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Standard Specification for Naval Brass Rod, Bar, and Shapes [Metric]¹

This standard is issued under the fixed designation B 21M; 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 specification has been approved for use by agencies of the Department of Defense. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.

1. Scope*

1.1 This specification establishes the requirements for naval brass rod, bar, and shapes produced from Copper Alloys UNS Nos. C46200, C46400, C47940, C48200, or C48500.

1.1.1 For piston-finish rod or shafting, refer to Section 9. 1.2 This specification is the companion to inch-pound

Specification B 21.

1.3 Warning—Mercury is a definite health hazard in use and disposal (see 8.1).

NOTE 1-For hot forging material, refer to Specification B 124.

2. Referenced Documents

2.1 ASTM Standards:

- B 124M Specification for Copper and Copper-Alloy Forging Rod, Bar, and Shapes [Metric]²
- B 154 Test Method for Mercurous Nitrate Test for Copper and Copper Alloys²
- B 249M Specification for General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, and Shapes [Metric]²
- B 601 Practice for Temper Designations for Copper and Copper Alloys—Wrought and Cast²
- E 8M Test Methods for Tension Testing of Metallic Materials [Metric]³
- E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness³
- E 478 Test Methods for Chemical Analysis of Copper Alloys⁴

3. Ordering Information

3.1 Orders for product under this specification are to include the following information:

3.1.1 ASTM designation and year of issue,

- 3.1.2 Copper Alloy UNS No. designation (Section 1.1),
- 3.1.3 Temper (Section 6),

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

² Annual Book of ASTM Standards, Vol 02.01.

⁴ Annual Book of ASTM Standards, Vol 03.05.

3.1.5 Diameter or distance between parallel surfaces (Section 11.2),

3.1.6 Length (Section 11.4),

3.1.7 Edge contours (Section 11.6),

3.1.8 Number of pieces or total weight, for each size and form, and

3.1.9 When product is specified for agencies of the U.S. Government (Section 10).

3.2 The following are options available under this specification and are to be specified in the contract or purchase order when required:

- 3.2.1 Mercurous Nitrate Test (Section 8),
- 3.2.2 Piston finish rod or shafting (Section 9),
- 3.2.3 Certification (Specification B 249M), and
- 3.2.4 Mill test report (Specification B 249M).

4. General Requirements

4.1 The following sections of Specification B 249M constitute a part of this specification:

- 4.1.1 Terminology,
- 4.1.2 Materials and Manufacture,
- 4.1.3 Workmanship, Finish, and Appearance,
- 4.1.4 Sampling,
- 4.1.5 Number of Tests and Retests,
- 4.1.6 Specimen Preparation,
- 4.1.7 Test Methods,
- 4.1.8 Significance of Numerical Limits,
- 4.1.9 Inspection,
- 4.1.10 Rejection and Rehearing,
- 4.1.11 Certification,
- 4.1.12 Mill Test Report,
- 4.1.13 Packaging and Product Marking, and
- 4.1.14 Supplementary Requirements.

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

5. Chemical Composition

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

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

5.3 For copper alloys in which zinc is specified as the

* A Summary of Changes section appears at the end of this specification.

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 Rod, Bar, Wire, Shapes and Forgings.

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³ Annual Book of ASTM Standards, Vol 03.01.

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TABLE 1 Chemical Requirements

Element, %	Copper Alloy UNS No.				
	C46200	C46400	C47940	C48200	C48500
Copper	62.0-65.0	59.0-62.0	63.0-66.0	59.0-62.0	59.0-62.0
Tin	0.50-1.0	0.50-1.0	1.2-2.0	0.50-1.0	0.50-1.0
Lead	0.20 max	0.20 max	1.0-2.0	0.40-1.0	1.3-2.2
Zinc	remainder	remainder	remainder	remainder	remainder
Iron	0.10 max	0.10 max	0.10-1.0	0.10 max	0.10 max
Nickel			0.10-0.50		

remainder, either copper or zinc is permitted to be taken as the difference between the sum of results determined for all elements analyzed and 100 %. When copper is so determined, that difference value shall conform to the requirements given in Table 1.

5.4 When all elements listed in Table 1 for the Copper Alloy UNS No. specified in the ordering information are analyzed, the sum of results shall be 99.6 % minimum.

