



Standard Specification for Phosphor Bronze Rod, Bar, and Shapes [Metric]¹

This standard is issued under the fixed designation B 139M; 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 phosphor bronze rod, bar, and shapes.

1.2 The values stated in SI units are the standard.

1.3 This specification is the companion to inch-pound Specification B 139.

2. Referenced Documents

2.1 *ASTM Standards:*

B 249M Specification for General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, Shapes, and Forgings (Metric)²

B 601 Practice for Temper Designations for Copper and Copper Alloys—Wrought and Cast²

E 62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Method)³

E 478 Test Methods for Chemical Analysis of Copper Alloys³

3. Ordering Information

3.1 Contracts and purchase orders for product under this specification should include the following information:

3.1.1 ASTM designation and year of issue (for example, B 139M – XX),

3.1.2 Copper Alloy UNS No. designation (for example, C51000),

3.1.3 Product temper (for example, H04—see Section 6),

3.1.4 Form: cross section such as round, hexagon, square, etc.,

3.1.5 Diameter or distance between parallel surfaces,

3.1.6 Edge Contours,

3.1.7 Quantity: total weight each copper alloy, temper, form, and size, and

3.1.8 When product is purchased for an agency of the U.S. Government (Section 9).

3.2 The following options are available and should be

specified in the contract or purchase order when required:

3.2.1 Piston-finish for rod and shafting (Section 8),

3.2.2 Certification (Specification B 249M), and

3.2.3 Test report (Specification B 249M).

4. Material and Manufacture

4.1 *Material:*

4.1.1 The material of manufacture shall be cast billets of Copper Alloy UNS No. C51000, C52100, C52400, C53400, or C54400 and of such soundness as to be suitable for extrusion.

NOTE 1—Copper Alloy UNS Nos. C51000, C52100, and C52400 are suitable for structural applications, pump parts, rods, bolts, gears, and similar applications.

NOTE 2—Copper Alloys UNS Nos. C53400 and C54400 are free machining and are suitable for screw-machine products.

5. Chemical Composition

5.1 The material shall conform to the requirements in Table 1 for the Copper Alloy UNS No. designation specified in the ordering information.

5.1.1 These limits do not preclude the presence of other elements. Limits may be established and analysis required for unnamed elements by agreement between the manufacturer and the purchaser.

5.2 Copper may be taken as the difference between the sum of all elements analyzed and 100 %.

5.3 When all elements in Table 1 for the Copper Alloy UNS No. named in the ordering information are determined, the sum of results shall be 99.5 % min.

6. Temper

6.1 *Rod and Bar:*

6.1.1 The tempers, as defined in Practice B 601, for rod and bar produced to this specification are identified in Table 2.

6.2 *Shapes:*

6.2.1 The temper for shapes is subject to agreement between the manufacturer and the purchaser and the agreement shall be a part of the contract or purchase order.

7. Mechanical Property Requirements

7.1 *Tensile Requirements:*

7.1.1 *Rod and Bar:*

7.1.1.1 Rod and bar shall conform to the requirements

¹ This specification is under the jurisdiction of ASTM Committee B-5 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.02 on Rods, Bars, and Shapes.

Current edition approved Sept. 10, 1995. Published November 1995. Originally published as B 139M – 80. Last previous edition B 139M – 90.

² *Annual Book of ASTM Standards*, Vol 02.01.

³ *Annual Book of ASTM Standards*, Vol 03.05.

TABLE 1 Chemical Requirements

Element, %	Copper Alloy UNS No.				
	C51000	C52100	C52400	C53400	C54400
Tin	4.2–5.8	7.0–9.0	9.0–11.0	3.5–5.8	3.5–4.5
Phosphorus	0.03–0.35	0.03–0.35	0.03–0.35	0.03–0.35	0.01–0.50
Iron, max	0.10	0.10	0.10	0.10	0.10
Lead	0.05 max	0.05 max	0.05 max	0.8–1.2	3.5–4.5
Zinc	0.30 max	0.20 max	0.20 max	0.30 max	1.5–4.5
Copper	remainder	remainder	remainder	remainder	remainder

prescribed in Table 2 for the specified Copper Alloy UNS No. designation, temper, cross-section, and size.

7.1.2 Shapes:

7.1.2.1 The requirements for shapes shall be subject to agreement between the manufacturer and the purchaser and the agreement shall be a part of the contract or purchaser order.

8. Piston-Finish

8.1 When specified in the contract or purchase order, round rod over 12 mm in diameter shall be furnished as piston-finished rod or shafting.

9. Purchases for U.S. Government

9.1 When specified in the contract or purchase order, product purchased for agencies of the U.S. Government shall conform to the special government regulations in the Supplemental Requirements section of Specification B 249M.

10. Dimensions, Mass, and Permissible Variations

10.1 The dimensions and tolerances for product furnished under this specification shall conform to the requirements of the following tables and related paragraphs, and referenced titled paragraphs of Specification B 249M:

10.1.1 Diameter or Distance Between Parallel Surfaces:

10.1.1.1 *Rod: Round, Hexagonal, Octagonal*—Table 2.

10.1.1.2 *Piston-Finish Rod*—Table 3.

10.1.1.3 *Bar: Rectangular and Square*—Table 9 and Table 11.

10.1.2 Shapes:

10.1.2.1 The dimensional tolerances for shapes shall be subject to agreement between the manufacturer and the purchaser and the agreement shall be a part of the contract or purchase order.

10.1.3 Length:

10.1.3.1 *Rod, Bar, and Shapes*—Table 13 and Table 15.

10.1.4 Straightness:

10.1.4.1 *Rod and Bar*—Table 16.

10.1.4.2 *Shafting Rod*—Table 17.

10.1.4.3 *Piston-Finish Rod*—The tolerance is subject to agreement between the manufacturer and the purchaser and the agreement shall be a part of the contract or purchase order.

10.1.5 Edge Contours:

10.1.5.1 Refer to paragraph titled “Edge Contours”.

11. Test Methods

11.1 Chemical Analysis:

11.1.1 Chemical composition shall be determined, in case of disagreement, as follows:

Element	Test Method
Copper	E 478
Iron	E 478
Lead	E 478 (AA)
Zinc <2 %	E 478 (AA)
>2 %	E 478 (Titrimetric)
Tin	E 478 (Titrametric)
Phosphorus	E 62

11.1.2 Test method(s) for the determination of element(s) required by contractual or purchase order agreement shall be as agreed upon between the manufacturer or supplier and the purchaser.

12. General Requirements

12.1 The following sections of Specification B 249M constitutes a part of this specification.

12.1.1 Terminology.

12.1.2 Materials and Manufacture.

12.1.3 Workmanship, Finish and Appearance.

12.1.4 Sampling.

12.1.5 Number of Tests and Retests.

12.1.6 Specimen Preparation.

12.1.7 Test Methods.

12.1.8 Significance of Numerical Limits.

12.1.9 Inspection.

12.1.10 Rejection and Rehearing.

12.1.11 Certification.

12.1.12 Test Reports.

12.1.13 Packaging and Package Marking.

12.2 In addition, when a section with a title identical to that referenced in 12.1 above appears in this specification, it contains additional information which supplements that appearing in Specification B 249M. In case of conflict, this specification shall prevail.

13. Keywords

13.1 phosphor bronze bar; phosphor bronze rod; phosphor bronze shapes