



## Designation: B134/B134M – 15 (Reapproved 2021)

# Standard Specification for Brass Wire<sup>1</sup>

This standard is issued under the fixed designation B134/B134M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope\*

1.1 This specification establishes requirements for round, hexagonal, octagonal, rectangular and square brass wire of UNS Alloy Nos. C21000, C22000, C22600, C23000, C23400, C24000, C26000, C27000, and C27400.

1.2 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. 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:*<sup>2</sup>

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

[B601 Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast](#)

[B846 Terminology for Copper and Copper Alloys](#)

[E8/E8M Test Methods for Tension Testing of Metallic Materials](#)

[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.

<sup>1</sup> 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.

Current edition approved July 1, 2021. Published July 2021. Originally approved in 1940. Last previous edition approved in 2015 as B134/B134M – 15. DOI: 10.1520/B0134\_B0134M-15R21.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

- 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 Reports
- 3.1.13 Product Marking;
- 3.1.14 Packaging and Package Marking
- 3.1.15 Supplementary Requirements

3.2 In addition, when a section with a title identical to that referenced in 3.1 appears in this specification, it contains additional requirements that supplement those that appear in Specification [B250/B250M](#).

## 4. Terminology

4.1 *Definitions of Terms Specific to This Standard:*

4.1.1 *camber offset, n*—the axial component of curvature of wire in an unrestrained state.

4.1.1.1 *Discussion*—The camber is measured as the offset in the ends of one turn of freely hanging wire.

4.1.2 *cast, n*—the maximum diameter of coiled wire when one complete circumference rests completely on a flat surface as a table, workbench, or floor.

4.2 For other definitions of terms related to copper and copper alloys, refer to Terminology [B846](#).

## 5. Ordering Information

5.1 Include the following information in orders for product:

5.1.1 ASTM Designation and year of issue;

5.1.2 Copper Alloy UNS No. designation;

5.1.3 Temper;

5.1.4 Cross section: round, hexagonal, octagonal, rectangular, or square;

5.1.5 Quantity: total weight, footage, or number of pieces of each temper, cross section, or alloy;

5.1.6 Dimensions: diameter or distance between parallel surfaces, width and thickness, length;

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

5.1.7 Type of edge: square corners, rounded edge, full-rounded edge;

5.1.8 How furnished: coil, spool, or reel, specific lengths with or without ends; and

5.1.9 When material is purchased for agencies of the U.S. government (Specification **B250/B250M**).

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

5.2.1 Certification (Specification **B250/B250M**, and

5.2.2 Mill test report (Specification **B250/B250M**).

5.2.3 Cast and camber requirements, if specified.

## 6. Materials and Manufacture

6.1 *Material*—The material shall be made from cast billets, logs, or rods of Copper Alloy UNS Nos. C21000, C22000, C22600, C23000, C23400, C24000, C26000, C27000, or C27400, of such purity, soundness, and structure to be suitable for processing into the desired product.

6.2 *Manufacture*—The products shall be manufactured by such hot working, cold working, and annealing processing as to produce a uniform wrought structure in the finished product.

## 7. Chemical Composition

7.1 The material shall conform to the chemical compositional requirements specified in **Table 1** for the copper alloy specified in the ordering information.

7.1.1 When all elements specified for a given alloy in **Table 1** are determined, their sum of results shall be as follows:

Alloy UNS Nos.	Sum of Results, Percent, Minimum
C21000, C22000, C22600, C23000, C23400, C24000	99.8
C26000, C27000, C27400	99.7

7.2 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 the purchaser.

7.3 Zinc, listed as the “remainder,” is the difference between the sum of results for all elements determined and 100 %.

## 8. Temper

8.1 The product in drawn or rolled wire of UNS Alloy Nos. C21000, C22000, C22600, C23000, C23400, C24000,

C26000, C27000, and C27400 shall be available in H00, H01, H02, H03, H04, H06, H08, and H10 tempers as defined in Classification **B601**.

8.1.1 Product made in H04 temper is not generally available in sizes over ½ in. [13 mm] in diameter.

8.1.2 Product made in H06 temper is not generally available in sizes over ¾ in. [10 mm] in diameter.

8.1.3 Product made in H08 temper is not generally available in sizes over ¼ in. [6 mm] in diameter.

8.1.4 Square product is not generally available in H06 or H08 tempers.

8.1.5 The tension test shall be the standard temper test for all H temper wire.

8.1.6 The product in annealed form of UNS Alloys Nos. C21000 and C22000 shall be available in OS050, OS035, OS025, and OS015 tempers as defined in Classification **B601**.

8.1.7 The product in annealed form of UNS Alloy Nos. C22600, C23000, C23400, and C24000 shall be available in OS070, OS050, OS035, OS025, OS015, and OS010 tempers as defined in Classification **B601**.

8.1.8 The product in annealed form of UNS Alloy Nos. C26000, C27000, and C27400 shall be available in OS120, OS070, OS050, OS035, OS025, and OS015 tempers as defined in Classification **B601**.

