Designation: ~~B584 – 12a~~ B584 – 13

Standard Specification for Copper Alloy Sand Castings for General Applications[1]

This standard is issued under the fixed designation B584; 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 covers requirements for copper alloy sand castings for general applications. Nominal compositions of the alloys defined by this specification are shown in Table 1.[2] This is a composite specification replacing former documents as shown in Table 1.

NOTE 1—Other copper alloy castings are included in the following ASTM specifications: B22, B61, B62, B66, B67, B148, B176, B271, B369, B427, B505/B505M, B763, B770, and B806.

1.2 Component part castings produced to this specification may be manufactured in advance and supplied from stock. In such cases the manufacturer shall maintain a general quality certification of all castings without specific record or date of casting for a specific casting.

1.3 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 *ASTM Standards:*[3]

B22 Specification for Bronze Castings for Bridges and Turntables
B61 Specification for Steam or Valve Bronze Castings
B62 Specification for Composition Bronze or Ounce Metal Castings
B66 Specification for Bronze Castings for Steam Locomotive Wearing Parts
B67 Specification for Car and Tender Journal Bearings, Lined
B148 Specification for Aluminum-Bronze Sand Castings
B176 Specification for Copper-Alloy Die Castings
B208 Practice for Preparing Tension Test Specimens for Copper Alloy Sand, Permanent Mold, Centrifugal, and Continuous Castings
B271 Specification for Copper-Base Alloy Centrifugal Castings
B369 Specification for Copper-Nickel Alloy Castings
B427 Specification for Gear Bronze Alloy Castings
B505/B505M Specification for Copper Alloy Continuous Castings
B763 Specification for Copper Alloy Sand Castings for Valve Applications
B770 Specification for Copper-Beryllium Alloy Sand Castings for General Applications
B806 Specification for Copper Alloy Permanent Mold Castings for General Applications
B824 Specification for General Requirements for Copper Alloy Castings
B846 Terminology for Copper and Copper Alloys
E255 Practice for Sampling Copper and Copper Alloys for the Determination of Chemical Composition
E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

