



Designation: B 150/B 150M – 03

Standard Specification for Aluminum Bronze Rod, Bar, and Shapes¹

This standard is issued under the fixed designation B 150/B 150M; 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 aluminum bronze rod, bar, and shapes for Copper Alloys UNS Nos. C61300, C61400, C61900, C62300, C62400, C63000, C63020, C63200, C64200, and C64210.

NOTE 1—Product intended for hot forging is described in Specification B 124/B 124M.

NOTE 2—**Warning**—Mercury is a definite health hazard in use and in disposal.

1.2 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.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

B 124/B 124M Specification for Copper and Copper Alloy Forging Rod, Bar and Shapes²

B 154 Test Method for Mercurous Nitrate Test for Copper and Copper Alloys²

B 249/B 249M Specification for General Requirements for Wrought Copper and Copper Alloy Rod, Bar and Forgings²

B 601 Practice for Temper Designations for Copper and Copper Alloys—Wrought and Cast²

B 858 Test Method for Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys²

E 8 Test Methods for Tension Testing of Metallic Materials³

E 8M Test Methods for Tension Testing of Metallic Materials [Metric]³

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials³

E 53 Test Methods for Chemical Analysis of Copper⁴

E 62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods)⁴

E 118 Test Methods for Chemical Analysis of Copper—Chromium Alloys⁴

E 478 Test Methods for Chemical Analysis of Copper Alloys⁴

3. General Requirements

3.1 The following sections of Specifications B 249/B 249M 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 Reheating,

3.1.11 Certification,

3.1.12 Mill Test Report,

3.1.13 Packaging and Package Marking, Preservation and Delivery, and

3.1.14 Supplementary Requirements.

3.2 In addition, when a section with a title identical to those referenced in 3.1, appears in this specification, it contains additional requirements that supplement those appearing in Specification B 249/B 249M.

4. Ordering Information

4.1 Include the following information when placing orders for product under this specification:

4.1.1 ASTM specification designation and year of issue (B 150/B 150M - 02),

4.1.2 Copper alloy UNS No. (See Table 1),

4.1.3 Temper (see Temper section),

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 Annual Book of ASTM Standards, Vol 02.01.

³ Annual Book of ASTM Standards, Vol 03.01.

⁴ Annual Book of ASTM Standards, Vol 03.05.

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

TABLE 1 Chemical Requirements

Elements	Composition, %										
	C61300	C61400	C61900	C62300	Copper Alloy UNS No. C62400		C63020	C63200	C64200	C64210	
Aluminum	6.0–7.5	6.0–8.0	8.5–10.0	8.5–10.0	10.0–11.5	9.0–11.0	10.0–11.0	8.7–9.5	6.3–7.6	6.3–7.0	
Copper, incl silver	remainder	remainder	remainder	remainder	remainder	remainder	74.5 min	remainder	remainder	remainder	
Iron	2.0–3.0	1.5–3.5	3.0–4.5	2.0–4.0	2.0–4.5	2.0–4.0	4.0–5.5	3.5–4.3 ^A	0.30 max	0.30 max	
Nickel, incl cobalt	0.15 max	...	...	1.0 max	...	4.0–5.5	4.2–6.0	4.0–4.8 ^A	0.25 max	0.25 max
Manganese	0.20 max	1.0 max	...	0.50 max	0.30 max	1.5 max	1.5 max	1.2–2.0	0.10 max	0.10 max	
Silicon	0.10 max	...	...	0.25 max	0.25 max	0.25 max	...	0.10 max	1.5–2.2	1.5–2.0
Tin	0.20–0.50	...	0.6 max	0.6 max	0.20 max	0.20 max	0.25 max	...	0.20 max	0.20 max	
Zinc, max	0.10 ^B	0.20	0.8	...	...	0.30	0.30	...	0.50	0.50
Lead, max	0.01	0.01	0.02	...	...	...	0.03	0.02	0.05	0.05
Arsenic, max	...	...	...	...	...	...	...	...	0.15	0.15
Phosphorus, max	0.015	0.015	...	...	...	...	...	...	...	...
Other named elements ^B							c				

^A Iron content shall not exceed nickel content.

