



Designation: B 134/B 134M – 01

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

This standard is issued under the fixed designation B 134/B 134M; 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 ( $\epsilon$ ) 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 requirements for round, hexagonal, octagonal, rectangular and square brass wire of UNS Alloys C21000, C22000, C22600, C23000, C23400, C24000, C26000, C27000, and C27400.

1.2 *Units*—The values stated in either inch-pound or SI units are to be regarded separately as standard. Within the text and tables, the 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*:

B 250 Specification for General Requirements for Wrought Copper-Alloy Wire<sup>2</sup>

B 250M Specification for General Requirements for Wrought Copper-Alloy Wire (Metric)<sup>2</sup>

B 601 Practice for Temper Designations for Copper and Copper Alloys—Wrought and Cast<sup>2</sup>

E 8 Test Methods for Tension Testing of Metallic Materials<sup>3</sup>

E 8M Test Methods for Tension Testing of Metallic Materials (Metric)<sup>3</sup>

E 112 Test Methods for Determining the Average Grain Size<sup>3</sup>

E 478 Test Methods for Chemical Analysis of Copper Alloys<sup>4</sup>

### 3. General Requirements

3.1 The following sections of Specification B 250 or B 250M 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 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 B 250 or B 250M.

### 4. Ordering Information

4.1 Include the following information in orders for product:

- 4.1.1 ASTM Designation and year of issue,
- 4.1.2 Copper Alloy UNS No. designation,
- 4.1.3 Temper,
- 4.1.4 Cross section (round, hexagonal, octagonal, rectangular, or square),
- 4.1.5 Quantity; total weight, footage, or number of pieces of each temper, cross section, or alloy,
- 4.1.6 Dimensions; diameter or distance between parallel surfaces, width and thickness, length,
- 4.1.7 Type of edge; square corners, rounded edge, full-rounded edge,
- 4.1.8 How furnished; coil, spool, or reel, specific lengths with or without ends, and
- 4.1.9 When material is purchased for agencies of the U.S. Government (Specification B 250 or B 250M).

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

- 4.2.1 Certification (Specification B 250 or B 250M), and
- 4.2.2 Mill Test Report (Specification B 250 or B 250M).

<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.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 02.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 03.01.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 03.06.

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

## 5. Materials and Manufacture

### 5.1 Material:

5.1.1 The material shall be made from cast billets, logs, or rods of Copper Alloy UNS Numbers 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.

### 5.2 Manufacture:

5.2.1 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.

## 6. Chemical Composition

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

6.1.1 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

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 or supplier and the purchaser.

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

## 7. Temper

7.1 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 Practice B 601.

7.1.1 Product made in H04 temper is not generally available in sizes over 1/2 in. [13 mm] in diameter.

7.1.2 Product made in H06 temper is not generally available in sizes over 3/8 in. [10 mm] in diameter.

7.1.3 Product made in H08 temper is not generally available in sizes over 1/4 in. [6 mm] in diameter.

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

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

7.1.6 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 Practice B 601.

7.1.7 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 Practice B 601.

7.1.8 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 Practice B 601.

## 8. Grain Size for Annealed Wire

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

8.2 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 E 112.

## 9. Mechanical Property Requirements

### 9.1 Tensile Strength Requirements:

9.1.1 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.

9.1.1.1 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.

9.1.2 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 E 8 or E 8M.

9.1.3 Acceptance or rejection based upon mechanical property shall depend on the tensile strength values obtained when tested in accordance with Test Methods E 8 or E 8M.

**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	0.10	0.07	remainder
C27400	61.0–64.0	0.10	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	
Standard (B 601)	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.

## 9.2 Rockwell Hardness:

9.2.1 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.