



~~Designation: B99/B99M-06~~ Designation: B99/B99M – 11

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 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 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—~~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 may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

2. Referenced Documents

2.1 *ASTM Standards:*²

B250/B250M [Specification for General Requirements for Wrought Copper Alloy Wire](#)

E88/E8M [Test Methods for Tension Testing of Metallic Materials](#) ~~E8M Test Methods for Tension Testing of Metallic Materials~~
[Metric]

E62 [Test Methods for Chemical Analysis of Copper and Copper Alloys \(Photometric Methods\)](#)

E112 [Test Methods for Determining Average Grain Size](#)

E478 [Test Methods for Chemical Analysis of Copper Alloys](#)

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 Mill 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 which supplement those that appear appearing in Specification B250/B250M.

4. Ordering Information

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

4.1.1 ASTM designation and year of issue,

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.

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

- 4.1.2 Copper Alloy UNS No.,
- 4.1.3 Temper,
- 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 If product is purchased for agencies of the U.S. government (see the Supplementary Requirements section of Specification B250/B250M).

4.2 The following options are available to this specification and should be specified at the time of placing of the order when required:

- 4.2.1 Heat identification or traceability details,
- 4.2.2 Certification,
- 4.2.3 Mill test reports, and
- 4.2.4 Special packaging and package markings.

5. Chemical Composition

5.1 The material 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* :

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 or E8ME8/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.

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