Designation: B150/B150M – 19

Standard Specification for Aluminum Bronze Rod, Bar, and Shapes[1]

This standard is issued under the fixed designation B150/B150M; 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 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 B124/B124M.

NOTE 2—**Warning—**Mercury has been designated by many regulatory agencies as a hazardous substance that can cause serious medical issues. Mercury, or its vapor, has been demonstrated to be hazardous to health and corrosive to materials. Use caution when handling mercury and mercury-containing products. See the applicable product Safety Data Sheet (SDS) for additional information. The potential exists that selling mercury or mercury-containing products, or both, is prohibited by local or national law. Users must determine legality of sales in their location.

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 are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

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, health, and environmental practices and determine the applicability of regulatory requirements prior to use.*

1.4 *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]

B124/B124M Specification for Copper and Copper Alloy Forging Rod, Bar, and Shapes

B154 Test Method for Mercurous Nitrate Test for Copper Alloys

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

B858 Test Method for Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys

E8/E8M Test Methods for Tension Testing of Metallic Materials

E18 Test Methods for Rockwell Hardness of Metallic Materials

E53 Test Method for Determination of Copper in Unalloyed Copper by Gravimetry

E62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods) (Withdrawn 2010)[3]

E118 Test Methods for Chemical Analysis of Copper-Chromium Alloys (Withdrawn 2010)[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;
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;
3.1.11 Certification;
3.1.12 Mill Test Report;
3.1.13 Packaging and Package Marking, Preservation and Delivery; and

[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] 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**

3.1.14 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 B249/B249M.

4. Ordering Information

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

4.1.1 Specification designation and year of issue,

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

4.1.3 Temper (see Temper section),

4.1.3.1 When Alloy UNS No. C63000 is specified, specify standard strength or high strength temper (See Table 2),

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 If product is being purchased for agencies of the U.S. government.

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

4.2.1 If Copper Alloy C61300 material is intended for subsequent welding applications (See Note B, Table 2),

4.2.2 Certification,

4.2.3 Mill test reports,

4.2.4 Residual stress test (Performance Requirements section)

4.2.4.1 Ammonia Vapor Test or Mercurous Nitrate Test,

4.2.4.2 For Ammonia Vapor Test, pH value other than 10.

4.2.5 If piston finish or shafting is required, (Workmanship, Finish, and Appearance section), and

4.2.6 When tensile test is required for alloys with hardness requirements in Table 3 (see 8.2.1).

5. Materials and Manufacture

5.1 *Manufacture:*

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

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

5.1.3 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 in Table 1 for the copper alloy UNS designation specified in the ordering information.

6.2 For alloys in which copper is listed as "remainder," copper is the difference between the sum of all elements determined and 100 %.

TABLE 1 Chemical Requirements

Elements	Composition, %									
	Copper Alloy UNS No.									
	C61300	C61400	C61900	C62300	C62400	C63000	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	. . .		. . .	. . .	. . .	. . .	. . .	. . .	0.09	0.09
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.

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	*rod (round only):*			
		½ [12] and under	80 [550]	50 [345]	30
		over ½ [12] to 1 [25], incl	75 [515]	45 [310]	30
		over 1 [25] to 2.0 [50] incl	72 [495]	40 [275]	30
		over 2 [50] to 3 [80], incl	70 [485]	35 [240]	30
HR50	drawn and stress relieved	*rod (hexagonal and octagonal) and bar:*			
		½ [12] and under	80 [550]	40 [275]	30
		over ½ [12] to 1 [25], incl	75 [515]	35 [240]	30
		over 1 [25] to 2 [50], incl	70 [485]	32 [220]	30
		Copper Alloy UNS No. C61400			
HR50	drawn and stress relieved	*rod (round only):*			
		½ [12] and under	80 [550]	40 [275]	30
		over ½ [12] to 1 [25], incl	75 [515]	35 [240]	30
		over 1 [25] to 2 [50], incl	70 [485]	32 [220]	30
		over 2 [50] to 3 [80], incl	70 [485]	30 [205]	30
		Copper Alloy UNS No. C61900			
HR50	drawn and stress relieved	*rod (round only):*			
		½ [12] and under	90 [620]	50 [345]	15
		over ½ [12] to 1 [25], incl	88 [605]	44 [305]	15
		over 1 [25] to 2 [50], incl	85 [585]	40 [275]	20
		over 2 [50] to 3 [80], incl	78 [540]	37 [255]	25
M20	as hot rolled	over 3 [80]	75 [515]	30 [205]	20
M20	as hot rolled	*shapes, all sizes*	75 [515]	30 [205]	20
M30	as hot extruded				
O20	hot forged and annealed				
O25	hot rolled and annealed				
O30	hot extruded and annealed				
HR50	drawn and stress relieved				
		Copper Alloy UNS No. C62300			
HR50	drawn and stress relieved	*rod (round only):*			
		½ [12] and under	90 [620]	50 [345]	12
		over ½ [12] to 1 [25], incl	88 [605]	44 [305]	15
		over 1 [25] to 2 [50], incl	84 [580]	40 [275]	15
		over 2 [50] to 3 [80], incl	76 [525]	37 [255]	20
M20	as hot rolled	over 3 [80]	75 [515]	30 [205]	20
M30	as hot extruded				
O20	hot forged and annealed				
O25	hot rolled and annealed				
O30	hot extruded and annealed				
HR50	drawn and stress relieved				
HR50	drawn and stress relieved	*rod (hexagonal and octagonal) and bar:*			
		1 [25] and under	80 [550]	35 [240]	15
		over 1 [25] to 2 [50], incl	78 [540]	32 [220]	15
M20	as hot rolled	over 2 [50]	75 [515]	30 [205]	20
M20	as hot rolled	*shapes, all sizes*	75 [515]	30 [205]	20
M30	as hot extruded				
O20	hot forged and annealed				
O25	hot rolled and annealed				
O30	hot extruded and annealed				
HR50	drawn and stress relieved				
		Copper Alloy UNS No. C62400			
HR50	drawn and stress relieved	*rod (round only):*			
		½ [12] and under	95 [655]	45 [310]	10
		over ½ [12] to 1 [25], incl	95 [655]	45 [310]	12
		over 1 [25] to 2 [50], incl	90 [620]	43 [295]	12
		over 2 [50] to 3 [80], incl	90 [620]	40 [275]	12
M20	as hot rolled	over 3 [80] to 5 [125] incl	90 [620]	35 [240]	12
M30	as hot extruded				
O20	hot forged and annealed	*rod (hexagonal and octagonal) and bar:*			
O25	hot rolled and annealed				
O30	hot extruded and annealed	½ [12] to 5 [125], incl	90 [620]	35 [240]	12
		shapes, all sizes	90 [620]	35 [240]	12