



Designation: B 453/B 453M – 01

## Standard Specification for Copper-Zinc-Lead Alloy (Leaded-Brass) Rod, Bar, and Shapes<sup>1</sup>

This standard is issued under the fixed designation B 453/B 453M; 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.

*This standard has been approved for use by agencies of the Department of Defense.*

### 1. Scope \*

1.1 This specification establishes the requirements for copper-zinc-lead alloy (leaded-brass) rod, bar, wire, and shapes produced from Copper Alloys UNS Nos. C33500, C34000, C34500, C35000, C35300, and C35600. These alloys have nominal composition given in Table 1.

1.1.1 This product is suitable for applications requiring extensive machining before such cold-forming operations as swaging, flaring, severe knurling, or thread rolling.

1.1.2 Typically, product made to this specification is furnished as straight lengths. Sizes ½ in. [12 mm] and under may be furnished as wire in coils or on reels when requested.

1.2 The values stated in either inch-pound units or SI units are to be regarded separately as the standard. Within the text, the SI units are shown in brackets. The values stated in each system are not 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—Refer to Specifications B 16/B 16M and B 140/B 140M for copper-zinc-lead (leaded-brass) rod and bar for screw machine applications.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

2.1.1 The following documents in the current *Book of Standards* form a part of this specification to the extent referenced herein:

B 16/B 16M Specification for Free-Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines<sup>2</sup>

B 140/B 140M Specification for Copper-Zinc-Lead (Leaded Red Brass or Hardware Bronze) Rod, Bar, and Shapes<sup>2</sup>

B 249 Specification for General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, Shapes, and Forgings<sup>2</sup>

B 249M Specification for General Requirements for

<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, Shapes, and Forgings.

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

TABLE 1 Nominal Composition, %

Copper Alloy UNS No.	Copper	Zinc	Lead
C33500	63.5	36.0	0.5
C34000	63.5	35.4	1.1
C34500	63.5	34.5	2.0
C35000	62.0	36.6	1.4
C35300	62.0	36.0	2.0
C35600	61.5	36.0	2.5

Wrought Copper and Copper-Alloy Rod, Bar, Shapes, and Forgings [Metric]<sup>2</sup>

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 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials<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 249, B 249M, B 250, and B 250M are 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,

<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.

- 3.1.11 Certification,
- 3.1.12 Test Report,
- 3.1.13 Packaging and Package Marking, and
- 3.1.14 Supplementary Requirements.

3.2 In addition, when a section with a title identical to one of those referenced in 3.1 appears in this specification, it contains additional requirements which supplement those appearing in Specifications B 249, B 249M, 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 (for example, B 453/B 453M – 01),
  - 4.1.2 Copper Alloy UNS Number designation,
  - 4.1.3 Product (rod, bar, wire, or shape),
  - 4.1.4 Cross section (round, hexagonal, square, and so forth),
  - 4.1.5 Temper,
  - 4.1.6 Dimensions (diameter or distance between parallel surfaces),
  - 4.1.7 How furnished: straight lengths, coils, or reels,
  - 4.1.8 Length,
  - 4.1.9 Total length or number of pieces of each size,
  - 4.1.10 Weight: total for each form, and size, and
  - 4.1.11 When product is purchased for agencies of the U.S. government.

4.2 The following are options and should be specified in the ordering information when required:

- 4.2.1 Tensile test for product ½ in. [12 mm] and over in diameter or distance between parallel surfaces,
- 4.2.2 Certification, and
- 4.2.3 Mill test report.

#### 5. Chemical Composition

5.1 The material shall conform to the chemical composition requirements in Table 2 for the Copper Alloy UNS No. designation specified in the ordering information.

5.1.1 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. For copper alloys in which zinc is listed as the “remainder,” either copper or zinc may be taken as the difference between the sum of all elements determined and 100 %. When copper is so determined, that difference value shall conform to the requirements given in Table 2.

5.2 When all the named elements in Table 2 for the specified alloy are determined, the sum of results shall be as follows:

**TABLE 2 Chemical Requirements**

Copper Alloy UNS No.	Composition, %			
	Copper	Lead	Iron	Zinc
C33500	62.0–65.0	0.25–0.7	0.15 max	remainder
C34000	62.0–65.0	0.8–1.5	0.15 max	remainder
C34500	62.0–65.0	1.5–2.5	0.15 max	remainder
C35000	61.0–63.0	0.8–2.0	0.15 max	remainder
C35300	61.0–63.0	1.5–2.5	0.15 max	remainder
C35600	60.0–63.0	2.0–3.0	0.15 max	remainder

Copper Alloy UNS No.

Percent, min

C33500, C34000, C34500, C35000  
C35300, C35600

99.6  
99.5

#### 6. Temper

6.1 The standard tempers for products described in this specification are given in Tables 3 and 4.

- 6.1.1 O60 (soft annealed),
- 6.1.2 H01 (¼ hard), and
- 6.1.3 H02 (½ hard).

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

#### 7. Mechanical Property Requirement

##### 7.1 Rockwell Hardness Requirements:

7.1.1 Product with a diameter or distance between parallel surfaces of ½ in. [12 mm] and over shall conform to the requirements of Table 3 when tested in accordance with Test Methods E 18.

7.1.1.1 Rockwell hardness test results shall be the basis for product acceptance for mechanical properties except when tensile test is so specified in the ordering information (4.2.1).

##### 7.2 Tensile Strength Requirements:

**TABLE 3 Hardness Requirements<sup>A</sup>**

Temper		Diameter or Distance Between Parallel Surfaces, in. [mm]	Rockwell B Hardness Determined on the Cross Section Midway Between Surface and Center
Code	Name		
Rod and Wire			
O60	soft anneal	½ [12] and over	45 max
H01	¼ hard	½ [12] to 1, both incl over 1 [25] to 2 [50], incl over 2 [50]	50–75 40–70 35–65
H02	½ hard	½ [25] to 1 [50], both incl over 1 [25] to 2 [50], incl over 2 [50]	60–80 55–75 40–70
Bar <sup>B</sup>			
O60	soft anneal	½ [12] and over	35 max
H01	¼ hard	½ [12] to 1, both incl over 1 [25] to 2 [50], incl over 2 [50]	45–75 35–70 35–65
H02	½ hard	½ [25] to 1 [50], both incl over 1 [25] to 2 [50], incl over 2 [50]	45–85 40–80 35–70

<sup>A</sup>Rockwell hardness requirements are not established for diameters less than ½ in. [12 mm].

<sup>B</sup>For rectangular bar, the Distance Between Parallel Surfaces refers to thickness.