



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

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 not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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

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

[E8E8/E8M](#) Test Methods for Tension Testing of Metallic Materials

~~[E8M](#) Test Methods for Tension Testing of Metallic Materials [Metric] (Withdrawn 2008)~~³

[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,

3.1.2 Materials and Manufacture,

3.1.3 Workmanship, Finish, and Appearance,

3.1.4 Sampling,

3.1.5 Number of Tests and Retest,

3.1.6 Specimen Preparation,

3.1.7 Test Methods,

3.1.8 Significance of Numerical Limits,

3.1.9 Inspection,

3.1.10 Rejection and Rehearing,

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.

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

- 3.1.11 Certification,
- 3.1.12 Mill Test Report,
- 3.1.13 Packaging and Package 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.

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 **B601**, identified in **Tables 2-5** for product produced under this specification, are as follows:

7.1.1 O60 (soft anneal).

**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 |
| Lead | 2.5 - 3.0 | 3.1 – 3.7 |
| Iron, max | 0.35 | 0.35 |
| Zinc | Remainder | Remainder |



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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 | |
| | | over 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 | ⅜ 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 | over 2 to 6, incl. over 2 to 4, incl. | 40 40 | 15 15 | 20 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.

TABLE 3 Tensile Requirements, SI

NOTE 1—See Table 2 for inch-pound values.

| Temper Designation Standard Name | | Diameter or Distance Between Parallel Surfaces, mm | Tensile Strength, min, MPa | Yield Strength at 0.5 % Extension under Load, min, MPa | Elongation, ^A min, % | |
|-------------------------------------|----------------|---|-------------------------------|--|------------------------------------|-----|
| Rod and Wire | | | | | | |
| O60 | soft anneal | 25 and under | 330 | 140 | 15 | |
| | | over 25 to 50, incl. | 305 | 125 | 20 | |
| | | over 50 | 275 | 105 | 25 | |
| H02 | half-hard | 12 and under | 395 | 170 | 7 ^B | |
| | | over 12 to 25, incl. | 380 ^C | 170 | 10 | |
| | | over 25 to 50, incl. | 345 | 140 | 15 | |
| | | over 50 to 100, incl., and over 100 | 310 275 | 105 105 | 20 20 | |
| | | H04 | hard | 1.6 to 4, incl. | 550 | 310 |
| over 4 to 12, incl. | 480 | | | 240 | 4 | |
| over 12 to 18, incl. | 450 | | | 205 | 6 | |
| Bar | | | | | | |
| Standard Name | | Thickness, mm | Width, mm | | | |
| O60 | soft anneal | 25 and under | 150 and under | 305 | 125 | 20 |
| | | over 25 | 150 and under | 275 | 105 | 25 |
| H02 | half-hard | 12 and under | 25 and under | 345 | 170 | 10 |
| | | 12 and under | over 25 to 150, incl. | 310 | 115 | 15 |
| | | over 12 to 50, incl. | 50 and under | 310 | 115 | 15 |
| | | over 12 to 50, incl. | over 50 to 150, incl. | 275 | 105 | 20 |
| | | over 50 | over 50 to 100, incl. | 275 | 105 | 20 |

^A In any case, a minimum gage length of 25 mm shall be used. SI elongation values are based on a gage length of 5.65 times the square root of the area for dimensions greater than 2.5 mm.

^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 350 MPa.