



Designation: B 138M – 96
METRIC

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

This standard is issued under the fixed designation B 138M; 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 manganese bronze rod, bar and shapes produced in Copper Alloy UNS No. C67000 or C67500.

1.2 This specification is the SI-Metric companion to Specification B 138.

1.3 **Warning**—Mercury is a definite health hazard in use and disposal (Section 8).

NOTE 1—Product suitable for hot forging applications is available under 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 of Mercurous Nitrate Test for Copper and Copper Alloys²

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

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

E 8M Test Methods for Tension Testing of Metallic Materials³

E 54 Test Methods for Chemical Analysis of Special Brasses and Bronzes⁴

E 62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric)⁴

E 478 Test Methods for Chemical Analysis of Copper Alloys⁴

3. Ordering Information

3.1 Orders for product shall include the following:

3.1.1 ASTM designation and year of issue (for example, B138 – 96),

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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² Annual Book of ASTM Standards, Vol 02.01.

³ Annual Book of ASTM Standards, Vol 03.01.

⁴ Annual Book of ASTM Standards, Vol 03.05.

3.1.2 Copper Alloy UNS No. designation (for example, C67000),

3.1.3 Temper (Section 6 and Table 1),

3.1.4 Form of product (for example, round, hexagonal),

3.1.5 Dimensions (for example, diameter, distance between parallel surfaces),

3.1.6 Tolerances for shapes,

3.1.7 Edge contours,

3.1.8 Length,

3.1.9 Quantity (total weight, footage or number of pieces),

3.1.10 When product is purchased for agencies of the U.S. Government (Section 10).

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

3.2.1 Heat identification or traceability details (Specification B 249),

3.2.2 Piston finish (Section 9),

3.2.3 Mercurous nitrate test (Section 8),

3.2.4 Certification (Specification B 249), and

3.2.5 Mill Test Report (Specification B 249).

4. Material and Manufacture

4.1 Material:

4.1.1 The material of manufacture shall be cast billets of Copper Alloy UNS No. C67000 or C67500, as specified in the ordering information, and shall be of such soundness as to be suitable for hot extrusion (Section 1.1).

4.2 Manufacture:

4.2.1 The product shall be manufactured by hot extrusion and finished by such cold working, annealing and straightening as may be necessary to achieve the required properties.

5. Chemical Composition

5.1 The material shall conform to the composition requirements specified in Table 2 for the Copper Alloy UNS No. named in the ordering information.

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

5.2 For Copper Alloys in which zinc is specified as the remainder, either copper or zinc is permitted to be taken as the

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

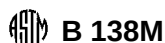


TABLE 1 Tensile Requirements

Form	Temper		Diameter or Distance Between Parallel Surface mm	Tensile Strength, min	Yield Strength, at 0.5 % extension under load, min	Elongation min, % ^A
	Standard	Name		MPa	MPa	
Copper Alloy UNS No. C67000						
Rod and bar	<i>B</i>	soft	all sizes	585	310	10
	<i>B</i>	half-hard	all sizes	720	415	7
	<i>B</i>	hard	all sizes	790	470	5
Copper Alloy UNS No. C67500						
Rod	O60	soft anneal	all sizes	380	150	20
	H02	half-hard	25 and under	500	250	13
			over 25 to 65 incl	450	240	15
over 65			450	220	17	
Bar	H04	hard	25 and under	550	385	8
			over 25 to 38 incl	525	360	10
			over 38 to 65 incl	510	330	12
	O60	soft anneal	over 65	470	310	16
			all sizes	380	150	20
			25 and under	450	250	13
			over 25 to 65 incl	485	240	15
			over 65	450	220	17
			25 and under	525	360	8
			over 25 to 65 incl	500	325	12
			over 65	470	310	16
			all sizes	380	150	20
Shapes ^C						
O60	soft anneal	all sizes	380	150	20	

^A Elongational values are based on gage length of 5.65 times the square root of the area for dimensions greater than 2.5 mm.

^B See Note 3. The tensile properties of hot-forged (M10), as-hot-rolled (M20), and as-hot-extruded (M30) are essentially the same as those shown for rod and bar, but have not been finalized for publication.

^C Tensile requirements for drawn shapes shall be as agreed upon between the manufacturer and the purchaser at the time of order.

TABLE 2 Chemical Requirements

	Copper Alloy UNS No.	
	C67000	C67500
Copper, %	63.0–68.0	57.0–60.0
Tin, %	0.50 max	0.50–1.5
Lead, max, %	0.20	0.20
Zinc, %	remainder	remainder
Iron, %	2.0–4.0	0.8–2.0
Aluminum, %	3.0–6.0	0.25 max
Manganese, %	2.5–5.0	0.05–0.50

difference between the sum of results for all elements analyzed and 100 %. When copper is so determined, that difference value shall conform to the requirements given in Table 2.

5.2.1 When all elements specified in Table 2 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 The standard tempers for product under this specification are identified in Table 1.

7. Mechanical Property Requirements

7.1 Tensile Requirements:

7.1.1 The product furnished under this specification shall conform to the tensile requirements prescribed in Table 1 when tested in accordance with Test Method E 8M.

8. Mercurous Nitrate Test

8.1 When specified in the contract or purchase order, the product shall conform to the requirements of Test Method B 154.

NOTE 2—**Warning:** 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 protective gloves for this test is recommended.

9. Piston Finish

9.1 When specified in the contract or purchase order, round rod over 13 mm in diameter shall be furnished piston finished.

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 product under this specification shall be as specified in the following tables and related paragraphs in Specification B 249M:

11.2 Diameter or Distance Between Parallel Surfaces:

11.2.1 Rod: Round, Hexagonal, Octagonal in H02 or H04 Tempers—Refer to Table 2.

11.2.2 Rod, M30 Temper in Alloy C67000—Refer to Table 5.

11.2.3 Rod, M20 Temper—Refer to Table 6.

11.2.4 Rod, Piston Finish—Refer to Table 3.

11.2.5 Bar, Rectangular and Square in Tempers H02 and H04—Refer to Tables 9 and Tables 11.

11.2.6 Rod and Bar in M10 Temper—Refer to Table 12.

NOTE 3—M10 hot-forged rod and bar are generally produced in sizes over 89 mm in diameter and should not be confused with M30 extruded or M20 rolled rod and bar.

11.2.7 Bar, Rectangular and Square in M30 Temper—Refer to Table 4 for thickness and width for Alloy C67500 and to



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