Designation: B271/B271M – 23

Standard Specification for Copper-Base Alloy Centrifugal Castings[1]

This standard is issued under the fixed designation B271/B271M; 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 covers requirements for centrifugal castings of copper-base alloys having the nominal compositions shown in Table 1.

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 may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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

2.2 *ASTM Standards:*[2]

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

B846 Terminology for Copper and Copper Alloys

E10 Test Method for Brinell Hardness of Metallic Materials

2.3 *ASME Code:*[3]

Boiler and Pressure Vessel Code

3. Terminology

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

4. Ordering Information

4.1 Orders for centrifugal castings under this specification should include the following information:

4.1.1 Specification title, number, and year of issue;

4.1.2 Quantity (length or number) of castings;

4.1.3 Copper Alloy UNS Number (Table 1) and temper (as-cast, heat-treated, and so forth);

4.1.4 Dimensions or drawing number and condition (as-cast, machined, and so forth);

4.1.5 *ASME Boiler and Pressure Vessel Code* requirements (Section 9); and

4.1.6 When castings are purchased for agencies of the U.S. Government, the Supplementary Requirements in Specification B824 may be specified.

4.2 The following are optional and should be specified in the purchase order when required:

4.2.1 Pressure test or soundness requirements (Specification B824),

4.2.2 Approval of weld repair (Section 8),

4.2.3 Certification (Specification B824),

4.2.4 Foundry test report (Specification B824),

4.2.5 Witness inspection (Specification B824),

4.2.6 Product marking (Specification B824), and

4.2.7 Castings for seawater service (Section X1.2).

5. Materials and Manufacture

5.1 Castings in Copper Alloy UNS No. C95520 are used in the heat-treated condition only.

5.2 For improved corrosion resistance for sea water applications, castings of Copper Alloy UNS No. C95800 may be given a temper anneal heat treatment at 1200 °F to 1300 °F [650 °C to 705 °C] for 6 h minimum. Cooling shall be by the fastest means possible that will not cause excess distortion or racking. Propeller castings shall be exempt from this requirement.

6. Chemical Composition

6.1 The centrifugal castings shall conform to the chemical requirement shown in Table 2 for the Copper Alloy UNS Numbers specified in the purchase order.

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

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

TABLE 1 Nominal Compositions

Classification	Copper Alloy UNS No.	Commercial Designation	Copper	Tin	Lead	Zinc	Nickel	Iron	Alum-inum	Mang-anese	Silicon
Leaded red brass	C83600	85-5-5-5	85	5	5	5	...	...	...	...	...
	C83800	83-4-6-7 or commercial red brass	83	4	6	7	...	...	...	...	...
Leaded semi-red brass	C84400	81-3-7-9 or valve composition	81	3	7	9	...	...	...	...	...
	C84800	76-2½-6½-15 or semi-red brass	76	2½	6½	15	...	...	...	...	...
Leaded yellow brass	C85200	high copper yellow brass	72	1	3	24	...	...	...	...	...
	C85400	commercial No. 1 yellow brass	67	1	3	29	...	...	...	...	...
Yellow brass	C85470[A]		62.5	2.5	...	34.3	...	...	0.5	...	...
Leaded yellow brass	C85700	leaded naval brass	61	1	1	37	...	...	...	...	...
Manganese bronze	C86100	manganese bronze	67	...	...	...	...	3	5	4	...
High-strength yellow brass	C86200	high-strength manganese bronze	63	...	...	27	...	3	4	3	...
	C86300	high-strength manganese bronze	61	...	...	27	...	3	6	3	...
	C86400	leaded manganese bronze	58	1	1	38	...	1	½	½	...
	C86500	No. 1 manganese bronze	58	...	...	39	...	1	1	1	...
	C86700	leaded manganese bronze	58	1	1	34	...	2	2	2	...
Silicon bronze and silicon brass	C87300	silicon bronze	95	...	...	...	...	...	...	1	4
	C87400	silicon brass	82	...	½	14	...	...	...	...	3½
	C87500	silicon brass	82	...	...	14	...	...	...	...	4
	C87600	silicon bronze	89	...	...	6	...	...	...	...	5
Tin bronze and leaded tin bronze	C90300	88-8-0-4, or modified “G” bronze	88	8	...	4	...	...	...	...	...
	C90500	88-10-0-2, or “G” bronze	88	10	...	2	...	...	...	...	...
	C92200	88-6-2-4 or “M” bronze	88	6	2	4	...	...	...	...	...
	C92300	87-8-1-4, or Navy PC	87	8	1	4	...	...	...	...	...
High-lead tin bronze	C93200	83-7-7-3	83	7	7	3	...	...	...	...	...
	C93500	85-5-9-1	85	5	9	1	...	...	...	...	...
	C93600	81-7-12	81	7	12	...	...	...	...	...	...
	C93700	80-10-10	80	10	10	...	...	...	...	...	...
	C93800	78-7-15	78	7	15	...	...	...	...	...	...
	C94300	71-5-24	71	5	24	...	...	...	...	...	...
Aluminum bronze	C95200	Grade A	88	...	...	...	...	3	9	...	...
	C95300	Grade B	89	...	...	...	...	1	10	...	...
	C95400	Grade C	85	...	...	...	...	4	11	...	...
	C95410		84	...	...	...	2	4	10	...	...
	C95900		82.5	...	...	...	...	4.5	13	...	...
Nickel aluminum bronze	C95500	Grade D	81	...	...	...	4	4	11	...	...
	C95520		78.5	...	...	...	5.5	5.0	11	...	...
	C95800		81.3	...	...	...	4.5	4	9	1.2	...
Leaded nickel bronze	C97300	12 % leaded nickel silver	57	2	9	20	12	...	...	...	...
	C97600	20 % leaded nickel silver	64	4	4	8	20	...	...	...	...
	C97800	25 % leaded nickel silver	66	5	2	2	25	...	...	...	...

