~~Designation:B 16/B 16M–00~~ Designation: B16/B16M – 05

Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines[1]

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 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 No. C36000 suitable for high-speed screw machining applications and moderate thread rolling.

~~1.2The values stated in either inch-pound units or in SI units are to be regarded separately as the standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system shall be used independent of the other. Combining values from the two systems may result in nonconformance with the specification.~~

1.2 *Units*—Values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, SI units are shown in brackets. 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.

1.3 *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]

B~~249~~249/B249M Specification for General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, ~~Shapes,~~Shapes and Forgings

~~B249MSpecification for General Requirements for Wrought Copper and Copper-Alloy Rod, Bar Shapes and Forgings [Metric]2~~

250/B250M Specification for General Requirements for Wrought Copper Alloy Wire

B~~250Specification for General Requirements for Wrought Copper-Alloy Wire2~~ 601 Classification for Temper Designations for Copper and Copper AlloysWrought and Cast

~~B250MSpecification for General Requirements for Wrought Copper-Alloy Wire2~~ E8 Test Methods for Tension Testing of Metallic Materials

~~B601Practice for Temper Designations for Copper and Copper Alloys—Wrought and Cast~~ E8M Test Methods for Tension Testing of Metallic Materials [Metric]

E~~8/E 8M~~18 Test Methods for ~~Tension Testing~~Rockwell Hardness of Metallic Materials

~~E18Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials3~~

~~E478~~478 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,

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[1] This specification is under the jurisdiction of ASTM Committee ~~B-5~~ B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.02 ~~on Rod, Bar, Shapes, Wire, 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* ~~, Vol 02.01.~~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.**

3.1.4 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,
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

~~3.1Contracts or purchase orders for product furnished under this specification shall contain the following information:~~
~~3.1.1ASTM specification designation and year of issue (B 16/B 16M-XX).~~
~~3.1.2Copper Alloy UNS No. designation (C36000, see Section~~
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. designation (C36000, see Section 6 and Table 1).

TABLE 1 Chemical Requirements
Copper Alloy UNS No. C36000

Element	Composition, %
Copper	60.0 - 63.0
Lead	2.5 - 3.7
Iron, max	0.35
Zinc	remainder

~~3.1.3~~4.1.3 Temper (see Section 7 and ~~Tables 2 and~~ Tables 2-~~3~~5).
~~3~~4.1.4 Product cross section form (for example, round, hexagonal, square, etc.).
~~3~~4.1.5 Dimensions (see Section 9).
~~3.1.6~~4.1.6 How furnished: straight lengths or coils (see 5.2).
~~3~~4.1.7 Edge contours (see Section 9).
~~3~~4.1.8 Quantity; total weight, footage, or number of pieces for each size.
~~3~~4.1.9 When product is purchased for applications requiring thread rolling (see 1.1, ~~Tables 2 and 3~~Tables 2-5).
~~3~~4.1.10 When product is purchased for agencies of the U.S. Government (see Section 11).
~~3.2The~~4.2 The following options are available and shall be specified at the time of placing the order when required:
~~3~~4.2.1 Tensile test for product ½ in. [12 mm] and over (see 8.2.1).
~~3.2.2Certification (refer to Specifications B 249B 249 and B 249MB 249M or B 250B 250 and B 250MB 250M~~
4.2.2 Certification (refer to Specifications B249/B249M or B250/B250M).
~~3.2.3Mill Test Report (refer to Specifications B 249B 249 and B 249MB 249M or B 250B 250 and B 250MB 250M~~
4.2.3 Mill Test Report (refer to Specifications B249/B249M or B250/B250M).

~~4.General Requirements~~

~~4.1The following sections of Specifications B 249B 249, B 249MB 249M (rod, bar, and shapes), B 250B 250, and B 250MB 250M (wrought copper alloy wire) constitute a part of this specification.~~
~~4.1.1Terminology,~~
~~4.1.2Materials and Manufacture,~~
~~4.1.3Workmanship, Finish, and Appearance,~~
~~4.1.4Sampling,~~
~~4.1.5Number of Tests and Retest,~~
~~4.1.6Specimen Preparation,~~
~~4.1.7Test Methods,~~
~~4.1.8Significance of Numerical Limits,~~
~~4.1.9Inspection,~~
~~4.1.10Rejection and Rehearing,~~

TABLE 2 Tensile Requirements, inch-pound

NOTE—See Table 3 for SI values.

