



Designation: B134/B134M – 15

Standard Specification for Brass Wire¹

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

2. Referenced Documents

2.1 ASTM Standards:²

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.

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,

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.

3.1.8 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,

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).

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

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.

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 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 ^A | | | | |
|--|--------------------|--------------|-------|---|-----------------|------------|-----|-----|
| | | | | 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 ^B | 52 ^B | ... | ... | 4 |
| OS035 | 0.035 ^C | 0.025 | 0.050 | 47 ^B | 54 ^B | ... | ... | 7 |
| OS025 | 0.025 | 0.015 | 0.035 | 50 ^B | 61 ^B | 1 | 1 | 17 |
| OS015 | 0.015 ^C | ^D | 0.025 | 54 ^B | 65 ^B | 7 | 7 | 23 |
| Copper Alloy UNS No. C22000 | | | | | | | | |
| OS050 | 0.050 | 0.035 | 0.090 | 50 | 60 | 1 | 1 | 16 |
| OS035 | 0.035 ^C | 0.025 | 0.050 | 54 | 64 | 7 | 7 | 21 |
| OS025 | 0.025 | 0.015 | 0.035 | 58 | 70 | 13 | 13 | 31 |
| OS015 | 0.015 ^C | ^D | 0.025 | 62 | 75 | 19 | 19 | 39 |
| Copper Alloy UNS Nos. C22600, C23000, and C23400 | | | | | | | | |
| OS070 | 0.070 | 0.050 | 0.100 | 53 | 60 | 6 | 6 | 16 |
| OS050 | 0.050 ^C | 0.035 | 0.070 | 56 | 63 | 10 | 10 | 20 |
| OS035 | 0.035 ^C | 0.025 | 0.050 | 58 | 66 | 13 | 13 | 24 |
| OS025 | 0.025 ^C | 0.015 | 0.035 | 60 | 72 | 16 | 16 | 34 |
| OS015 | 0.015 ^C | ^D | 0.025 | 62 | 79 | 19 | 19 | 48 |
| OS010 | 0.010 ^C | ^D | 0.015 | 66 | 83 | 25 | 25 | 50 |
| Copper Alloy UNS No. C24000 | | | | | | | | |
| OS070 | 0.070 | 0.050 | 0.120 | 53 | 64 | 2 | 2 | 21 |
| OS050 | 0.050 ^C | 0.035 | 0.070 | 57 | 67 | 8 | 8 | 27 |
| OS035 | 0.035 ^C | 0.025 | 0.050 | 61 | 72 | 16 | 16 | 35 |
| OS025 | 0.025 ^C | 0.015 | 0.035 | 63 | 77 | 20 | 20 | 42 |
| OS015 | 0.015 ^C | ^D | 0.025 | 66 | 83 | 25 | 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 | 3 | 27 |
| OS050 | 0.050 | 0.035 | 0.070 | 61 | 73 | 20 | 20 | 35 |
| OS035 | 0.035 | 0.025 | 0.050 | 65 | 76 | 25 | 25 | 38 |
| OS025 | 0.025 | 0.015 | 0.035 | 67 | 79 | 27 | 27 | 42 |
| OS015 | 0.015 | ^D | 0.025 | 72 | 85 | 33 | 33 | 50 |

^A 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.

^B 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.

^C 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.

^D 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 ^A | | | | | | | | | |
|---------------------|--------------------|------------------------------------|-----|-----------------------------|-----|---|-----|---|-----|--|-----|
| 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 | 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 ^B | hard | 61 | 68 | 70 | 79 | 83 | 92 | 100 | 110 | 102 | 117 |
| H06 ^{C, D} | extra-hard | 66 | 73 | 78 | 86 | 94 | 102 | 112 | 121 | 115 | 129 |
| H08 ^{E, D} | spring | 72 | ... | 84 | ... | 100 | ... | 116 | ... | 120 | ... |

^A ksi = 1000 psi.

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

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

^D Square wire is not generally available in extra hard or spring tempers.

^E H08 (spring) temper is not generally available in sizes over 1/4 in. 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.

**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 ^A | | | | | | | | | |
|---------------------|--------------------|------------------------------------|-----|-----------------------------------|-----|---|-----|---|-----|---|-----|
| 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 ^B | Hard | 420 | 470 | 485 | 545 | 570 | 635 | 690 | 760 | 705 | 805 |
| H06 ^{C, D} | Extra-hard | 455 | 505 | 540 | 595 | 650 | 700 | 770 | 835 | 795 | 890 |
| H08 ^{E, D} | Spring | 495 | ... | 580 | ... | 690 | ... | 800 | ... | 830 | ... |

^A See Appendix X1.