[A] Phosphorus 0.13

6.2 These specification limits do not preclude the presence of other elements. Limits may be established and analysis required for unnamed elements agreed upon between the manufacturer or supplier and the purchaser. Copper or zinc may be given as remainder and may be taken as the difference between the sum of all elements analyzed and 100 %. When all named elements in Table 2 are analyzed, their sum shall be as specified in Table 3.

7. Mechanical Properties

7.1 Mechanical properties shall be determined from test bar castings cast in accordance with Practice B208 and shall meet the requirements shown in Table 4.

8. Weld Repair

8.1 The castings shall not be weld repaired without customer approval.

9. ASME Requirements

9.1 When specified in the purchase order to meet *ASME Boiler and Pressure Vessel Code* requirements castings in Copper Alloy UNS Nos. C95200 and C95400 shall comply with the following:

9.1.1 Certification requirements of Specification B824.

9.1.2 Foundry test report requirements of Specification B824.

9.1.3 Castings shall be marked with the manufacturer’s name, the Copper Alloy UNS No., and the casting quality factor. In addition, heat numbers or serial numbers that are traceable to heat numbers shall be marked on all pressure-containing castings individually weighing 50 lb [22.7 kg] or more. Pressure-containing castings weighing less than 50 lb [22.7 kg] shall be marked with either the heat number or a serial number that will identify the casting as to the month in which it was poured. Marking shall be in such a position as to not injure the usefulness of the casting.

10. General Requirements

10.1 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.

