



Designation: **B151/B151M—13** **B151/B151M—20**

Standard Specification for Copper-Nickel-Zinc Alloy (Nickel Silver) and Copper-Nickel Rod and Bar¹

This standard is issued under the fixed designation B151/B151M; 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.

1. Scope*

1.1 This specification establishes the requirements for copper-nickel-zinc and copper-nickel rod and bar for general application produced from Copper Alloy UNS Nos. C70600, C70620, C71500, C71520, C74500, C75200, C75700, C76400, C77000, and C79200.

1.1.1 Copper Alloys UNS Nos. C70620 and C71520 are for product intended for welding applications.

1.1.2 *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 ~~may~~ are not ~~be~~ necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other. Combining other, and values from the two systems may result in nonconformance with the standard shall not be combined.

NOTE 1—Requirements for copper-nickel-zinc alloy wire appear in Specification **B206/B206M**.

1.2 *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

B206/B206M Specification for Copper-Nickel-Zinc (Nickel Silver) Wire and Copper-Nickel Alloy Wire

B249/B249M Specification for General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, Shapes and Forgings

B601 Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast

B846 Terminology for Copper and Copper Alloys

B950 Guide for Editorial Procedures and Form of Product Specifications for Copper and Copper Alloys

E75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys (Withdrawn 2010)³

E76 Test Methods for Chemical Analysis of Nickel-Copper Alloys (Withdrawn 2003)³

E478 Test Methods for Chemical Analysis of Copper Alloys

3. General Requirements

3.1 The following sections of Specification **B249/B249M** constitute a part of this specification:

3.1.1 ~~Terminology;~~ Terminology;

3.1.2 ~~Material and Manufacture;~~ Manufacture;

3.1.3 ~~Workmanship, Finish, and Appearance;~~ Appearance;

3.1.4 ~~Sampling;~~ Sampling;

3.1.5 ~~Number of Tests and Retests;~~ Retests;

3.1.6 ~~Specimen Preparation;~~ Preparation;

3.1.7 ~~Test Methods;~~ Methods;

3.1.8 ~~Significance of Numerical Limits;~~ Limits;

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~~ standard's Document Summary page on the ASTM website.

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

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



- 3.1.9 ~~Inspection~~;Inspection;
- 3.1.10 ~~Rejection and Rehearing~~;Rehearing;
- 3.1.11 ~~Certification~~;Certification;
- 3.1.12 ~~Report~~;Report;
- 3.1.13 Packaging and Package ~~Marking~~;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 appearing in ~~Specifications~~Specification **B249/B249M**.

4. Terminology

4.1 For definitions of terms related to copper and copper alloys, refer to Terminology **B846**.

5. Ordering Information

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

- 5.1.1 ASTM designation and year of ~~issue~~ (for example, ~~issue~~:B151/B151M–XX);
- 5.1.2 Copper Alloy UNS No. designation (Section 1););
- 5.1.3 Temper (Section 8 and **Tables 2-6**););
- 5.1.4 Form: cross section such as round, hexagonal, square, and so forth (Section ~~1211~~););
- 5.1.5 Diameter or distance between parallel surfaces, length (Section ~~1211~~););
- 5.1.6 Weight: total for each form, size, and ~~temper~~;temper; and
- 5.1.7 Intended application.

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

- 5.2.1 Heat identification or traceability details (~~Section 4.1~~ (4.1 of Specification **B249/B249M**),
- 5.2.2 Certification (Section 15 of Specification **B249/B249M**),
- 5.2.3 Test report (Section 16 of Specification **B249/B249M**), and
- 5.2.4 When material is purchased for agencies of the U.S. Government (Section 11).

6. Materials and Manufacture

6.1 *Material:*

6.1.1 The material of manufacture as specified in the contract or purchase order, shall be of one of Copper Alloy UNS Nos. C70600, C70620, C71500, C71520, C74500, C75200, C75700, C76400, C77000, or C79200.

7. Chemical Composition

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

7.1.1 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.

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

7.3 For alloys in which zinc is listed as “remainder,” either copper or zinc may be taken as the difference between the sum of all elements determined and 100 %.

