Reapproved 2015)~~ B16/B16M – 19

Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines¹

This standard is issued under the fixed designation B16/B16M; 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 (ϵ) indicates an editorial change since the last revision or reapproval.

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

1. Scope*

1.1 This specification establishes the requirements for free-cutting brass rod, bar, wire, and shapes of any specified cross section produced from Copper Alloy UNS Nos. C36000 or C36010 suitable for high-speed screw machining applications and moderate thread rolling.

1.2 *Units*—Values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system ~~may~~ are not ~~be~~ necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other. ~~Combining other and values from the two systems may result in non-conformance with the standard; shall not be combined.~~

1.2.1 Within the text, SI units are shown in brackets.

1.3 *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 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

[B250/B250M](#) Specification for General Requirements for Wrought Copper Alloy Wire

[B601](#) Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast [2b/astm-b16-b16m-19](#)

[E8/E8M](#) Test Methods for Tension Testing of Metallic Materials

[E18](#) Test Methods for Rockwell Hardness of Metallic Materials

[E478](#) Test Methods for Chemical Analysis of Copper Alloys

3. General Requirements

3.1 The following sections of Specifications [B249/B249M](#) (rod, bar, and shapes), and [B250/B250M](#) (wrought copper alloy wire) constitute a part of this specification.

3.1.1 ~~Terminology;~~ Terminology;

3.1.2 ~~Materials and Manufacture;~~ Manufacture;

3.1.3 ~~Workmanship, Finish, and Appearance;~~ Appearance;

3.1.4 ~~Sampling;~~ Sampling;

3.1.5 ~~Number of Tests and Retest;~~ Retest;

3.1.6 ~~Specimen Preparation;~~ Preparation;

3.1.7 ~~Test Methods;~~ Methods;

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

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

- 3.1.8 ~~Significance of Numerical Limits;Limits;~~
- 3.1.9 ~~Inspection;Inspection;~~
- 3.1.10 ~~Rejection and Rehearing;Rehearing;~~
- 3.1.11 ~~Certification;Certification;~~
- 3.1.12 ~~Mill Test Report;Report;~~
- 3.1.13 ~~Packaging and Package Marking;Marking;~~ and
- 3.1.14 ~~Supplementary Requirements.~~

3.2 In addition, when a section with a title identical to those referenced in 3.1 appears in this specification, it contains additional requirements that supplement those appearing in Specifications B249/B249M and B250/B250M.

4. Ordering Information

- 4.1 Include the following information when placing orders for product under this specification, as applicable:
 - 4.1.1 ASTM specification designation and year of issue (B16/B16M – XX).
 - 4.1.2 Copper Alloy UNS No. designations (C36000 or C36010, see Section 6 and Table 1). Unless otherwise specified, the alloy supplied will be C36000.
 - 4.1.3 Temper (see Section 7 and Tables 2-5).
 - 4.1.4 Product cross section form (for example, round, hexagonal, square, etc.).
 - 4.1.5 Dimensions (see Section 9).
 - 4.1.6 How furnished: straight lengths or coils (see 5.2).
 - 4.1.7 Edge contours (see Section 9).
 - 4.1.8 Quantity; total weight, footage, or number of pieces for each size.
 - 4.1.9 When product is purchased for applications requiring thread rolling (see 1.1, Tables 2-5).
 - 4.1.10 When product is purchased for agencies of the U.S. Government (see Section 11).
- 4.2 The following options are available and shall be specified at the time of placing the order when required:
 - 4.2.1 Tensile test for product ½ in. [12 mm] and over (see 8.2.1).
 - 4.2.2 Certification (refer to Specifications B249/B249M or B250/B250M).
 - 4.2.3 Mill Test Report (refer to Specifications B249/B249M or B250/B250M).

5. Materials and Manufacture

5.1 *Material*—The material of manufacture shall be a cast billet of Copper Alloy UNS No. C36000 or C36010 and of such purity and soundness as to be suitable for hot extrusion into rod, bar, wire, and shaped products.

5.1.1 In the event 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.

5.2 *Manufacture*—Product produced under this specification shall be in straight lengths; however, it shall be furnished in coils when so specified in the contract or purchase order (see 4.1.6).

6. Chemical Composition

6.1 The product shall conform to the chemical compositional requirements specified in Table 1 for Copper Alloy UNS No. C36000 or C36010.