^B When the product is for subsequent welding applications and is so specified by the purchaser, chromium shall be 0.05 % max, cadmium 0.05 % max, zirconium 0.05 % max, and zinc 0.05 % max.

^C Chromium shall be 0.05 max and cobalt shall be 0.20 max.

4.1.3.1 When Alloy UNS No. C63000 is specified, specify standard strength or high strength temper,

4.1.4 Product cross-section (for example round, hexagonal, square, and so forth),

4.1.5 Dimensions (diameter or distance between parallel surfaces and length) and permissible variations (Section 10),

4.1.5.1 When product of Copper Alloy UNS No. C63020 is specified, the tolerances for diameter, thickness, width, and length shall be part of the contract or purchase order and shall be agreed upon between the supplier and the purchaser.

4.1.5.2 *Shapes*—When product is shapes, the dimensional tolerances shall be as agreed upon between the manufacturer and the purchaser and shall be specified.

4.1.6 Quantity, total weight, footage, or number of pieces for each size.

4.1.7 When product is purchased for agencies of the U.S. government.

4.2 The following options are available and should be specified at the time of placing orders when required:

4.2.1 If the material is intended for welding applications,

4.2.2 Certification,

4.2.3 Mill test reports,

4.2.4 Mercurous Nitrate Test, (see 9.1),

4.2.5 Ammonia Vapor Test, (see 9.2),

4.2.6 If piston finish is required, (see 9.3), and

4.2.7 When tensile test is required for alloys with hardness requirements in Table 3 (see 8.1.1.1).

5. Materials and Manufacture

5.1 *Copper Alloy UNS C63020*—Rod and Bar shall be heat-treated to 26 Rockwell hardness (C scale) (HRC) minimum as follows:

5.1.1 Heat to 1550°/1650°F [850/900°C] for 2 h minimum and quenched in water.

5.1.2 Temper at 900°/1000°F [480/540°C] for 2 h minimum and air cool to room temperature.

5.2 *Copper Alloy UNS C63200*—Rod and Bar shall be heat-treated as follows:

5.2.1 Heat to 1550°F [850°C] minimum for 1 h minimum at temperature and quench in water or other suitable medium,

5.2.2 Temper anneal at 1300 ± 25°F [700 ± 15°C] for 3 to 9 h at temperature as required to obtain desired mechanical properties, and

5.2.3 Heat treatment is not mandatory for sections that exceed 12 in. [300 mm] in diameter or thickness.

6. Chemical Composition

6.1 The material shall conform by alloy to the chemical composition requirements specified in Table 1.

6.1.1 Copper, when specified as the remainder and not determined directly, shall be taken as the difference between the sum of all elements with limiting values analyzed and 100 %.

6.2 The sum of specified elements, when analyzed, shall be 99.5 % minimum for all alloys except C61300 which shall be 99.8 % min.

6.3 These specification limits do not preclude the presence of other elements. Limits for unnamed elements may be established by agreement between the manufacturer and the purchaser.

7. Temper

7.1 Tempers available under this specification, and as defined in Practice B 601, and HR50, M10, M20, M30, O20, O25, O30, O32, TQ30, TQ50 and TQ55.

8. Mechanical Property Requirements

8.1 The product shall conform to the mechanical property requirements given in Table 2 and Table 3 for the Copper Alloy UNS No. designation specified in the ordering information.

8.1.1 *Rockwell Hardness*—For the alloys and tempers listed, product 0.5 in. [12 mm] and over in diameter or distance between parallel surfaces shall conform with the requirements given in Table 3, when tested in accordance with Test Methods E 18.

