



Designation: B 36/B 36M – 01

Standard Specification for Brass Plate, Sheet, Strip, And Rolled Bar¹

This standard is issued under the fixed designation B 36/B 36M; 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 brass plate, sheet, strip, and rolled bar of the following alloys:²

Copper Alloy UNS No.	Previously Used Designation	Nominal Composition	
		Copper, %	Zinc, %
C21000	1	95	5
C22000	2	90	10
C22600	...	87.5	12.5
C23000	3	85	15
C24000	4	80	20
C26000	6	70	30
C26800	8	66	34
C27200	9	63	37
C28000	...	60	40

1.2 The values stated in either inch-pound units 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 two systems may result in nonconformance with the standard.

2. Referenced Documents

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

2.2 ASTM Standards:

B 248 Specification for Requirements for Wrought Copper and Copper Alloy Plate, Sheet, Strip, and Rolled Bar³

B 248M Specification for Requirements for Wrought Copper and Copper Alloy Plate, Sheet, Strip, and Rolled Bar [Metric]³

B 601 Practice for Temper Designations for Copper and Copper Alloys—Wrought and Cast³

B 846 Standard Terminology for Copper and Copper Alloys³

E 8 Test Methods for Tension Testing of Metallic Materials⁴

E 8M Test Methods for Tension Testing of Metallic Materials [Metric]⁴

E 112 Test Methods for Determining Grain Size⁴

E 478 Test Methods for Chemical Analysis of Copper Alloys⁵

3. General Requirements

3.1 The following sections of Specification B 248 [B 248M] constitute a part of this specification:

3.1.1 Terminology

3.1.2 Materials and Manufacture

3.1.3 Dimensions, Mass, and permissible Variations

3.1.4 Workmanship, Finish, and Appearance

3.1.5 Sampling

3.1.6 Number of tests and Retests

3.1.7 Specimen Preparation

3.1.8 Test Methods

3.1.9 Significance of Numerical Limits

3.1.10 Inspection

3.1.11 Rejection and Reheating

3.1.12 Certification

3.1.13 Test Reports

3.1.14 Packaging and Package Marking

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 Specification B 248 [B 248M].

4. Terminology

4.1 For definitions of terms related to copper and copper alloys, refer to Terminology B 846.

5. Ordering Information

5.1 Orders for products should include the following information:

5.1.1 ASTM designation and year of issue,

5.1.2 Copper alloy UNS No. designation,

5.1.3 Quantity,

5.1.4 Form of material: plate, sheet, strip, or rolled bar,

¹ This specification is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.01 on Plate, Sheet, and Strip.

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² SAE Specifications CA210, CA220, CA230, CA240, CA260, CA268, and CA272 conform to the requirements for Copper Alloy UNS Nos. C21000, C22000, C23000, C24000, C26000, C26800, and C27200, respectively.

³ Annual Book of ASTM Standards, Vol 02.01.

⁴ Annual Book of ASTM Standards, Vol 03.01.

⁵ Annual Book of ASTM Standards, Vol 03.06.

- 5.1.5 Temper (Section 7),
 - 5.1.6 Dimensions: thickness, width, and length if applicable,
 - 5.1.7 Tolerances (Section 10),
 - 5.1.8 How furnished: rolls, stock lengths with or without ends, specific lengths with or without ends (Section 10),
 - 5.1.9 Type of edge, if required (Section 10),
 - 5.1.10 When the product is purchased for agencies of the U.S. Government.
- 5.2 The following options are available and should be specified at the time of placing the order when required:
- 5.2.1 Heat identification or traceability details,
 - 5.2.2 Certification,
 - 5.2.3 Mill test report,
 - 5.2.4 Special tests or exceptions, if any.
 - 5.2.5 Supplemental requirements for agencies of the U.S. Government as given in Specification B 248 [B 248M].

6. Chemical Composition

6.1 The material shall conform to the chemical compositional requirements in Table 1 for the copper alloy UNS No. designation specified in the ordering information.

6.2 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 and purchaser.

6.3 Either copper or zinc may be taken as the difference between the sum of all elements analyzed and 100 %. When all elements in Table 1 are analyzed, the sum of the results shall be as shown in the in the table as follows:

Copper Alloy UNS No.	Copper Plus Named Elements, % min
C21000	99.8
C22000	99.8
C22600	99.8
C23000	99.8
C24000	99.8
C26000	99.7
C26800	99.7
C27200	99.7
C28000	99.7

7. Temper

7.1 *As Hot-Rolled (M20)*—The standard temper of sheet and plate and produced by hot rolling as designated in Table 2.

