Designation: B981/B981M – 12

Standard Specification for Low Leaded Brass Rod, Bar and Shapes[1]

This standard is issued under the fixed designation B981/B981M; 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.

1. Scope

1.1 This specification establishes the requirements for low leaded brass rod, bar, wire, and shapes of any specified cross section produced from Copper Alloys UNS No. C36300, C36500, C37000, C37100 and C37700 suitable for high-speed screw machining applications.

NOTE 1—Refer to Specification B124/B124M when purchasing bar or rod for forging production.

1.2 The 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.

1.3 *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]

B124/B124M Specification for Copper and Copper Alloy Forging Rod, Bar, and Shapes

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

E8/E8M Test Methods for Tension Testing of Metallic Materials

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,
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 (Bxxx/BxxxM – XX).

4.1.2 Copper Alloy UNS No. designations (C36300, C36500, C37000, C37100 and C37700, see Section 6 and Table 1.

4.1.3 Temper (see Section 7 and Table 2 and Table 3).

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.

4.2 The following options are available and shall be specified at the time of placing the order when required:

4.2.1 Tensile test requirement for product ½ in. [12 mm] and over (see 8.2).

[1] This test method 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.

TABLE 1 Chemical Requirements

Copper Alloy UNS No.	Composition (%) Copper	Lead	Phosphorus	Iron Max.	Tin Max.	Zinc	Copper Plus Elements with Specific Limits Present, min
C36300	61.0 – 63.0	0.25 – 0.7	0.04 – 0.15	0.15	–	remainder	99.5
C36500	58.0 – 61.0	0.25 – 0.7		0.15	–	remainder	99.6
C37000	59.0 – 62.0	0.8 – 1.5		0.15	–	remainder	99.6
C37100	58.0 – 62.0	0.6 – 1.2		0.15	–	remainder	99.6
C37700	58.0 – 61.0	1.5 – 2.5		0.30	–	remainder	99.5

TABLE 2 Tensile Requirements, inch-pound

NOTE 1—See Table 3 for SI values.

Temper Designation Code	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, Bar, Shapes			
H02	Half-hard	½ and under	63	28	10[B]
		over 1/2 to 1, incl.	55	26	12
		over 1 to 2, incl.	48	24	20
		over 2	45	20	25

[A] In any case, a minimum gauge length of 1 in. shall be used.
[B] For product furnished in coils the elongation shall be 4 % minimum.

TABLE 3 Tensile Requirements, SI

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

Temper Designation Code	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, Bar, Shapes			
H02	Half-hard	12 and under	430	190	10[B]
		over 12 to 25, incl.	380	180	12
		over 25 to 50, incl.	330	165	20
		over 50	310	135	25

[A] In any case, a minimum gauge 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 % minimum.

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).

4.2.4 When product is purchased for agencies of the U.S. Government see Section 11.

5. Materials and Manufacture

5.1 *Material*—The material of manufacture shall be a cast billet of Copper Alloys UNS No. C36300, C36500, C37000, C37100 and C37700 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 2—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 Alloys UNS No. C36300, C36500, C37000, C37100 and C37700.

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.

7. Temper

7.1 Tempers, as defined in Practice B601, identified in Table 2 and Table 3 for products produced under this specification, are as follows:

7.1.1 H02 (half hard).

7.2 Rod and bar shall be furnished in the H02 (half hard) temper.

8. Mechanical Properties

8.1 *Tensile Requirements:*

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

8.1.1.1 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.

8.1.1.2 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.

8.2 *Wire and Shapes*—Mechanical property requirements for wire and shapes shall be subject to agreement between the manufacturer and the purchaser and the agreement shall be part of that contract or purchase order.

9. Dimensions, Mass, and Permissible Variations

9.1 The dimensions and tolerances for bar, rod and shapes produced under this specification shall be as specified in the following tables and paragraphs in Specification B249/B249M.

9.1.1 *Diameter or Distance Between Parallel Surfaces:*

9.1.1.1 *Rod in Length*—See Table 2.

9.1.1.2 *Bar, Rectangular and Square*—See Tables 9 and 11.

9.1.2 *Shapes*—Dimensional tolerances shall be subject to agreement between the manufacturer and the purchaser and the agreement shall be part of the contract or purchase order.

9.1.3 *Length:*

9.1.3.1 *Rod, Bar, and Shapes*—See Tables 13 and 14.

9.1.4 *Edge Contours*—Refer to the subsection titled "Edge Contours" and Figs. 1, 2, and 3.

9.2 The dimensions and tolerances for wire product under this specification shall be as specified in Table 1 and the related section in Specification B250/B250M.

9.2.1 *Wire, Coiled, Round*—See Table 1.

10. Test Methods

10.1 *Chemical Analysis*—Chemical composition shall, in case of disagreement, be determined subject to agreement between the manufacturer and the purchaser.

10.2 Test method(s) to be followed for the determination of other element(s) resulting from contractual or purchaser order agreement shall be as agreed upon between the manufacturer and the purchaser.

11. Purchases for U.S. Government Agencies

11.1 Product purchased for agencies of the U.S. Government, when specified in the contract or purchase order, shall conform to the special Supplementary Requirements section in Specifications B249/B249M (rod, bar, and shapes) and B250/B250M (wire).

12. Keywords

12.1 bar; Copper Alloy UNS No. C36300, C36500, C37000, C37100 and C37700; low leaded; rod; shapes; wire