Designation: B806 – 14

Standard Specification for Copper Alloy Permanent Mold Castings for General Applications[1]

This standard is issued under the fixed designation B806; 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 U.S. Department of Defense.

1. Scope*

1.1 This specification establishes requirements for copper alloy[2] permanent mold castings for general applications. Nominal compositions of the alloys under this specification are shown in Table 1.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

2. Referenced Documents

2.1 The following documents of the issue in effect on date of material purchase form part of this specification to the extent referenced herein:

2.2 *ASTM Standards:*[3]

B208 Practice for Preparing Tension Test Specimens for Copper Alloy Sand, Permanent Mold, Centrifugal, and Continuous Castings

B824 Specification for General Requirements for Copper Alloy Castings

E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

3. Ordering Information

3.1 Orders for casting under this specification shall include the following information:

3.1.1 Quantity of castings required,

3.1.2 Copper Alloy UNS number (Table 2) and temper (as-cast, heat-treated, and so forth), (4.2),

3.1.3 Specification number, title, and year of issue.

3.1.4 Pattern or drawing number, and condition (cast, machined, and so forth),

3.1.5 Pressure test requirements, if specified in the purchase order (Specification B824),

3.1.6 Soundness requirements, if specified in the purchase order (Specification B824),

3.1.7 Repair of castings (Section 7),

3.1.8 Certification, if specified in the purchase order (Specification B824),

3.1.9 Foundry test report, if specified in the purchase order (Specification B824),

3.1.10 Witness inspection, if specified in the purchase order (Specification B824),

3.1.11 Product marking, if specified in the purchase order (Specification B824), and

3.1.12 Castings for Seawater Service (Section 4).

3.2 When material is purchased for agencies of the U.S. government, the Supplementary Requirements of Specification B824 may be specified.

4. Materials and Manufacture

4.1 For better corrosion resistance in sea water applications, castings in Copper Alloy UNS No. C95800 shall be given a temper anneal heat treatment at 1250 ± 50°F (675 ± 10°C) for 6 h minimum. Cooling shall be the fastest means possible that will not cause excess distortion or cracking. Propeller castings shall be exempt from this requirement.

5. Chemical Composition

5.1 The castings shall conform to the chemical requirements specified in Table 2.

5.2 These specification limits do not preclude the presence of other elements. Limits may be established for unnamed elements by agreement between the manufacturer and the supplier and the purchaser. Copper or zinc may be given as the remainder and may be taken as the difference between the sum of all the elements analyzed and 100 %.

[1] This specification is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.05 on Castings and Ingots for Remelting.

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[2] The UNS system for copper and copper alloys (see Practice E527) is a simple expansion of the former standard designation system accomplished by the addition of a prefix "C" and a suffix "00". The suffix can be used to accommodate composition variations of the base alloy.

[3] 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.

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

TABLE 1 Nominal Composition

Classification	Copper Alloy UNS No.	Nominal Composition								
		Copper	Aluminum	Iron	Manganese	Nickel (incl Cobalt)	Silicon	Lead	Zinc	Tin
Yellow brass	C85470[A]	62.5	0.5	. . .	. . .	. . .	. . .	. . .	34.3	2.5
Silicon brass	C87500	82.0	...	...	...	...	4.0	...	14.0	...
	C87800	82.0	...	...	...	...	4.0	...	14.0	...
	C87850[B]	76.0	. . .	. . .	. . .	. . .	3.0	. . .	20.9	. . .
Lead-free yellow brass[C]	C89540	61.0	0.40	0.30	...	0.5	...	...	36.0	0.8
Aluminum bronze	C95300	89.0	10.0	1.0	...	...	...	...	...	...
	C95400	85.0	11.0	4.0	...	...	...	...	...	...
	C95410	84.0	10.0	4.0	...	2.0	...	...	...	...
Nickel aluminum bronze	C95500	81.0	11.0	4.0	...	4.0	...	...	...	...
	C95800	81.3	9.0	4.0	1.2	4.5	...	...	...	...

[A] Phosphorus 0.13.
[B] Phosphorus 0.12.
[C] Bismuth 0.9; selenium 0.03.