7.2 *Rolled (H)*—The standard tempers of rolled material are as designated in Table 2 with the prefix “H”. Former designations and the standard designations as defined in Practice B 601 are shown.

7.3 *Annealed (OS)*—The standard tempers of annealed material are as designated in Tables 3 and 4. Nominal grain size and the standard designations are defined in Practice B 601 are shown.

7.4 *Annealed-To-Temper (O)*—The standard tempers of annealed-to-temper material are as designated in Table 5 with the prefix “O.” Former designations and the standard designations as defined in Practice B 601 are shown.

7.5 Special or nonstandard tempers are subject to negotiation between the manufacturer and purchaser (See 5.1.5).

8. Grain Size

8.1 Grain size shall be standard requirement for all products of the annealed (OS) tempers.

8.2 Acceptance or rejection based upon grain size shall depend only on the average grain size of the test specimens and shall be within the limits prescribed in Table 3 when determined in accordance with Test Methods E 112.

8.3 The average grain size shall be determined on a plane parallel to the surface of the product.

9. Mechanical Properties

9.1 Tensile Strength Requirements of Rolled Tempers

9.1.1 Product furnished under this specification shall conform to the tensile strength requirements prescribed in Table 2 when tested in accordance with Test Methods E 8 [E 8M]. The test specimens shall be taken so the longitudinal axis of the specimen is parallel to the direction of rolling.

9.1.2 Acceptance or rejection based upon mechanical properties shall depend only on tensile strength.

9.2 Tensile Strength Requirements of Annealed-to-Temper

9.2.1 Product furnished under this specification shall conform to the tensile strength requirements prescribed in Table 5 when tested in accordance with Test Methods E 8 [E 8M]. The test specimens shall be taken so the longitudinal axis of the specimen is parallel to the direction of rolling.

9.2.2 Acceptance or rejection based upon mechanical properties shall depend only on tensile strength.

9.3 Rockwell Hardness

TABLE 1 Chemical Requirements

Copper Alloy UNS No.	Copper, %	Lead, max, %	Iron, max, %	Zinc
C21000	94.0 to 96.0	0.03	0.05	remainder
C22000	89.0 to 91.0	0.05	0.05	remainder
C22600	86.0 to 89.0	0.05	0.05	remainder
C23000	84.0 to 86.0	0.05	0.05	remainder
C24000	78.5 to 81.5	0.05	0.05	remainder
C26000	68.5 to 71.5	0.07	0.05	remainder
0.26800 ^A	64.0 to 68.5	0.15	0.05	remainder
C27200 ^B	62.0 to 65.0	0.07	0.07	remainder
C28000 ^C	59.0 to 63.0	0.30	0.07	remainder

^AMaterial shall be free from beta constituent when examined at a magnification of 75 diameters.

^BSmall amounts of beta constituent, if present, may interfere in some instances with severe forming or drawing; therefore, suitability for forming or drawing should be established between manufacturer and purchaser.

^CIt is anticipated that this material will contain the beta constituent that may interfere with severe forming or drawing operations.

TABLE 2 Tensile Strength Requirements and Approximate Rockwell Hardness Values for Rolled Temper (H) Product

NOTE 1—Plate is generally available in only the as hot-rolled (M20) temper. Required properties for other tempers shall be agreed upon between the manufacturer and the purchaser at the time of placing the order.