^B H04 (hard) temper wire is not generally available in sizes over 13 mm in diameter.

^C H06 (extra-hard) temper is not generally available in sizes over 10 mm in diameter.

^D Square wire is not generally available in extra hard or spring tempers.

^E H08 (spring) temper is not generally available in sizes over 6 mm in diameter.

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

TABLE 5 Tensile Strength Requirements and Approximate Rockwell Hardness Values for Rectangular Wire

| Temper Designation | | Tensile Strength, ksi | | Approximate Rockwell Hardness ^A | | | |
|--|--------------------|--------------------------|-----|--|-------------------|----------------------------------|-------------------|
| | | | | B Scale | | Superficial 30-T | |
| Code | Name | Min | Max | 0.020 to 0.036 in. incl | Over 0.036 in. | 0.012 to 0.028 in. incl | Over 0.028 in. |
| Copper Alloy UNS No. C21000 | | | | | | | |
| H01 | quarter-hard | 37 | 47 | 20-48 | 24-52 | 34-51 | 37-54 |
| H02 | half-hard | 42 | 52 | 40-56 | 44-60 | 46-57 | 48-59 |
| H03 | three-quarter-hard | 46 | 56 | 50-61 | 53-64 | 52-60 | 54-62 |
| H04 | hard | 50 | 59 | 57-64 | 60-67 | 57-62 | 59-64 |
| H06 | extra hard | 56 | 64 | 64-70 | 66-72 | 62-66 | 63-67 |
| H08 | spring | 60 | 68 | 68-73 | 70-75 | 64-68 | 65-69 |
| H10 | extra spring | 61 | 69 | 69-74 | 71-76 | 65-69 | 66-70 |
| Copper Alloy UNS No. C22000 | | | | | | | |
| H01 | quarter-hard | 40 | 50 | 27-52 | 31-56 | 38-53 | 41-56 |
| H02 | half-hard | 47 | 57 | 50-63 | 53-66 | 52-61 | 54-63 |
| H03 | three-quarter-hard | 52 | 62 | 59-68 | 62-71 | 58-64 | 60-66 |
| H04 | hard | 57 | 66 | 65-72 | 68-75 | 62-66 | 64-68 |
| H06 | extra hard | 64 | 72 | 72-77 | 74-79 | 67-71 | 68-72 |
| H08 | spring | 69 | 77 | 76-79 | 78-81 | 70-72 | 71-73 |
| H10 | extra spring | 72 | 80 | 78-81 | 80-83 | 71-73 | 72-74 |
| Copper Alloy UNS Nos. C22600 and C23000 | | | | | | | |
| H01 | quarter-hard | 44 | 54 | 33-58 | 37-62 | 42-57 | 45-60 |
| H02 | half-hard | 51 | 61 | 56-68 | 59-71 | 56-64 | 58-66 |
| H03 | three-quarter-hard | 57 | 67 | 66-73 | 69-76 | 63-68 | 65-70 |
| H04 | hard | 63 | 72 | 72-78 | 74-80 | 67-71 | 68-72 |
| H06 | extra hard | 72 | 80 | 78-83 | 80-85 | 70-74 | 71-75 |
| H08 | spring | 78 | 86 | 82-85 | 84-87 | 74-76 | 75-77 |
| H10 | extra spring | 82 | 90 | 84-87 | 86-89 | 75-77 | 76-78 |
| Copper Alloy UNS Nos. C23400 and C24000 | | | | | | | |
| H01 | quarter-hard | 48 | 58 | 38-61 | 42-65 | 42-57 | 45-60 |
| H02 | half-hard | 55 | 65 | 59-70 | 62-73 | 56-64 | 58-66 |
| H03 | three-quarter-hard | 61 | 71 | 69-76 | 72-79 | 63-68 | 65-70 |
| H04 | hard | 68 | 77 | 76-82 | 78-84 | 68-72 | 69-73 |
| H06 | extra hard | 78 | 87 | 83-87 | 85-89 | 72-75 | 73-76 |
| H08 | spring | 85 | 93 | 87-90 | 89-92 | 75-77 | 76-78 |
| H10 | extra spring | 89 | 97 | 88-91 | 90-93 | 76-78 | 77-79 |
| Copper Alloy UNS No. C26000 | | | | | | | |
| H01 | quarter-hard | 49 | 59 | 40-61 | 44-65 | 43-57 | 46-60 |
| H02 | half-hard | 57 | 67 | 60-74 | 63-77 | 56-66 | 58-68 |
| H03 | three-quarter-hard | 64 | 74 | 72-79 | 75-82 | 65-70 | 67-72 |
| H04 | hard | 71 | 81 | 79-84 | 81-86 | 70-73 | 71-74 |
| H06 | extra hard | 83 | 92 | 85-89 | 87-91 | 74-76 | 75-77 |
| H08 | spring | 91 | 100 | 89-92 | 90-93 | 76-78 | 76-78 |
| H10 | extra spring | 95 | 104 | 91-94 | 92-95 | 77-79 | 77-79 |
| Copper Alloy UNS Nos. C27000 and C27400 | | | | | | | |
| H01 | quarter-hard | 49 | 59 | 40-61 | 44-65 | 43-57 | 46-60 |
| H02 | half-hard | 55 | 65 | 57-71 | 60-74 | 54-64 | 56-66 |
| H03 | three-quarter-hard | 62 | 72 | 70-77 | 73-80 | 65-69 | 67-71 |
| H04 | hard | 68 | 78 | 76-82 | 78-84 | 68-72 | 69-73 |
| H06 | extra hard | 79 | 89 | 83-87 | 85-89 | 73-75 | 74-76 |
| H08 | spring | 86 | 95 | 87-90 | 89-92 | 75-77 | 76-78 |
| H10 | extra spring | 90 | 99 | 88-91 | 90-93 | 76-78 | 77-79 |