10.1.1 Terminology;

10.1.2 Other Requirements;

10.1.3 Dimensions, Mass, and Permissible Variations;

10.1.4 Workmanship, Finish, and Appearance;

TABLE 2 Chemical Requirements

	Composition, % max Except as Indicated												
Copper Alloy UNS No.	Copper	Tin	Lead	Zinc	Iron	Nickel incl Cobalt	Aluminum	Manganese	Antimony	Sulfur	Phosphorus	Other	Silicon
C83600	84.0–86.0	4.0–6.0	4.0–6.0	4.0–6.0	0.30	1.0[A]	0.005	...	0.25	0.08	0.05[B]	...	0.005
C83800	82.0–83.8	3.3–4.2	5.0–7.0	5.0–8.0	0.30	1.0[A]	0.005	...	0.25	0.08	0.03[B]	...	0.005
C84400	78.0–82.0	2.3–3.5	6.0–8.0	7.0–10.0	0.40	1.0[A]	0.005	...	0.25	0.08	0.02[B]	...	0.005
C84800	75.0–77.0	2.0–3.0	5.5–7.0	13.0–17.0	0.40	1.0[A]	0.005	...	0.25	0.08	0.02[B]	...	0.005
C85200	70.0–74.0	0.7–2.0	1.5–3.8	20.0–27.0	0.6	1.0[A]	0.005	...	0.20	0.05	0.02	...	0.05
C85400	65.0–70.0	0.50–1.5	1.5–3.8	24.0–32.0	0.7	1.0[A]	0.35	...	...	...	...	...	0.05
C85470	60.0–65.0	1.0–4.0	0.09	Rem	0.20	...	0.10–1.0	...	...	...	0.02–0.25	...	...
C85700	58.0–64.0	0.50–1.5	0.8–1.5	32.0–40.0	0.7	1.0[A]	0.8	...	...	...	...	...	0.05
C86100	66.0–68.0[A]	0.20	0.20	Rem	2.0–4.0	...	4.5–5.5	2.5–5.0	...	...	...	...	...
C86200	60.0–66.0	0.20	0.20	22.0–28.0	2.0–4.0	1.0[A]	3.0–4.9	2.5–5.0	...	...	...	...	...
C86300	60.0–66.0	0.20	0.20	22.0–28.0	2.0–4.0	1.0[A]	5.0–7.5	2.5–5.0	...	...	...	...	...
C86400	56.0–62.0	0.50–1.5	0.50–1.5	34.0–42.0	0.40–2.0	1.0[A]	0.50–1.5	0.10–1.5	...	...	...	...	...
C86500	55.0–60.0	1.0	0.40	36.0–42.0	0.40–2.0	1.0[A]	0.50–1.5	0.10–1.5	...	...	...	...	...
C86700	55.0–60.0	1.5	0.50–1.5	30.0–38.0	1.0–3.0	1.0[A]	1.0–3.0	0.10–3.5	...	...	...	...	...
C87300	94.0 min	...	0.09	0.25	0.20	...	...	0.8–1.5	...	...	...	...	3.5–4.5
C87400	79.0 min	...	1.0	12.0–16.0	...	...	0.8	...	...	...	...	...	2.5–4.0
C87500	79.0 min	...	0.09	12.0–16.0	...	...	0.50	...	...	...	...	...	3.0–5.0
C87600	88.0 min	...	0.09	4.0–7.0	0.20	...	...	0.25	...	...	...	...	3.5–5.5
C90300	86.0–89.0	7.5–9.0	0.30	3.0–5.0	0.20	1.0[A]	0.005	...	0.20	0.05	0.05	...	0.005
C90500	86.0–89.0	9.0–11.0	0.30	1.0–3.0	0.20	1.0[A]	0.005	...	0.20	0.05	0.05	...	0.005
C92200	86.0–90.0	5.5–6.5	1.0–2.0	3.0–5.0	0.25	1.0[A]	0.005	...	0.25	0.05	0.05	...	0.005
C92300	85.0–89.0	7.5–9.0	0.30–1.0	2.5–5.0	0.25	1.0[A]	0.005	...	0.25	0.05	0.05	...	0.005
C93200	81.0–85.0	6.3–7.5	6.0–8.0	1.0–4.0	0.20	1.0[A]	0.005	...	0.35	0.08	0.15	...	0.005
C93500	83.0–86.0	4.3–6.0	8.0–10.0	2.0	0.20	1.0[A]	0.005	...	0.30	0.08	0.05	...	0.005
C93600	79.0–83.0	6.0–8.0	11.0–13.0	1.0	0.20	1.0[A]	0.005	...	0.55	0.08	0.15	...	0.005
C93700	78.0–82.0	9.0–11.0	8.0–11.0	0.8	0.7[C]	0.50[A]	0.005	...	0.50	0.08	0.10	...	0.005
C93800	75.0–79.0	6.3–7.5	13.0–16.0	0.8	0.15	1.0[A]	0.005	...	0.8	0.08	0.05	...	0.005
C94300	67.0–72.0	4.5–6.0	23.0–27.0	0.8	0.15	1.0[A]	0.005	...	0.8	0.08	0.05	...	0.005
C95200	86.0 min	...	...	...	2.5–4.0	...	8.5–9.5	...	...	...	...	...	...
C95300	86.0 min	...	...	...	0.8–1.5	...	9.0–11.0	...	...	...	...	...	...
C95400	83.0 min	...	...	...	3.0–5.0	1.5	10.0–11.5	0.50	...	...	...	...	...
C95410	83.0 min	...	...	...	3.0–5.0	1.5–2.5	10.0–11.5	0.50	...	...	...	...	...
C95500	78.0 min	...	...	...	3.0–5.0	3.0–5.5	10.0–11.5	3.5	...	...	...	...	...
C95520	74.5 min	0.25	0.03	0.30	4.0–5.5	4.2–6.0	10.5–11.5	1.5	...	...	...	Cr 0.05 Co 0.20	0.15
C95800	79.0 min	...	0.03	...	3.5–4.5[D]	4.0–5.0[D]	8.5–9.5	0.8–1.5	...	...	...	...	0.10
C95900	rem.	...	...	...	3.0–5.0	0.50	12.0–13.5	1.5	...	...	...	...	...
C97300	53.0–58.0	1.5–3.0	8.0–11.0	17.0–25.0	1.5	11.0–14.0	0.005	0.50	0.35	0.08	0.05	...	0.15
C97600	63.0–67.0	3.5–4.5	3.0–5.0	3.0–9.0	1.5	19.0–21.5	0.005	1.0	0.25	0.08	0.05	...	0.15
C97800	64.0–67.0	4.0–5.5	1.0–2.5	1.0–4.0	1.5	24.0–27.0	0.005	1.0	0.20	0.08	0.05	...	0.15

[A] In determining copper minimum, copper may be calculated as copper plus nickel.
[B] For Continuous Castings, P shall be 1.5 % max.
[C] Iron shall be 0.35 % max. when used for Steel-backed.
[D] Iron content shall not exceed nickel content.