## 9. Grain Size for Annealed Wire

9.1 Grain size shall be the standard requirement for all product in the annealed tempers.

9.2 Acceptance or rejection based on 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 **Table 2** when determined in accordance with Test Methods **E112**.

## 10. Mechanical Property Requirements

### 10.1 Tensile Strength Requirements:

10.1.1 Drawn or rolled product shall conform to the requirements specified in **Tables 3-6**, by alloy and temper, for wire 0.020 in. [0.5 mm] and over in diameter or distance between parallel surfaces.

10.1.1.1 The temper of wire under 0.020 in. [0.5 mm] in diameter or distance between parallel surfaces shall be subject to agreement between the manufacturer, or supplier, and the purchaser.

**TABLE 1 Chemical Requirements**

Copper Alloy UNS No.	Composition, %			
	Copper	Lead, max	Iron, max	Zinc
C21000	94.0–96.0	0.05	0.05	remainder
C22000	89.0–91.0	0.05	0.05	remainder
C22600	86.0–89.0	0.05	0.05	remainder
C23000	84.0–86.0	0.05	0.05	remainder
C23400	81.0–84.0	0.05	0.05	remainder
C24000	78.5–81.5	0.05	0.05	remainder
C26000	68.5–71.5	0.07	0.05	remainder
C27000	63.0–68.5	0.09	0.07	remainder
C27400	61.0–64.0	0.09	0.05	remainder

**TABLE 2 Grain Size Requirements and Approximate Rockwell Hardness Values for Annealed Wire**

Temper Designation		Grain Size, mm			Approximate Rockwell Hardness for Rectangular Wire <sup>A</sup>			
					F Scale		30-T Scale	
Code	Nominal	Min	Max	Min	Max	Min	Max	
Copper Alloy UNS No. C21000								
OS050	0.050	0.035	0.090	40 <sup>B</sup>	52 <sup>B</sup>	...	4	
OS035	0.035 <sup>C</sup>	0.025	0.050	47 <sup>B</sup>	54 <sup>B</sup>	...	7	
OS025	0.025	0.015	0.035	50 <sup>B</sup>	61 <sup>B</sup>	1	17	
OS015	0.015 <sup>C</sup>	<sup>D</sup>	0.025	54 <sup>B</sup>	65 <sup>B</sup>	7	23	
Copper Alloy UNS No. C22000								
OS050	0.050	0.035	0.090	50	60	1	16	
OS035	0.035 <sup>C</sup>	0.025	0.050	54	64	7	21	
OS025	0.025	0.015	0.035	58	70	13	31	
OS015	0.015 <sup>C</sup>	<sup>D</sup>	0.025	62	75	19	39	
Copper Alloy UNS Nos. C22600, C23000, and C23400								
OS070	0.070	0.050	0.100	53	60	6	16	
OS050	0.050 <sup>C</sup>	0.035	0.070	56	63	10	20	
OS035	0.035 <sup>C</sup>	0.025	0.050	58	66	13	24	
OS025	0.025 <sup>C</sup>	0.015	0.035	60	72	16	34	
OS015	0.015 <sup>C</sup>	<sup>D</sup>	0.025	62	79	19	48	
OS010	0.010 <sup>C</sup>	<sup>D</sup>	0.015	66	83	25	50	
Copper Alloy UNS No. C24000								
OS070	0.070	0.050	0.120	53	64	2	21	
OS050	0.050 <sup>C</sup>	0.035	0.070	57	67	8	27	
OS035	0.035 <sup>C</sup>	0.025	0.050	61	72	16	35	
OS025	0.025 <sup>C</sup>	0.015	0.035	63	77	20	42	
OS015	0.015 <sup>C</sup>	<sup>D</sup>	0.025	66	83	25	50	
Copper Alloy UNS Nos. C26000, C27000, and C27400								
OS120	0.120	0.070	...	50	62	...	21	
OS070	0.070	0.050	0.120	52	67	3	27	
OS050	0.050	0.035	0.070	61	73	20	35	
OS035	0.035	0.025	0.050	65	76	25	38	
OS025	0.025	0.015	0.035	67	79	27	42	
OS015	0.015	<sup>D</sup>	0.025	72	85	33	50	

<sup>A</sup> Rockwell hardness values apply as follows: The F scale applies to metal 0.020 in. [0.5 mm] in thickness and over; the 30-T scale applies to metal 0.015 in. [0.4 mm] in thickness and over.

<sup>B</sup> Copper Alloy UNS No. C21000 in these several OS (annealed) tempers is too soft for Rockwell F hardness tests below 0.030 in. [0.75 mm] in thickness.

<sup>C</sup> The nominal grain sizes are those in which wire other than rectangular are normally available. Rectangular wire is normally available in any of the nominal grain sizes listed.

<sup>D</sup> Although no minimum grain size is required, the material must be fully recrystallized.