^A Rockwell hardness values apply as follows: the B scale values apply to metal 0.020 in. and over in thickness, and the 30-T scale values apply to metal 0.012 in. and over in thickness.

TABLE 6 Tensile Strength Requirements and Approximate Rockwell Hardness Values for Rectangular Wire

| Temper Designation | | Tensile Strength, MPa ^A | | Approximate Rockwell Hardness ^B | | | |
|---|--------------------|---------------------------------------|-----|--|----------------|--------------------------|----------------|
| | | | | B Scale | | Superficial 30-T | |
| Code | Name | Min | Max | 0.5 to 0.9 mm incl | Over 0.9 mm | 0.3 to 0.7 mm incl | Over 0.7 mm |
| Copper Alloy UNS No. C21000 | | | | | | | |
| H01 | quarter-hard | 255 | 325 | 20-48 | 24-52 | 34-51 | 37-54 |
| H02 | half-hard | 290 | 360 | 40-56 | 44-60 | 46-57 | 48-59 |
| H03 | three-quarter-hard | 315 | 385 | 50-61 | 53-64 | 52-60 | 54-62 |
| H04 | hard | 345 | 405 | 57-64 | 60-67 | 57-62 | 59-64 |
| H06 | extra hard | 385 | 440 | 64-70 | 66-72 | 62-66 | 63-67 |
| H08 | spring | 415 | 470 | 68-73 | 70-75 | 64-68 | 65-69 |
| H10 | extra spring | 420 | 475 | 69-74 | 71-76 | 65-69 | 66-70 |
| Copper Alloy UNS No. C22000 | | | | | | | |
| H01 | quarter-hard | 275 | 345 | 27-52 | 31-56 | 38-53 | 41-56 |
| H02 | half-hard | 325 | 395 | 50-63 | 53-66 | 52-61 | 54-63 |
| H03 | three-quarter-hard | 360 | 425 | 59-68 | 62-71 | 58-64 | 60-66 |
| H04 | hard | 395 | 455 | 65-72 | 68-75 | 62-66 | 64-68 |
| H06 | extra hard | 440 | 495 | 72-77 | 74-79 | 67-71 | 68-72 |
| H08 | spring | 475 | 530 | 76-79 | 78-81 | 70-72 | 71-73 |
| H10 | extra spring | 495 | 550 | 78-81 | 80-83 | 71-73 | 72-74 |
| Copper Alloy UNS Nos. C22600 and C23000 | | | | | | | |
| H01 | quarter-hard | 305 | 370 | 33-58 | 37-62 | 42-57 | 45-60 |
| H02 | half-hard | 350 | 420 | 56-68 | 59-71 | 56-64 | 58-66 |
| H03 | three-quarter-hard | 395 | 460 | 66-73 | 69-76 | 63-68 | 65-70 |
| H04 | hard | 435 | 495 | 72-78 | 74-80 | 67-71 | 68-72 |
| H06 | extra hard | 495 | 550 | 78-83 | 80-85 | 70-74 | 71-75 |
| H08 | spring | 540 | 595 | 82-85 | 84-87 | 74-76 | 75-77 |
| H10 | extra spring | 565 | 620 | 84-87 | 86-89 | 75-77 | 76-78 |
| Copper Alloy UNS Nos. C23400 and C24000 | | | | | | | |
| H01 | quarter-hard | 330 | 400 | 38-61 | 42-65 | 42-57 | 45-60 |
| H02 | half-hard | 380 | 450 | 59-70 | 62-73 | 56-64 | 58-66 |
| H03 | three-quarter-hard | 420 | 490 | 69-76 | 72-79 | 63-68 | 65-70 |
| H04 | hard | 470 | 530 | 76-82 | 78-84 | 68-72 | 69-73 |
| H06 | extra hard | 540 | 600 | 83-87 | 85-89 | 72-75 | 73-76 |
| H08 | spring | 585 | 640 | 87-90 | 89-92 | 75-77 | 76-78 |