6.2 The UNS designated composition limits do not preclude the possible presence of other unnamed elements; however, analysis shall be made regularly only for the minor elements listed in Table 1, plus either copper or zinc, or plus all major elements except one. The major element that is not analyzed shall be determined by difference between the sum of those elements analyzed and 100 %. By agreement between producer or supplier and purchaser, analysis may be required and limits established for the elements not cited. Percentage content of elements shown as “remainder” (rem.) is calculated by difference.

**TABLE 1 Chemical Requirements
Copper Alloy UNS No. C36000 and C36010**

Element	Composition, %	
	Copper Alloy UNS No.	
	C36000	C36010
Copper	60.0–63.0	60.0–63.0
Copper	60.0 to 63.0	60.0 to 63.0
Lead	2.5–3.0	3.1–3.7
Lead	2.5 to 3.0	3.1 to 3.7
Iron, max	0.35	0.35
Zinc	Remainder	Remainder

TABLE 2 Tensile Requirements, inch-pound

 NOTE 1—See **Table 3** for SI values.

Temper Designation Standard Name		Diameter or Distance Between Parallel Surfaces, in.	Tensile Strength, min, ksi	Yield Strength at 0.5 % Extension under Load, min, ksi	Elongation, ^A min, %	
Rod and Wire						
O60	soft anneal	1 and under	48	20	15	
		over 1 to 2, incl. over 2	44 40	18 15	20 25	
H02	half-hard	½ and under	57	25	7 ^B	
H02	half-hard	under ½	57	25	7 ^B	
		over ½ to 1, incl.	55 ^C	25	10	
		½ to 1, incl.	55 ^C	25	10	
		over 1 to 2, incl.	50	20	15	
		over 2 to 4, incl., and over 4	45 40	15 15	20 20	
H04	hard	⅙ to ⅜ incl.	80	45		
		over ⅜ to ½ incl.	70	35	4	
		over ½ to ¾ incl.	65	30	6	
Bar						
Standard Name		Thickness, in.	Width, in.			
O60	soft anneal	1 and under	6 and under	44	18	20
		over 1	6 and under	40	15	25
H02	half-hard	½ and under	1 and under	50	25	10
		½ and under	over 1 to 6, incl.	45	17	15
		over ½ to 2, incl.	2 and under	45	17	15
		over ½ to 2, incl.	over 2 to 6, incl.	40	15	20
		over 2	over 2 to 4, incl.	40	15	20

^A In any case, a minimum gage length of 1 in. shall be used.

^B For product furnished in coils the elongation shall be 4 % min.

^C If product is specified for thread rolling applications, the minimum tensile strength shall be 52 ksi.

 6.3 When all elements in **Table 1** are analyzed, their sum shall be 99.5 % min.

7. Temper

 7.1 Tempers, as defined in **Practice Classification B601**, identified in **Tables 2-5** for product produced under this specification, are as follows:

- 7.1.1 O60 (soft anneal).
- 7.1.2 H02 (half hard).
- 7.1.3 H04 (hard).

 7.2 Rod and bar shall be furnished in the H02 (half hard) temper, unless otherwise specified in the ordering information (see **4.1.3**).

8. Mechanical Property Requirements

8.1 Rockwell Hardness:

 8.1.1 Product ½ in. [12 mm], and over in diameter or distance between parallel surfaces, shall conform with the requirements given in **Table 4** and **Table 5** for temper, size, and form when tested in accordance with Test Methods **E18**.

8.1.1.1 Rockwell hardness shall be the acceptance criterion for sizes ½ in. [12 mm], or greater, based upon mechanical properties, except when tensile requirements are specified as the acceptance criteria in the ordering information.

8.2 Tensile Requirements:

 8.2.1 When tensile requirements are specified, the product shall conform to the requirements given in **Table 2** and **Table 3** for temper, size, and form.

 8.2.1.1 Tensile requirements shall be the acceptance criteria of mechanical properties for product under ½ in. [12 mm] in diameter or distance between parallel surfaces when tested in accordance with Test Methods **E8/E8M**.

 8.2.1.2 When specified in the ordering information, tensile requirements shall be the acceptance criteria based upon mechanical properties for product ½ in. [12 mm], or greater in diameter or distance between parallel planes when tested in accordance with Test Methods **E8/E8M**.