—Temper Designation —Standard Name		Diameter or Distance Between Parallel Surfaces, in. [mm]	Tensile Strength, min, ksi [MPa]	Yield Strength at 0.5- % Extension under Load, min, ksi [MPa]	Elongation,[A] min, %	
		Rod and Wire				
O60	soft anneal	1 [25] and under		48 [330]	20 [140]	15
O60	soft anneal	1 and under		48	20	15
		over 1 [25] to 2 [50]			44 [305]	18 [125] 2
		over 1 to 2, incl.			44	18 2
		over 2 [50]			40 [275]	15 [105] 2
		over 2			40	15 2
H02	half-hard	½ [12]and under	57 [395]	25 [170]	7[B]	
H02	half-hard	½ and under	57	25	7[B]	
		over ½ [12]to 1 [25]	55 [380][C]	25 [170]	10	
		over ½ to 1, incl.	55[C]	25	10	
		over 1 [25] to 2 [50]			50 [345]	20 [140] 1
		over 1 to 2, incl.			50	20 1
		over 2 [50] to 4 [100], and	45 [310]	15 [105]	20	
		over 2 to 4, incl., and	45	15	20	
		over 4 [100]			40 [275]	15 [105] 2
		over 4			40	15 2
H04	hard	1/16 [1.6]to [4], 3/16, incl.	80 [550]	45 [310]		
H04	hard	1/16 to 3/16, incl.	80	45		
		over 3/16 [4]to [12], ½, incl.	70 [480]	35 [240]	4	
		over 3/16 to ½, incl.	70	35	4	
		over ½ [12]to [18], ¾, incl.	65 [450]	30 [205]	6	
		over ½ to ¾, incl.	65	30	6	

Standard Name		Thickness, in. [mm]	Width, in. [mm]			
		Bar				
Standard Name		Thickness, in.	Width, in.			
O60	soft anneal	1 [25] and under	6 [150] and under	44 [305]	18 [125]	20
O60	soft anneal	1 and under	6 and under	44	18	20
		over 1 [25]	6 [150] and under	40 [275]	15 [105]	25
		over 1	6 and under	40	15	25
H02	half-hard	½ [12]and under	1 [25] and under	50 [345]	25 [170]	10
H02	half-hard	½ and under	1 and under	50	25	10
		½ [12]and under	over 1 [25] to 6 [150]	45 [310]	17 [115]	15
		½ and under	over 1 to 6, incl.	45	17	15
		over ½ [12]to 2 [50]	2 [50] and under	45 [310]	17 [115]	15
		over ½ to 2, incl.	2 and under	45	17	15
		over ½ [12]to 2 [50]	over 2 [50] to 6 [150]	40 [275]	15 [105]	20
		over ½ to 2, incl.	over 2 to 6, incl.	40	15	20
		over 2 [50]	over 2 [50] to 4 [100]	40 [275]	15 [105]	20
		over 2	over 2 to 4, incl.	40	15	20

[A] In any case, a minimum gage length of 1 in. [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 52 ksi [350 MPa].

4.1.11Certification,

4.1.12Test Report,

4.1.13Packaging and Package Marking, and

4.1.14Supplementary Requirements.

4.2In addition, when a section with a title identical to those referenced in 4.1 appears in this specification, it contains additional requirements that supplement those appearing in Specifications B 249B 249, B 249MB 249M, B 250B 250, and B 250MB 250M.

5. Materials and Manufacture

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

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

TABLE 3 RockwTell Hardnessile Requirements, SI

NOTE 1—RockwSell hardness requirements Tare not established 2 for d inch–pound vametersluess than ½ in. [12 mm].

Temper Designation		Diameter of Distance Between Parallel Surftaces, in. [dard Nammm]e	Rockwell B HDiardnmess Determ or Distanced on Bethwe Cross Section MidwPay Bralletweenl Surface as, mm		Tensile Str min, MI
			Rod and Wire Standard Name		
			Rod and Wire		
	soft anneal	25 and under		Round	Hexagonal and C
O60	soft anneal	25 and under		330	140
O60	s	of t anneal		½ [12] and over	10 – 4
		over 25 to 50, incl.		305	125
		over 50		275	105
H02	half-hard	12 and under		½ [12] to 1 [25] incl.	60 – 8
H02	half-hard	12 and under		395	170
		55 , incl.		380[C]	170
		over 12 to 25, incl.		380[C]	170
				over 1 [25] to 2 [50] incl.	55 – 7
		over 25 to 50, incl.		345	140
				over 2 [50] to3 [75], incl.	45 – 7
		over 50 to 100, incl., and		310	105
				over 3 [75] to 4 [100], incl.	40 – 6
		over 100		275	105
		over 4 [100]	25 min	25 min	
	hard	1.6 to 4, incl.			
H04	hard	1.6 to 4, incl.		550	310
		over 4 to 12, incl.		480	240
		over 12 to 18, incl.		450	205
			Bar		
			Thickness, in. [mm]	Width, in. [mm]	
Standard Name		Thickness, mm	Width, mm		
O60	soft anneal	½ [12] and over	½ [12] and over	10 -35	125
O60	soft anneal	25 and under	150 and under	305	125
				275	105
		over 25	150 and under	275	105
H02	half-hard	½ [12] and under	1 [25] and under	45 - 85	170
H02	half-hard	12 and under	25 and under	345	170
		½ [12] and under	over 1 [25] to 6 [150]	35 - 70	115
		12 and under	over 25 to 150, incl.	310	115
		over [12] to 2 [50], incl.	2 [50] and under	40 - 80	115
		over 12 to 50, incl.	50 and under	310	115
			over 2 [50] to 6 [150]	35 -75	105
		over 12 to 50, incl.	over 50 to 150, incl.	275	105
		over 2 [50]	over 2 [50] to 4 [100]	35 -75	105
		over 50	over 50 to 100, incl.	275	105

[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 Rockw minimum tensill B hae strdnength ss shall be 355–750 MPa.

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 3.1.64.1.6).