TABLE 2 Tensile Requirements

Temper Designation		Diameter or Distance Between Parallel Surfaces, ^A in. [mm]	Tensile Strength, min ksi [MPa]	Yield Strength, min ksi [MPa], at 0.5 % Extension Under Load	Elongation in 4 × Diameter or Thickness of Specimen min, % ^B
Code	Name				
Copper Alloy UNS No. C61300					
HR50	drawn and stress relieved	<i>rod (round only):</i> ½ [12] and under over ½ [12] to 1 [25], incl over 1 [25] to 2.0 [50] incl over 2 [50] to 3 [80], incl	80 [550] 75 [515] 72 [495] 70 [485]	50 [345] 45 [310] 40 [275] 35 [240]	30 30 30 30
HR50	drawn and stress relieved	<i>rod (hexagonal and octagonal) and bar:</i> ½ [12] and under over ½ [12] to 1 [25], incl over 1 [25] to 2 [50], incl	80 [550] 75 [515] 70 [485]	40 [275] 35 [240] 32 [220]	30 30 30
Copper Alloy UNS No. C61400					
HR50	drawn and stress relieved	<i>rod (round only):</i> ½ [12] and under over ½ [12] to 1 [25], incl over 1 [25] to 2 [50], incl over 2 [50] to 3 [80], incl	80 [550] 75 [515] 70 [485] 70 [485]	40 [275] 35 [240] 32 [220] 30 [205]	30 30 30 30
Copper Alloy UNS No. C61900					
HR50	drawn and stress relieved	<i>rod (round only):</i> ½ [12] and under over ½ [12] to 1 [25], incl over 1 [25] to 2 [50], incl over 2 [50] to 3 [80], incl	90 [620] 88 [605] 85 [585] 78 [540]	50 [345] 44 [305] 40 [275] 37 [255]	15 15 20 25
M20	as hot rolled	over 3 [80]	75 [515]	30 [205]	20
M20 M30 O20 O25 O30 HR50	as hot rolled as hot extruded hot forged and annealed hot rolled and annealed hot extruded and annealed drawn and stress relieved	<i>shapes, all sizes</i>	75 [515]	30 [205]	20
Copper Alloy UNS No. C62300					
HR50	drawn and stress relieved	<i>rod (round only):</i> ½ [12] and under over ½ [12] to 1 [25], incl over 1 [25] to 2 [50], incl over 2 [50] to 3 [80], incl	90 [620] 88 [605] 84 [580] 76 [525]	50 [345] 44 [305] 40 [275] 37 [255]	12 15 15 20
M20 M30 O20 O25 O30 HR50 HR50	as hot rolled as hot extruded hot forged and annealed hot rolled and annealed hot extruded and annealed drawn and stress relieved drawn and stress relieved	over 3 [80]	75 [515]	30 [205]	20
HR50	drawn and stress relieved	<i>rod (hexagonal and octagonal) and bar:</i> 1 [25] and under over 1 [25] to 2 [50], incl	80 [550] 78 [540]	35 [240] 32 [220]	15 15
M20	as hot rolled	over 2 [50]	75 [515]	30 [205]	20
M20 M30 O20 O25 O30 HR50	as hot rolled as hot extruded hot forged and annealed hot rolled and annealed hot extruded and annealed drawn and stress relieved	<i>shapes, all sizes</i>	75 [515]	30 [205]	20
Copper Alloy UNS No. C62400					
HR50	drawn and stress relieved	<i>rod (round only):</i> ½ [12] and under over ½ [12] to 1 [25], incl over 1 [25] to 2 [50], incl over 2 [50] to 3 [80], incl	95 [655] 95 [655] 90 [620] 90 [620]	45 [310] 45 [310] 43 [295] 40 [275]	10 12 12 12
M20 M30	as hot rolled as hot extruded	over 3 [80] to 5 [125] incl	90 [620]	35 [240]	12