TABLE 2 Chemical Requirements

Classification	Copper Alloy UNS No.	Composition, % max except as indicated									
		Copper	Aluminum	Iron	Manganese	Nickel (incl Cobalt)	Silicon	Lead	Zinc	Tin	Copper + Sum of named elements, min
Yellow brass	C85470[A]	60.0–65.0	0.10–1.0	0.20	...	...	...	0.09	Rem	1.0–4.0	99.5
Silicon brass	C87500	79.0 min	0.5	...	...	...	3.0–5.0	0.09	12.0–16.0	...	99.5
	C87800	80.0 min	0.15	0.15	0.15	0.20	3.8–4.2	0.09	12.0–16.0	0.25	99.8[B]
	C87850[C]	75.0–78.0	. . .	0.10	0.10	0.20	2.7–3.4	0.09	Remainder	0.30	99.5
Lead-free yellow brass[D]	C89540	58.0–64.0	0.10–0.60	0.50	...	1.0	...	0.10	32.0–38.0	1.2	99.5
Aluminum bronze	C95300	86.0 min	9.0–11.0	0.75–1.5	...	...	...	...	...	...	99.0
	C95400	83.0 min	10.0–11.5	3.0–5.0	0.25	1.5	...	...	...	...	99.5
	C95410	83.0 min	10.0–11.5	3.0–5.0	0.25	1.5–2.5	...	...	...	...	99.5
Nickel aluminum bronze	C95500	78.0 min	10.0–11.5	3.0–5.0	1.0	3.0–5.5	...	...	...	...	99.5
	C95800	79.0 min	8.5–9.5	3.5–4.5[E]	0.8–1.5	4.0–5.0[E]	0.10	0.03	...	...	99.5

[A] Phosphorus 0.02–0.25
[B] Antimony 0.05 %; arsenic 0.05 %; magnesium 0.01 %; phosphorus 0.01 %; and sulfur 0.05 % max.
[C] Antimony 0.10 %; phosphorus is a major element at 0.05–0.20 %.
[D] Bismuth 0.6–1.2; selenium 0.10.
[E] Iron content shall not exceed the nickel content.

6. Mechanical Properties

6.1 Mechanical properties shall be determined from separately cast test bar castings and shall meet the requirements shown in Table 3.

7. Casting Repair

7.1 Alloys included in this specification are generally weldable. Weld repairs may be made at the manufacturer's discretion.

7.2 The castings shall not be impregnated without approval of the purchaser (3.1.7).

8. General Requirements

8.1 Material furnished under this specification shall conform to the applicable requirements of Specification B824.

9. Sampling

9.1 A lot shall be as defined in Specification B824 with the exception that a lot shall consist of not more than 1000 lbs (455 kg) of castings (gates and risers removed).

TABLE 3 Mechanical Requirements

Copper Alloy UNS No.	Tensile Strength, min ksi[A] (MPa)[B]	Yield Strength, min[C] ksi (MPa)	Elongation in 2 in. (50.8 mm) min, %
C85470	50 (345)	21 (150)	15
C95300	80 (550)	30 (205)	20
C95400	100 (690)	40 (275)	10
C95410	100 (690)	40 (275)	10
C95500	110 (760)	60 (415)	5
C95800[D]	90 (620)	40 (275)	15
C87500	80 (550)	30 (205)	15
C87800	80 (550)	30 (205)	15
C87850	64 (440)	32 (220)	16
C89540	35 (240)	21 (140)	5

[A] ksi = 1000 psi.
[B] See Appendix X1.
[C] Yield strength shall be determined as the stress producing an elongation under load of 0.5 %, that is, 0.01 in. in a gage length of 2 in.
[D] As cast or temper annealed.

9.2 Test bar castings shall be cast to the form and dimensions shown in Figs. 8 or 10 using the dies shown in Figs. 7 or 9 of Practice B208.

10. Keywords

10.1 copper alloy castings; copper-base alloy castings; permanent mold castings

APPENDIX

(Nonmandatory Information)

X1. METRIC EQUIVALENTS

X1.1 The SI unit for strength properties now shown is in accordance with the International System of Units (SI). The derived SI unit for force is the newton (N), which is defined as that force which when applied to a body having a mass of one kilogram gives it an acceleration of one metre per second squared (N = kg·m/s2). The derived SI unit for pressure or stress is the newton per square metre (N/m2), which has been named the pascal (Pa) by the General Conference on Weights and Measures. Since 1 ksi = 6 894 757 Pa, the metric equivalents are expressed as megapascal (MPa), which is the same as MN/m2 and N/mm2.

SUMMARY OF CHANGES

Committee B05 has identified the location of selected changes to this standard since the last issue (B806 – 08a) that may impact the use of this standard. (Approved April 1, 2014.)

(1) Added UNS Alloy No. C85470 to Table 1, Table 2 and Table 3.