



Designation: B99/B99M – 15 (Reapproved 2021)

Standard Specification for Copper-Silicon Alloy Wire for General Applications¹

This standard is issued under the fixed designation B99/B99M; 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 U.S. Department of Defense.

1. Scope*

1.1 This specification establishes the requirements for round, rectangular, and square wire for general applications other than for electrical transmission cable. The alloys involved are UNS Nos. C65100 and C65500.

1.2 *Units*—The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, SI units are shown in brackets. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards*:² <https://www.astm.org/standards/sist/17085310-7743-4fb8-a453-7f5d34984845/astm-b99-b99m-152021>

B250/B250M Specification for General Requirements for Wrought Copper Alloy Wire

E8/E8M Test Methods for Tension Testing of Metallic Materials

E62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods) (Withdrawn 2010)³

E112 Test Methods for Determining Average Grain Size

E478 Test Methods for Chemical Analysis of Copper Alloys

¹ This specification 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.

³ The last approved version of this historical standard is referenced on www.astm.org.

3. General Requirements

3.1 The following sections of Specification **B250/B250M** 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,
- 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 that referenced in 3.1, above, appears in this specification, it contains additional requirements that supplement those appearing in Specification **B250/B250M**.

4. Ordering Information

4.1 Include the following specified choices when placing orders for product under this specification, as applicable:

- 4.1.1 ASTM designation and year of issue,
- 4.1.2 Copper Alloy UNS No.;
- 4.1.3 Temper (Section 6),
- 4.1.4 Dimensions (diameter, distance between parallel surfaces, width, and thickness);
- 4.1.5 How furnished (coil, reel, and so forth);
- 4.1.6 Total weight of each size; and
- 4.1.7 Intended application.

4.2 The following options are available but may not be included unless specified at the time of placing of the order when required:

- 4.2.1 Heat identification or traceability details (see 4.1.2 of Specification **B250/B250M**),
- 4.2.2 Certification,
- 4.2.3 Test reports,
- 4.2.4 Special packaging and package markings, and

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

4.2.5 If product is purchased for agencies of the U.S. government (see the Supplementary Requirements section of Specification **B250/B250M**).

5. Chemical Composition

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

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

5.2 For alloys in which copper is listed as “remainder,” copper is the difference between the sum of results for all elements determined and 100 %.

5.3 When all elements in **Table 1** are determined, the sum of results shall be 99.5 % min.

6. Temper

6.1 The standard tempers for products described in this specification are given in **Table 2**.

6.1.1 Product made to H04 (full hard) temper is generally not available in sizes larger than 0.500 in. [12 mm] in diameter or distance between parallel faces.

6.1.2 Product made to H08 (spring) temper is generally not available in sizes larger than 0.250 in. [6 mm] in diameter or distance between parallel faces.

7. Grain Size for Annealed Temper

7.1 Grain size shall be the standard requirement for all product in annealed temper.

7.2 The average grain size of O61 (annealed) temper wire shall not exceed 0.040 mm, but the wire must be completely recrystallized.

7.3 Acceptance or rejection based upon grain size shall depend only on the average grain size of test specimens taken from each of two sample portions and each specimen shall be within the limits prescribed in **7.2** when determined in accordance with Test Methods **E112**.

8. Mechanical Property Requirements

8.1 Tensile Strength Requirements:

TABLE 1 Chemical Requirements

	Composition, % max	
	Copper Alloy UNS No.	
	C65100	C65500
Copper (incl silver)	remainder	remainder
Lead	0.05	0.05
Iron	0.8	0.8
Zinc	1.5	1.5
Manganese	0.7	0.50–1.3
Silicon	0.8–2.0	2.8–3.8
Nickel (incl cobalt)	...	0.6

8.1.1 Product furnished under this specification shall conform to the tensile requirements prescribed in **Table 2**, when tested in accordance with Test Methods **E8/E8M**.

9. Performance Requirements

9.1 Bending Requirements:

9.1.1 Wire in sizes up to 0.250 in. [6 mm] inclusive produced to this specification shall be capable of being bent or wrapped one full turn (360°) around its own diameter, or distance between parallel faces, without developing cracks or other flaws visible to the unaided eye on the outside surface of the bend.

NOTE 1—Test specimens that include brazed or welded areas shall not be used for bend test purposes.

10. Dimensions, Mass, and Permissible Variations

10.1 The dimensions and tolerances for product described by this specification shall be as specified in Specification **B250/B250M** with particular reference to the following tables and related paragraphs in that specification:

10.1.1 Diameter or Distance Between Parallel Surfaces:

10.1.1.1 Copper Alloy UNS No. C65100—Table 1.

10.1.1.2 Copper Alloy UNS No. C65500—Table 2.

10.1.2 Thickness:

10.1.2.1 Copper Alloy UNS No. C65100—Table 3.

10.1.2.2 Copper Alloy UNS No. C65500—Table 4.

10.1.3 Width:

10.1.3.1 Copper Alloy UNS No. C65100—Table 5.

10.1.3.2 Copper Alloy UNS No. C65500—Table 6.

11. Test Methods

11.1 Chemical Analysis:

11.1.1 In cases of disagreement, test methods for chemical analysis shall be subject to agreement between the manufacturer or supplier and the purchaser. The following table is a list of published methods, some of which may no longer be viable, which along with others not listed, may be used subject to agreement:

Element	Methods
Copper	E478
Silicon	E62
Lead	E478 (AA)
Iron	E478
Zinc	E478 (titrametric)
Nickel	E478 (photometric)
Manganese	E62

11.1.2 Test method(s) to be followed for the determination of elements resulting from contractual or purchase order agreement shall be as agreed upon between the manufacturer or supplier and the purchaser.

12. Keywords

12.1 copper-silicon alloy wire; general purpose wire; non-electrical wire; UNS C65100 wire; UNS C65500 wire