



Standard Specification for Copper-Silicon Alloy Rod, Bar and Shapes¹

This standard is issued under the fixed designation B 98/B 98M; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope *

1.1 This specification² establishes requirements for copper-silicon rod, bar, and shapes for UNS Alloys C65100 (Low Silicon Bronze B), C65500 (High Silicon Bronze A), and C66100.

NOTE 1—Material for hot forging is covered by Specification B 124.

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

2. Referenced Documents

2.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein:

2.2 ASTM Standards:

B 124 Specification for Copper and Copper Alloy Forging Rod, Bar and Shapes³

B 249 Specification for General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, Shapes and Forgings³

B 249M Specification for General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, Shapes and Forgings [Metric]³

B 601 Practice for Temper Designations for Copper and Copper Alloys—Wrought and Cast³

E 8 Test Methods for Tension Testing of Metallic Materials⁴

E 8M Test Methods for Tension Testing of Metallic Materials [Metric]⁴

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials⁴

E 54 Test Methods for Chemical Analysis of Special Brasses and Bronzes⁵

E 62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Method)⁵

E 478 Test Methods for Chemical Analysis of Copper Alloys⁶

3. General Requirements

3.1 The following sections of Specification B 249 or B 249M 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 Retests,

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 Test Report (Mill),

3.1.13 Packaging and Package Marking, and

3.1.14 Supplemental Requirements.

3.2 In addition, when a section with a title identical to one of those referenced in 3.1 appears in this specification, it contains additional requirements that supplement those which appear in Specification B 249 or B 249M.

4. Ordering Information

4.1 Orders for product under this specification should include the following information:

4.1.1 ASTM Designation and year of issue,

4.1.2 Copper Alloy UNS No. designation,

4.1.3 Temper designation,

4.1.4 Quantity; total weight or length, or number of pieces of each temper, form, or alloy,

4.1.5 Dimensions; diameter or distance between parallel surfaces,

4.1.6 Type of edge; edge contours,

4.1.7 How furnished; specific lengths with or without ends, and

4.1.8 When material is purchased for agencies of the U.S. Government (see Specifications B 249 or B 249M).

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 For ASME Boiler and Pressure Vessel Code applications see related Specification SB-98 in Section II of that code.

³ Annual Book of ASTM Standards, Vol 02.01.

⁴ Annual Book of ASTM Standards, Vol 03.01.

⁵ Annual Book of ASTM Standards, Vol 03.05.

⁶ Annual Book of ASTM Standards, Vol 03.06.

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

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

- 4.2.1 Certification (Specifications B 249 or B 249M), and
- 4.2.2 Mill Test Report (Specifications B 249 or B 249M).

5. Material and Manufacture

5.1 The starting material shall be cast billets or rods of Copper Alloy UNS Numbers C65100, C65500, or C66100, and shall be of such soundness and structure as to enable them to be processed into the product specified in the contract or purchase order.

5.2 The product shall be manufactured by such hot-working, cold-working, straightening, and annealing processing as to produce a uniform wrought structure and obtain the required finish properties.

6. Chemical Composition

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

6.1.1 When all elements listed in Table 1 are determined for the designated alloy, the sum of results shall be 99.5 % min.

6.1.2 Copper may be determined as the difference between the sum of results for all elements analyzed an 100 %.

6.2 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 and the purchaser.

7. Temper

7.1 Tempers, as defined in Practice B 601, available under this specification are O60 (soft anneal), H01 (quarter-hard), H02 (half-hard), H04 (hard), H06 (extra hard), M20 (as hot rolled), and M30 (as hot extruded).

7.2 Product of bars and shapes in the H06 (extra-hard) temper is normally not produced.

8. Mechanical Property Requirements

8.1 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.

8.1.1 *Rockwell Hardness*—For the alloys and tempers listed, product 0.5 in. [12.7 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 or B 249M.

8.1.1.1 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.

8.1.2 *Tensile Strength*—The product shall conform with the requirements of Table 2 when tested in accordance with Test Methods E 8 or B 249M.

9. Dimensions, Mass and Permissible Variations

9.1 Refer to the appropriate paragraphs in Specification B 249/B 249M with particular reference to the following tables:

9.2 *Diameter or Distance Between Parallel Surfaces:*

9.2.1 *Rod: Round, Hexagonal, Octagonal*—Refer to Table 1 for Alloy C65100 and to Table 2 for Alloys C65500 and C66100.

9.2.2 *Rod: Round M20 Temper*—Refer to Table 6.

9.2.3 *Rod: Round, Hexagonal, Octagonal, M30 Temper*—Refer to Table 5.

9.2.4 *Bar: Rectangular and Square*—Refer to Tables 8 and 10 for Alloy C65100, and Tables 9 and 11 for Alloys C65500 and C66100.

9.2.5 *Bar: M30 Temper*—Refer to Table 5 for thickness and width tolerances.

9.3 *Shapes*—The dimensional tolerance for shapes shall be as agreed upon between the manufacturer and the purchaser, and shall be specified in the order.

9.4 *Length:*

9.4.1 *Rod, Bar and Shapes*—Refer to Tables 13 and 15.

9.5 *Straightness:*

9.5.1 *Rod and Bar*—Refer to Table 16.

9.6 *Edge Contours:*

9.6.1 *Rod and Bar*—Refer to the section entitled, “Edge Contours” and to Figs. 1, 2, and 3.

10. Test Methods

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

Element	Test Methods
Copper	E 478
Lead	E 478, Atomic absorption
Manganese	E 62
Nickel	E 478, Photometric
Silicon	E 54, Perchloric acid dehydration
Zinc	E 478, Atomic absorption

10.1.1 Test Method(s) to be followed for the determination of elements required by contractual or purchase order agreement shall be as agreed upon between the supplier and purchaser.

10.2 Refer to Specifications B 249 or B 249M for other appropriate test methods.

11. Keywords

11.1 copper—rod, bar, shapes; copper-silicon alloy; high silicon bronze A; low silicon bronze B; silicon bronze

TABLE 1 Chemical Requirements

	Composition, % Maximum (Unless Shown as a Range or Minimum)		
	Copper Alloy UNS No.		
	C65100	C65500	C66100
Copper (Includes silver)	96.0 min	94.8 min	94.0 min
Lead	0.05	0.05	0.20–0.8
Iron	0.8	0.8	0.25
Zinc	1.5	1.5	1.5
Aluminum
Manganese	0.7	0.50–1.3	1.5
Silicon	0.8–2.0	2.8–3.8	2.8–3.5
Nickel	...	0.6	...