[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 Compositions

Classification	Copper Alloy UNS No.	Previous Designation	Commercial Designation	Copper	Tin	Lead	Zinc	Nickel	Iron	Alum-inum	Man-ganese	Sili-con	Nio-bium	Bis-muth
Leaded red brass	C83450	. . .	. . .	88	2½	2	6½	1	. . .	. . .	. . .	. . .	. . .	. . .
	C83600	B145-4A	85-5-5-5 or No. 1 composition	85	5	5	5	. . .	. . .	. . .	. . .	. . .	. . .	. . .
	C83800	B145-4B	commercial red brass, 83-4-6-7	83	4	6	7	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Leaded semi-red brass	C84400	B145-5A	valve composition, 81-3-7-9	81	3	7	9	. . .	. . .	. . .	. . .	. . .	. . .	. . .
	C84800	B145-5B	semi-red brass, 76-2½-6½-15	76	2½	6½	15	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Leaded yellow brass	C85200	B146-6A	high-copper yellow brass	72	1	3	24	. . .	. . .	. . .	. . .	. . .	. . .	. . .
	C85400	B146-6B	commercial No. 1 yellow brass	67	1	3	29	. . .	. . .	. . .	. . .	. . .	. . .	. . .
	C85700	B146-6C	leaded naval brass	61	1	1	37	. . .	. . .	. . .	. . .	. . .	. . .	. . .
High-strength yellow brass	C86200	B147-8B	high-strength manganese bronze	63	. . .	. . .	27	. . .	3	4	3	. . .	. . .	. . .
	C86300	B147-8C	high-strength manganese bronze	61	. . .	. . .	27	. . .	3	6	3	. . .	. . .	. . .
	C86400	B147-7A	leaded manganese bronze	58	1	1	38	. . .	1	½	½	. . .	. . .	. . .
	C86400	B 132-A												
	C86500	B147-8A	No. 1 manganese bronze	58	. . .	. . .	39	. . .	1	1	1	. . .	. . .	. . .
	C86700	B 132-B	leaded manganese bronze	58	1	1	34	. . .	2	2	2	. . .	. . .	. . .
Silicon bronze + silicon brass	C87300	B198-12A	silicon bronze	95	. . .	. . .	. . .	. . .	. . .	. . .	1	4	. . .	. . .
	C87400	B198-13A	silicon brass	82	. . .	½	14	. . .	. . .	. . .	. . .	3½	. . .	. . .
	C87500	B198-13B	silicon brass	82	. . .	. . .	14	. . .	. . .	. . .	. . .	4	. . .	. . .
	C87600	B198-13C	silicon bronze	91	. . .	. . .	5	. . .	. . .	. . .	. . .	4	. . .	. . .
	C87610	B198-12A	silicon bronze	92	. . .	. . .	4	. . .	. . .	. . .	. . .	4	. . .	. . .
	C87710	. . .	silicon bronze	86	. . .	. . .	10	. . .	. . .	. . .	. . .	4	. . .	. . .
	C87845[A]	. . .	silicon bronze	76	. . .	. . .	21.26	. . .	. . .	. . .	. . .	2.7	. . .	. . .
	C87850[B]	. . .	silicon brass	76	. . .	. . .	20.9	. . .	. . .	. . .	. . .	3	. . .	. . .
Bismuth selenium brass	C89510[C]	. . .	sebiloy I	87	5	. . .	5	. . .	. . .	. . .	. . .	. . .	. . .	1.0
	C89520[D]	. . .	sebiloy II	86	5½	. . .	5	. . .	. . .	. . .	. . .	. . .	. . .	1.9
	C89530[E]	. . .		86.5	4.7	. . .	8.0	. . .	. . .	. . .	. . .	. . .	. . .	1.5
	C89535	. . .		86.5	3.0	. . .	7.0	0.65	. . .	. . .	. . .	. . .	. . .	1.4
Bismuth brass	C89720[F]	. . .		67.5	1	. . .	29.8	. . .	. . .	0.5	. . .	0.5	. . .	0.7
Bismuth red brass	C89833	. . .	bismuth brass	89	5	. . .	3	. . .	. . .	. . .	. . .	. . .	. . .	2.2
Bismuth bronze	C89836	. . .	lead-free bronze	89.5	5.5	. . .	3.0	. . .	. . .	. . .	. . .	. . .	. . .	2
Bismuth semi-red brass	C89844	. . .	bismuth brass	84½	4	. . .	8	. . .	. . .	. . .	. . .	. . .	. . .	3
Tin bronze + leaded tin bronze	C90300	B143-1B	modified “G” bronze, 88-8-0-4	88	8	. . .	4	. . .	. . .	. . .	. . .	. . .	. . .	. . .
	C90500	B143-1A	“G” bronze, 88-10-0-2	88	10	. . .	2	. . .	. . .	. . .	. . .	. . .	. . .	. . .
	C92200	B143-2A	steam or valve bronze-Navy “M”	88	6	1½	4½	. . .	. . .	. . .	. . .	. . .	. . .	. . .
	C92210	. . .	. . .	88	5	2	4	1	. . .	. . .	. . .	. . .	. . .	. . .
	C92300	B143-2B	87-5-1-4, Navy PC	87	8	1	4	. . .	. . .	. . .	. . .	. . .	. . .	. . .
	C92600	. . .	87-10-1-2	87	10	1	2	. . .	. . .	. . .	. . .	. . .	. . .	. . .
High-lead tin bronze	C93200	B144-3B	83-7-7-3	83	7	7	3	. . .	. . .	. . .	. . .	. . .	. . .	. . .
	C93500	B144-3C	85-5-9-1	85	5	9	1	. . .	. . .	. . .	. . .	. . .	. . .	. . .
	C93700	B144-3A	80-10-10	80	10	10	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
	C93800	B144-3D	78-7-15	78	7	15	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
	C94300	B144-3E	71-5-24	71	5	24	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Nickel-tin bronze + leaded nickel-tin bronze	C94700	B 292-A	nickel-tin bronze Grade “A”	88	5	. . .	2	5	. . .	. . .	. . .	. . .	. . .	. . .
	C94800	B 292-B	leaded nickel-tin bronze Grade “B”	87	5	1	2	5	. . .	. . .	. . .	. . .	. . .	. . .
	C94900	. . .	leaded nickel-tin bronze Grade “C”	80	5	5	5	5	. . .	. . .	. . .	. . .	. . .	. . .
Spinodal alloy	C96800	. . .	. . .	82	8	. . .	. . .	10	. . .	. . .	. . .	. . .	0.2	. . .
Leaded nickel bronze	C97300	B149-10A	12 % leaded nickel silver	57	2	9	20	12	. . .	. . .	. . .	. . .	. . .	. . .
	C97600	B149-11A	20 % leaded nickel silver	64	4	4	8	20	. . .	. . .	. . .	. . .	. . .	. . .

TABLE 1 *Continued*

Classification	Copper Alloy UNS No.	Previous Designation	Commercial Designation	Copper	Tin	Lead	Zinc	Nickel	Iron	Alum-inum	Man-ganese	Sili-con	Nio-bium	Bis-muth
	C97800	B149-11B	25 % leaded nickel silver	66	5	2	2	25	...	...	...	...	...	...

[A] Phosphorus 0.04.
[B] Phosphorus 0.12.
[C] Selenium 0.5.
[D] Selenium 0.9.
[E] Selenium 0.20.
[F] Antimony 0.07, Boron 0.001.