6. Temper

6.1 Tempers, as defined in Practice B 601, available under this specification are shown in Table 2.

7. Mechanical Property Requirements

7.1 The product shall conform to the mechanical property requirements given in Tables 2 and 3 for the Copper Alloy UNS No. designation specified in the ordering information.

7.1.1 Rockwell Hardness—For the alloys and tempers listed, the product 12 mm and over in diameter or distance between parallel surfaces shall conform with the requirements given in Table 3, when tested in accordance with Test Methods E 18.

7.1.1.1 For the alloys and tempers listed in Table 3, Rockwell hardness shall be the basis of acceptance or rejection for mechanical properties except when the tensile test is specified in the contract or purchase order.

7.1.2 *Tensile Strength*—The product shall conform with the requirements of Table 2, when tested in accordance with Test Methods E 8M.

8. Mercurous Nitrate Test

8.1 When specified in the contract or purchase order, the test specimens, cut at least 150 mm in length, shall be totally immersed for 30 min in the standard mercurous nitrate solution specified in Method B 154. There shall be no cracks in the specimen when examined immediately after it is removed from the solution, rinsed, and wiped.

NOTE 2: Precaution—Mercury is a definite health hazard, and therefore equipment for the detection and removal of mercury vapor produced in volatilization is recommended. The use of rubber gloves in testing is advisable.

NOTE 3—Bars that have been properly straightened or sprung will have internal stresses so broken up as not to be in danger of splitting or cracking. The mercurous nitrate test is designed to determine whether the internal stresses have been properly broken up and rendered safe.

9. Piston-Finish Rod and Shafting

9.1 When so specified in the contract or order, round rods over 12 mm in diameter shall be furnished as piston-finish rods or shafting.

9.2 Piston-finish rods shall have a special surface produced by turning or grinding and shall comply with the special diameter tolerances specified in 11.2.3.

9.3 The straightness tolerances for piston-finish rod are subject to agreement between the manufacturer or supplier and the purchaser.

10. Purchases for U.S. Government

10.1 Product purchased for agencies of the U.S. Government shall conform to the additional requirements prescribed in the Supplemental Requirements section of Specification B 249M.

11. Dimensions, Mass, and Permissible Variations

11.1 The dimensions and tolerances for material covered by this specification shall be as specified in the current edition of Specification B 249M, with particular reference to Section 5 and the following tables of that specification.

11.2 Diameter or Distance Between Parallel Surfaces:

11.2.1 Rod: Round, Hexagonal, Octagonal—See 5.2, Table 1.

11.2.2 Rod, M30, (As-Hot Extruded)-See 5.2, Table 4.

11.2.3 Piston-Finish Rod-See 5.2, Table 3.

11.2.4 Bar: Rectangular and Square—See 5.2, Tables 8 and 10.

11.2.5 Bar, M30, (As-Hot Extruded)-See 5.2, Table 4.

11.3 *Shapes*—The dimensional tolerances for shapes shall be as agreed upon by the manufacturer or supplier and the purchaser, and shall be specified in the order.

11.4 Length of Rod, Bar, and Shapes—See 5.3, Tables 13 and 14.

11.5 Straightness:

11.5.1 Rod and Bar-See 5.4.1, Table 16.

11.5.2 Shafting Rod-See 5.4.2, Table 17.

11.5.3 M30 (As-Hot Extruded) rod, bar, and shapes shall be commercially straight.

11.6 Edge Contours-See 5.5.

12. Test Specimens

12.1 In the tension test all material shall be pulled in full size when practicable. Full-size or machined test specimens shall be as specified in Test Methods E 8. Whenever tension test results are obtained from both full-size and from machined test specimens and they differ, the results obtained from full-size test specimens shall be used to determine conformance to the requirements of this specification.

Note 4—The tension test specimens shall conform to the dimensions specified in Section 6 of Test Methods E 8M.

12.2 Mercurous nitrate test specimens shall be of the full size of the material, and without bending, springing, polishing, or any other preparation.

13. Test Methods

13.1 Chemical Analysis:

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

Element	ASTM Test Method		
Соррег	E 478		
Iron	E 478		
Lead	E 478 (AA)		
Nickel	E 478		
Tin	E 478 (Titrimetric)		
Zinc	E 478 (Titrimetric)		