| H10 | extra spring | 615 | 670 | 88-91 | 90-93 | 76-78 | 77-79 |
| Copper Alloy UNS No. C26000 | | | | | | | |
| H01 | quarter-hard | 340 | 405 | 40-61 | 44-65 | 43-57 | 46-60 |
| H02 | half-hard | 395 | 460 | 60-74 | 63-77 | 56-66 | 58-68 |
| H03 | three-quarter-hard | 440 | 510 | 72-79 | 75-82 | 65-70 | 67-72 |
| H04 | hard | 490 | 560 | 79-84 | 81-86 | 70-73 | 71-74 |
| H06 | extra hard | 570 | 635 | 85-89 | 87-91 | 74-76 | 75-77 |
| H08 | spring | 625 | 690 | 89-92 | 90-93 | 76-78 | 76-78 |
| H10 | extra spring | 655 | 715 | 91-94 | 92-95 | 77-79 | 77-79 |
| Copper Alloy UNS Nos. C27000 and C27400 | | | | | | | |
| H01 | quarter-hard | 340 | 405 | 40-61 | 44-65 | 43-57 | 46-60 |
| H02 | half-hard | 380 | 450 | 57-71 | 60-74 | 54-64 | 56-66 |
| H03 | three-quarter-hard | 425 | 495 | 70-77 | 73-80 | 65-69 | 67-71 |
| H04 | hard | 470 | 540 | 76-82 | 78-84 | 68-72 | 69-73 |
| H06 | extra hard | 545 | 615 | 83-87 | 85-89 | 73-75 | 74-76 |
| H08 | spring | 595 | 655 | 87-90 | 89-92 | 75-77 | 76-78 |
| H10 | extra spring | 620 | 685 | 88-91 | 90-93 | 76-78 | 77-79 |

^A See Appendix X1.

^B Rockwell hardness values apply as follows: the B scale values apply to metal 0.5 mm and over in thickness, and the 30-T scale values apply to metal 0.3 mm and over in thickness.



APPENDIX

(Nonmandatory Information)

X1. METRIC EQUIVALENTS

X1.1 The SI unit for strength properties now shown is in accordance with the International System of Units (SI). The derived SI unit for force is the newton (N), which is defined as that force which when applied to a body having a mass of one kilogram gives it an acceleration of one metre per second squared ($N = \text{kg}\cdot\text{m}/\text{s}^2$). The derived SI unit for pressure or

stress is the newton per square metre (N/m^2), which has been named the pascal (Pa) by the General Conference on Weights and Measures. Since $1 \text{ ksi} = 6\,894\,757 \text{ Pa}$, the metric equivalents are expressed as megapascal (MPa), which is the same as MN/m^2 and N/mm^2 .

SUMMARY OF CHANGES

Committee B05 has identified the location of selected changes to this standard since the last issue (B134/B134M – 08) that may impact the use of this standard. (Approved May 1, 2015.)

(1) Addition of two terms in Terminology Section (cast and camber). Also in the Ordering Information, the option is given to specify requirements for camber and cast with actual values to be agreed upon between supplier and customer.

(2) Minor editing such as Test Methods E8/E8M but no changes to any values.

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