2.2 *ASME Code:*
ASME Boiler and Pressure Vessel Code[4]

3. Terminology

3.1 Definitions of terms relating to copper alloys can be found in Terminology B846.

4. General Requirements

4.1 The following sections of Specification B824 form a part of this specification. In the event of a conflict between this specification and Specification B824, the requirements of this specification shall take precedence.

4.1.1 Terminology,
4.1.2 Other Requirements,
4.1.3 Dimensions, Mass, and Permissible Variations,
4.1.4 Workmanship, Finish, and Appearance,
4.1.5 Sampling,
4.1.6 Number of Tests and Retests,
4.1.7 Specimen Preparation,
4.1.8 Test Methods,
4.1.9 Significance of Numerical Limits,
4.1.10 Inspection,
4.1.11 Rejection and Rehearing,
4.1.12 Certification,
4.1.13 Test Report,
4.1.14 Product Marking,
4.1.15 Packaging and Package Marking, and
4.1.16 Supplementary Requirements.

5. Ordering Information

5.1 Orders for castings under this specification should include the following information:
5.1.1 Specification title, number, and year of issue,
5.1.2 Quantity of castings,
5.1.3 Copper alloy UNS Number (Table 1) and temper (as-cast, heat treated, and so forth),
5.1.4 Pattern or drawing number, and condition (as-cast, machined, etc.),
5.1.5 *ASME Boiler and Pressure Vessel Code*—compliance (Section 10),
5.1.6 When material is purchased for agencies of the U.S. government, the Supplementary Requirements of Specification B824 may be specified.

5.2 The following options are available and should be specified in the purchase order when required:
5.2.1 Chemical analysis of residual elements (7.3),
5.2.2 Pressure test or soundness requirements (Specification B824),
5.2.3 Approval of weld repair or impregnation, or both (Section 9),
5.2.4 Certification (Specification B824),
5.2.5 Foundry test report (Specification B824),
5.2.6 Witness inspection (Specification B824), and

[4] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990, http://www.asme.org.

5.2.7 Product marking (Specification B824).

6. Manufacture

6.1 Copper alloy UNS Nos. C94700 and C96800 may be supplied in the heat treated condition to obtain the higher mechanical properties shown in Table 2. Suggested heat treatments for these alloys are given in Table 3. Actual practice may vary by manufacturer.

6.2 Separately cast test bar coupons representing castings made in copper alloy UNS Nos. C94700HT and C96800HT shall be heat treated with the castings.

7. Chemical Composition

7.1 The castings shall conform to the compositional requirements for named elements as shown in Table 4 for the copper alloy UNS numbers specified in the purchase order.

TABLE 2 Mechanical Requirements

Copper Alloy UNS No.	Tensile Strength, min		Yield Strength,[A] min		Elongation in 2 in. or 50 mm, min, %
	ksi[B]	MPa[C]	ksi[B]	MPa[C]	
C83450	30	207	14	97	25
C83600	30	207	14	97	20
C83800	30	207	13	90	20
C84400	29	200	13	90	18
C84800	28	193	12	83	16
C85200	35	241	12	83	25
C85400	30	207	11	76	20
C85700	40	276	14	97	15
C86200	90	621	45	310	18
C86300	110	758	60	414	12
C86400	60	414	20	138	15
C86500	65	448	25	172	20
C86700	80	552	32	221	15
C87300	45	310	18	124	20
C87400	50	345	21	145	18
C87500	60	414	24	165	16
C87600	60	414	30	207	16
C87610	45	310	18	124	20
C87710	47	324	24	165	10
C87845	52	359	18	124	29
C87850	59	407	22	152	16
C89510	26	184	17	120	8
C89520	25	176	17	120	6
C89530	28	195	13[D]	90[D]	15
C89535	32	220	16[D]	110[D]	15
C89720	30	210	16	110	15
C89833	30	207	14	97	16
C89836	33	229	14	97	20
C89844	28	193	13	90	15
C90300	40	276	18	124	20
C90500	40	276	18	124	20
C92200	34	234	16	110	22
C92210	32	225	15	103	20
C92300	36	248	16	110	18
C92600	40	276	18	124	20
C93200	30	207	14	97	15
C93500	28	193	12	83	15
C93700	30	207	12	83	15
C93800	26	179	14	97	12
C94300	24	165	. . .	. . .	10
C94700	45	310	20	138	25
C94700 (HT)	75	517	50	345	5
C94800	40	276	20	138	20
C94900	38	262	15	103	15
C96800	125	862	100[D]	689[D]	3
C96800 (HT)	135	931	120[D]	821[D]	. . .
C97300	30	207	15	103	8
C97600	40	276	17	117	10
C97800	50	345	22	152	10

[A] Yield strength shall be determined as the stress producing an elongation under load of 0.5 %, that is, 0.01 in. (0.254 mm) in a gage length of 2 in. or 50 mm.
[B] ksi = 1000 psi.
[C] See Appendix X1.
[D] Yield strength 0.2 %, offset.