7.4 When all elements listed in **Table 1** for a specified alloy are determined, the sum of results shall be 99.5 % minimum.

TABLE 1 Chemical Requirements

Copper Alloy UNS No.	Composition, % max (unless shown as range or min)								
	Copper, Incl Silver	Nickel, Incl Cobalt	Lead	Iron	Manganese	Zinc	Phosphorous	Sulfur	Carbon
C70600	remainder	9.0-11.0	0.05	1.0-1.8	1.0	1.0	...	...	...
C70620	86.5 min	9.0-11.0	0.02	1.0-1.8	1.0	0.50	0.02	0.02	0.05
C71500	remainder	29.0-33.0	0.05	0.40-1.0	1.0	1.0	...	...	...
C71520	65.0 min	29.0-33.0	0.02	0.40-1.0	1.0	0.50	0.02	0.02	0.05
C74500	63.5-66.5	9.0-11.0	0.05	0.25	0.50	remainder	...	...	...
C75200	63.0-66.5	16.5-19.5	0.05	0.25	0.50	remainder	...	...	...
C75700	63.5-66.5	11.0-13.0	0.05	0.25	0.50	remainder	...	...	...
C76400	58.5-61.5	16.5-19.5	0.05	0.25	0.50	remainder	...	...	...
C77000	53.5-56.5	16.5-19.5	0.05	0.25	0.50	remainder	...	...	...
C79200	59.0-66.5	11.0-13.0	0.8-1.4	0.25	0.50	remainder	...	...	...



TABLE 2 Grain Size Requirements for OS (Annealed) Temper Rod and Bar

Copper Alloy UNS No.	Temper Designation	Grain Size, mm		
		Nominal	Minimum	Maximum
All alloys	OS015	0.015	. . .	0.030
All alloys	OS035	0.035	0.025	0.050
C74500, C75200, C75700, C76400, and C77000	OS070	0.070	0.050	0.100

TABLE 3 Tensile Requirements for Copper-Nickel-Zinc Alloy Rod and Bar (Inch-Pound Units)

NOTE 1—SI values are stated in Table 4.

Temper Designation	Diameter or Distance Between Parallel Surfaces, in.	Tensile Strength, ksi			
		Copper Alloy UNS Nos. C75200 and C79200		Copper Alloy UNS Nos. C74500, C75700, C76400, and C77000	
		Min	Max	Min	Max
H01	Rod: round 0.02 to 0.50, incl	60	80	75	95
	Rod: round, hexagonal, octagonal 0.02 to 0.25, incl	80	100	90	110
H04	Over 0.25 to 0.50, incl	70	90	80	100
	Over 0.50 to 1.0, incl	65	85	75	95
	Over 1.0	60	80	70	90
H04	Bar: square, rectangular all sizes	68	88	75	95

TABLE 4 Tensile Requirements for Copper-Nickel-Zinc Alloy Rod and Bar [SI Units]

NOTE 1—Inch-Pound values are stated in Table 3.

Temper Designation	Diameter or Distance Between Parallel Surfaces, mm	Tensile Strength, MPa			
		Copper Alloy UNS Nos. C75200 and C79200		Copper Alloy UNS Nos. C74500, C75700, C76400 and C77000	
		Min	Max	Min	Max
H01	Rod: round 0.5 to 10, incl	415	550	515	655
	Rod: round, hexagonal, octagonal 0.5 to 6.5 incl	550	690	620	760
H04	Over 6.5 to 10, incl	485	620	550	690
	Over 10 to 25, incl	450	590	515	655
	Over 25	415	550	485	620
H04	Bar: square, rectangular all sizes	470	605	515	650

8. Temper

8.1 The standard tempers for products described in this specification and as defined in Classification B601 are: O60, OS015, OS035, OS070, M30, H01, and H04 as given in Tables 2-6.

NOTE 2—The purchaser should confer with the manufacturer or supplier concerning the availability of a specific form and temper.

8.2 Other tempers, and tempers for other products, including shapes, shall be subject to agreement between the manufacturer and the purchaser.

9. Grain Size of Annealed Tempers

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