



Designation: B 21 – 96

AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Specification for Naval Brass Rod, Bar, and Shapes¹

This standard is issued under the fixed designation B 21; 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 naval brass rod, bar, and shapes produced from Copper Alloys UNS No. C46200, C46400, C47940, C48200, or C48500.

1.1.1 For piston-finish rod or shafting refer to Section 9.

1.2 This specification is the companion to SI Specification B 21M; therefore no SI equivalents are shown.

1.3 **Warning**—Mercury is a definite health hazard in use and disposal (see 7.1).

NOTE 1—For hot forging material, refer to Specification B 124.

2. Referenced Documents

2.1 *ASTM Standards:*

B 124 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 Specification for General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, and Shapes²

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

E 8 Test Methods for Tension Testing of Metallic Materials³

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

E 478 Test Methods for Chemical Analysis of Copper Alloys⁴

3. Ordering Information

3.1 Orders for product under this specification are to include the following information:

3.1.1 ASTM designation and year of issue,

3.1.2 Copper Alloy UNS No. designation (Section 1.1),

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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.

3.1.3 Temper (Section 5),

3.1.4 Form: cross-section such as round, hexagonal, square, etc.,

3.1.5 Diameter or distance between parallel surfaces (Section 10.2),

3.1.6 Length (Section 10.4),

3.1.7 Edge contours (Section 10.6),

3.1.8 Number of pieces or total weight, for each size and form, and

3.1.9 When product is specified for agencies of the U.S. Government (Section 9).

3.2 The following are options available under this specification and are to be specified in the contract or purchase order when required:

3.2.1 Mercurous Nitrate Test (Section 7),

3.2.2 Piston finish rod or shafting (Section 8),

3.2.3 Certification (Specification B 249), and

3.2.4 Mill test report (Specification B 249).

4. Chemical Composition

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

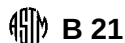
4.2 These composition limits do not preclude the presence of other elements. Limits may be established and analysis required for unnamed elements by agreement between the manufacturer or supplier, and purchaser.

4.3 For copper alloys in which zinc is specified as the remainder, either copper or zinc is permitted to be taken as the difference between the sum of results determined for all elements analyzed and 100 %. When copper is so determined, that difference value shall conform to the requirements given in Table 1.

4.4 When all elements listed in Table 1 for the Copper Alloy UNS No. specified in the ordering information are analyzed, the sum of results shall be 99.6 % minimum.

5. Temper

5.1 Tempers, as defined in Practice B 601, available under this specification are shown in Table 2.



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TABLE 1 Chemical Requirements

Element, %	Copper Alloy UNS No.				
	C46200	C46400	C47940	C48200	C48500
Copper	62.0–65.0	59.0–62.0	63.0–66.0	59.0–62.0	59.0–62.0
Tin	0.50–1.0	0.50–1.0	1.2–2.0	0.50–1.0	0.50–1.0
Lead	0.20 max	0.20 max	1.0–2.0	0.40–1.0	1.3–2.2
Zinc	remainder	remainder	remainder	remainder	remainder
Iron	0.10 max	0.10 max	0.10–1.0	0.10 max	0.10 max
Nickel	...	...	0.10–0.50	...	...

TABLE 2 Tensile Requirements

Temper Designation		Diameter or Distance Between Parallel Surfaces, in.	Tensile Strength, min, ksi	Yield Strength at 0.5 % Extension Under Load, min, ksi	Elongation in 4 × Diameter of Thickness of Specimen, min, % ^A
Standard	Former				
Copper Alloy UNS No. C46200					
M30	as-hot extruded	all forms, all sizes	50	20	30
O60	soft anneal	rods and bars, all sizes	48	16	30
O50	light anneal	rods and bars:			
		0.500 and under	58	27	22
		over 0.500 to 1.000, incl	56	27	25
		over 1.000 to 2.000, incl	54	26	25
		over 2.000 to 3.000, incl	52	25	27
		over 3.000 to 4.000, incl	50	22	30
		over 4.000	50	20	30
H60	cold heading, forming	rods, all sizes	48	18	22
H02	half-hard	rods and bars:			
		0.500 and under	58	27	22
		over 0.500 to 1.000, incl	56	27	25
		over 1.000 to 2.000, incl	54	26	25
		over 2.000 to 3.000, incl	52	25	27
		over 3.000 to 4.000, incl	50	22	30
		over 4.000	50	20	30
H04	hard	rods and bars:			
		0.500 and under	64	40	13
		over 0.500 to 1.000, incl	62	38	13
		over 1.000 to 2.000, incl	58	34	18
Copper Alloy UNS No. C46400					
M30	as-hot extruded	all forms, all sizes	52	20	30
O60	soft anneal	rods and bars:			
		1.000 and under	54	20	30
		over 1.000 to 2.000, incl	52	20	30
		over 2.000	50	20	30
		shapes, all sizes	52	20	30
O50	light anneal	rods and bars:			
		0.500 and under	60	27	22
		over 0.500 to 1.000, incl	60	27	25
		over 1.000 to 2.000, incl	58	26	25
		over 2.000 to 3.000, incl	54	25	25
		over 3.000 to 4.000, incl	54	22	27
		over 4.000	54	22	30
H50 ^B	extruded and drawn ^B	shapes, all sizes	58	25	20
H02	half-hard	rods and bars:			
		0.500 and under	60	27	22
		over 0.500 to 1.000, incl	60	27	25
		over 1.000 to 2.000, incl	58	26	25
		over 2.000 to 3.000, incl	54	25	25
		over 3.000 to 4.000, incl	54	22	27
		over 4.000	54	22	30
H04	hard	rods and bars:			
		1.000 and under	67	45	13
		over 1.000 to 2.000, incl	62	37	18
Copper Alloy UNS No. C47940					
M30	as-hot extruded	all forms, all sizes	50	20	30
O60	soft anneal	rods and bars, all sizes	48	20	30
O50	light anneal	rods and bars:			
		0.500 and under	58	30	18
		over 0.500 to 1.000, incl	56	30	20
		over 1.000 to 2.000, incl	54	25	22
		over 2.000	50	25	25
H50 ^B	extruded and drawn ^B	shapes, all sizes	56	25	20
H02	half-hard	rods and bars:			