



Designation: B151/B151M – 05

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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

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 The values stated in either inch-pound or SI 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 nonconformance with the standard.

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

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

E75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys

E76 Test Methods for Chemical Analysis of Nickel-Copper Alloys³

E478 Test Methods for Chemical Analysis of Copper Alloys

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³ Withdrawn.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

3. General Requirements

3.1 The following sections of Specifications B249/B249M are a part of this specification:

- 3.1.1 Terminology,
- 3.1.2 Material and Manufacture,
- 3.1.3 Workmanship, Finish, and Appearance,
- 3.1.4 Sampling,
- 3.1.5 Specimen Preparation,
- 3.1.6 Test Methods,
- 3.1.7 Inspection,
- 3.1.8 Certification,
- 3.1.9 Report,
- 3.1.10 Packaging and Package Marking, and
- 3.1.11 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 which supplement those appearing in Specifications 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 information in the contract or purchase order:

- 5.1.1 ASTM designation and year of issue (for example, B151/B151M – XX),
- 5.1.2 Copper Alloy UNS No. designation (Section 1),
- 5.1.3 Temper (Section 8 and Tables 2-5),
- 5.1.4 Form: cross section such as round, hexagonal, square, and so forth (Section 12),
- 5.1.5 Diameter or distance between parallel surfaces, length (Section 12),
- 5.1.6 Weight: total for each form, size, and temper, and
- 5.1.7 When material is purchased for agencies of the U.S. government (Section 11).

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

- 5.2.1 Heat identification or traceability detail,
- 5.2.2 Certification, and

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

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	0.02	0.02	...
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

Temper Designation	Diameter or Distance Between Parallel Surfaces, in. [mm]	Tensile Strength, ksi [MPa] ^A			
		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 [0.5 to 10], incl	60 [415]	80 [550]	75 [515]	95 [655]
H04	Rod: round, hexagonal, octagonal				
	0.02 to 0.25 [0.5 to 6.5], incl	80 [550]	100 [690]	90 [620]	110 [760]
	Over 0.25 to 0.50 [6.5 to 10], incl	70 [485]	90 [620]	80 [550]	100 [690]
H04	Over 0.50 to 1.0 [10 to 25], incl	65 [450]	85 [590]	75 [515]	95 [655]
	Over 1.0 [25]	60 [415]	80 [550]	70 [485]	90 [620]
	Bar: square, rectangular all sizes	68 [470]	88 [605]	75 [515]	95 [650]

5.2.3 Test report.

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 shall conform to the chemical compositional requirements prescribed in **Table 1** for the Copper Alloy UNS No. designation specified in the contract or purchase order.

7.1.1 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 and the purchaser.

7.2 For copper alloys in which zinc or copper is specified as the remainder, zinc or copper may be taken as the difference between the sum of results for all elements determined and 100 %.

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

8. Temper

8.1 The standard tempers available under this specification and as defined in Classification **B601** are: O60, OS015, OS035, OS070, M30, H01, and H04 are given in **Tables 2-5**.

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:

9.1.1 Product in the OS temper shall conform to the grain size requirement prescribed in **Table 2** for the specified copper alloy and temper.

9.1.2 Grain size shall be the basis for acceptance or rejection for OS temper product produced from Copper Alloy UNS Nos. C74500, C75200, C75700, C76400, C77000, and C79200.

10. Mechanical Property Requirements

10.1 Tensile Strength Requirement:

10.1.1 Copper-Nickel-Zinc Alloys UNS Nos. C74500, C75200, C75700, C76400, C77000, and C79200 in Tempers H01 and H04 shall conform to the requirement prescribed in **Table 3** for the specified shape and size and the tensile strength shall be the basis of acceptance or rejection for product in these tempers.

10.1.2 Copper-Nickel Alloys UNS Nos. C70600, C70620, C71500, and C71520 in Tempers H01, H04, M30, and O60 shall conform to the requirement prescribed in **Tables 4 and 5** for the specified shape and size, and the tensile properties shall be the basis of acceptance or rejection for all tempers.