Rolled Temper		Tensile Strength, ksi [MPa ¹]		Approximate Rockwell Hardness ^B							
Standard	Temper Designation	Min	Max	B Scale				Superficial 30-T			
				0.020 (0.508) to 0.036 in. (0.914 mm) incl		Over 0.036 in. (0.914) mm		0.012 (0.305) to 0.028 in. (0.711 mm) incl		Over 0.028 in. (0.711 mm)	
				Min	Max	Min	Max	Min	Max	Min	Max
Copper Alloy UNS No. C21000											
M20	As hot-rolled	32 [220]	42 [290]	...	...	...	...	...	...	...	...
H01	Quarter hard	37 [255]	47 [325]	20	48	24	52	34	51	37	54
H02	Half-hard	42 [290]	52 [355]	40	56	44	60	46	57	48	59
H03	Three-quarter-hard	46 [315]	56 [385]	50	61	53	64	52	60	54	62
H04	Hard	50 [345]	59 [405]	57	64	60	67	57	62	59	64
H06	Extra hard	56 [385]	64 [440]	64	70	66	72	62	66	63	67
H08	Spring	60 [415]	68 [470]	68	73	70	75	64	68	65	69
H10	Extra spring	61 [420]	69 [475]	69	74	71	76	65	69	66	70
Copper Alloy UNS No. C22000											
M20	As hot-rolled	33 [230]	43 [295]	...	...	...	...	...	...	...	...
H01	Quarter-hard	40 [275]	50 [345]	27	52	31	56	34	51	37	54
H02	Half-hard	47 [325]	57 [395]	50	63	53	66	50	59	52	61
H03	Three-quarter-hard	52 [355]	62 [425]	59	68	62	71	55	62	58	64
H04	Hard	57 [395]	66 [455]	65	72	68	75	60	65	62	67
H06	Extra hard	64 [440]	72 [495]	72	77	74	79	64	68	66	69
H08	Spring	69 [475]	77 [530]	76	79	78	81	67	69	68	70
H10	Extra spring	72 [495]	80 [550]	78	81	80	83	68	70	69	71
Copper Alloy UNS No. C22600											
H01	Quarter-hard	42 [290]	52 [355]	29	58	29	58	39	58	39	58
H02	Half-hard	48 [330]	58 [400]	52	68	52	68	54	64	54	64
H03	Three-quarter-hard	53 [365]	63 [435]	61	73	61	73	59	68	59	68
H04	Hard	58 [400]	67 [460]	67	77	67	77	64	70	64	70
H06	Extra hard	65 [450]	73 [505]	74	81	74	81	68	73	68	73
H08	Spring	70 [485]	78 [540]	78	83	78	83	71	74	71	74
H10	Extra spring	74 [510]	82 [565]	81	86	81	86	73	76	73	76
Copper Alloy UNS No. C23000											
M20	As hot-rolled	37 [255]	47 [325]	...	...	...	...	...	...	...	...
H01	Quarter-hard	44 [305]	54 [370]	33	58	37	62	42	57	45	60
H02	Half-hard	51 [350]	61 [420]	56	68	59	71	56	64	58	66
H03	Three-quarter-hard	57 [395]	67 [460]	66	73	69	76	63	68	65	70
H04	Hard	63 [435]	72 [495]	72	78	74	80	67	71	68	72
H06	Extra hard	72 [495]	80 [550]	78	83	80	85	70	74	71	75
H08	Spring	78 [540]	86 [595]	82	85	84	87	74	76	75	77
H10	Extra spring	82 [565]	90 [620]	84	87	86	89	75	77	76	78
Copper Alloy UNS No. C24000											
M20	As hot-rolled	41 [285]	51 [350]	...	...	...	...	...	...	...	...
H01	Quarter-hard	48 [330]	58 [400]	38	61	42	65	42	57	45	60
H02	Half-hard	55 [380]	65 [450]	59	70	62	73	56	64	58	66
H03	Three-quarter-hard	61 [420]	71 [490]	69	76	72	79	63	68	65	70
H04	Hard	68 [470]	77 [530]	76	82	78	84	68	72	69	73
H06	Extra hard	78 [540]	87 [600]	83	87	85	89	72	75	73	76
H08	Spring	85 [585]	93 [640]	87	90	89	92	75	77	76	78
H10	Extra spring	89 [615]	97 [670]	88	91	90	93	76	78	77	79
Copper Alloy UNS No. C26000											
M20	As hot-rolled	41 [285]	51 [350]	...	...	...	...	...	...	...	...
H01	Quarter-hard	49 [340]	59 [405]	40	61	44	65	43	57	46	60
H02	Half-hard	57 [395]	67 [460]	60	74	63	77	56	66	58	68
H03	Three-quarter-hard	64 [440]	74 [510]	72	79	75	82	65	70	67	72
H04	Hard	71 [490]	81 [560]	79	84	81	86	70	73	71	74
H06	Extra hard	83 [570]	92 [635]	85	89	87	91	74	76	75	77
H08	Spring	91 [625]	100 [690]	89	92	90	93	76	78	76	78
H10	Extra spring	95 [655]	104 [715]	91	94	92	95	77	79	77	79
Copper Alloy UNS No. C26800											
M20	As hot-rolled	40 [275]	50 [345]	...	...	...	...	...	...	...	...
H01	Quarter-hard	49 [340]	59 [405]	40	61	44	65	43	57	46	60
H02	Half-hard	55 [380]	65 [450]	57	71	60	74	54	64	56	66