**TABLE 3 Tensile Strength Requirements for Round, Hexagonal, Octagonal, and Square Wire  
0.020 in. and Over in Diameter or Distance Between Parallel Surfaces**

Temper Designation		Tensile Strength, ksi <sup>A</sup>									
		Copper Alloy UNS No. C21000		Copper Alloy UNS No. C22000		Copper Alloy UNS Nos. C22600 and C23000		Copper Alloy UNS Nos. C23400 and C24000		Copper Alloy UNS Nos. C26000, C27000, and C27400	
Code	Name	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
H00	eighth-hard	35	45	38	50	43	57	50	65	50	65
H01	quarter-hard	41	51	45	57	53	65	62	75	62	77
H02	half-hard	49	58	56	67	66	77	78	90	79	94
H03	three-quarter hard	57	64	64	74	76	86	90	101	92	107
H04 <sup>B</sup>	hard	61	68	70	79	83	92	100	110	102	117
H06 <sup>C, D</sup>	extra-hard	66	73	78	86	94	102	112	121	115	129
H08 <sup>E, D</sup>	spring	72	...	84	...	100	...	116	...	120	...

<sup>A</sup> ksi = 1000 psi.

<sup>B</sup> H04 (hard) temper wire is not generally available in sizes over 1/2 in. in diameter.

<sup>C</sup> H06 (extra-hard) temper is not generally available in sizes over 3/8 in. in diameter.

<sup>D</sup> Square wire is not generally available in extra hard or spring tempers.

<sup>E</sup> H08 (spring) temper is not generally available in sizes over 1/4 in. in diameter.

10.1.2 Rectangular product, furnished in the “H” tempers shall conform to the requirements in **Tables 5 and 6** for the temper and Copper Alloy UNS No. designation specified in the ordering information when tested in accordance with Test Methods **E8/E8M**.

10.1.3 Acceptance or rejection based upon mechanical property shall depend on the tensile strength values obtained when tested in accordance with Test Methods **E8/E8M**.

**TABLE 4 Tensile Strength Requirements for Round, Hexagonal, Octagonal, and Square Wire  
0.5 mm and Over in Diameter or Distance Between Parallel Surfaces**

Temper Designation		Tensile Strength, MPa <sup>A</sup>									
Code	Name	Copper Alloy UNS No. C21000		Copper Alloy UNS No. C22000		Copper Alloy UNS Nos. C22600 and C23000		Copper Alloy UNS Nos. C23400 and C24000		Copper Alloy UNS Nos. C26000, C27000, and C27400	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
H00	Eighth-hard	240	310	260	345	295	395	345	450	345	450
H01	Quarter-hard	285	350	310	395	365	450	425	515	425	530
H02	Half-hard	340	400	385	460	455	530	540	620	545	650
H03	Three-quarter hard	395	440	440	510	525	595	620	695	635	740
H04 <sup>B</sup>	Hard	420	470	485	545	570	635	690	760	705	805
H06 <sup>C, D</sup>	Extra-hard	455	505	540	595	650	700	770	835	795	890
H08 <sup>E, D</sup>	Spring	495	...	580	...	690	...	800	...	830	...

<sup>A</sup> See Appendix X1.

<sup>B</sup> H04 (hard) temper wire is not generally available in sizes over 13 mm in diameter.

<sup>C</sup> H06 (extra-hard) temper is not generally available in sizes over 10 mm in diameter.

<sup>D</sup> Square wire is not generally available in extra hard or spring tempers.

<sup>E</sup> H08 (spring) temper is not generally available in sizes over 6 mm in diameter.

## 10.2 Rockwell Hardness:

10.2.1 The approximate Rockwell hardness values for rectangular other than square wire given in Table 2, Table 5, and Table 6 are for general information and assistance in testing and shall not be used as a basis for product rejection.

NOTE 1—The Rockwell hardness test offers a quick and convenient method of checking for general compliance with properties for temper condition.

## 11. Dimensions, Mass, and Permissible Variations

11.1 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 those specifications:

11.1.1 *Diameter or Distance Between Parallel Surfaces*—Table 1 in Specification B250/B250M.

11.1.2 *Thickness*—Table 3 in Specification B250/B250M.

11.1.3 *Width*—Table 5 in Specification B250/B250M.

11.1.4 *Length*—Tables 7 and 8 in Specification B250/B250M.

11.1.5 *Straightness*—Table 9 in Specification B250/B250M.

11.1.5.1 This requirement is applicable to rectangular and square product only when ordered in lengths.

11.1.6 *Edge Contour*—Refer to the section on edge contour.

## 12. Test Methods

12.1 *Chemical Analysis:*

12.1.1 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 test methods, some of which may no longer be viable, with along with others not listed, may be used subject to agreement.

Element	Test Method
Copper	E478
Lead	E478 (AA)
Iron	E478
Zinc	E478 (Titrametric)

12.1.2 Test methods 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.

## 13. Keywords

13.1 brass wire; copper-alloy wire; copper-zinc alloy wire; general purpose wire; hexagonal wire; high strength wire; nonelectrical wire; octagonal wire; ornamental wire; rectangular wire; round wire; spring wire; square wire; UNS No. C21000; UNS No. C22000; UNS No. C22600; UNS No. C23000; UNS No. C23400; UNS No. C24000; UNS No. C26000; UNS No. C27000; UNS No. C27400; wire