Designation: ~~B176 – 08 (Reapproved 2013)~~ B176 – 14

Standard Specification for Copper-Alloy Die Castings[1]

This standard is issued under the fixed designation B176; 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~~ Scope*

1.1 This specification establishes the requirements for copper-alloy die castings. The alloys specified are Copper Alloy UNS Nos. C85700, C85800, C86500, C87800, C99700, and C99750.[2]

1.2 *Units*—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]
B824 Specification for General Requirements for Copper Alloy Castings
B846 Terminology for Copper and Copper Alloys
E8/E8M Test Methods for Tension Testing of Metallic Materials
E18 Test Methods for Rockwell Hardness of Metallic Materials
E23 Test Methods for Notched Bar Impact Testing of Metallic Materials
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)
2.2 *American Die Casting Institute:*[4]
"E" Series Product Standards
2.3 *Federal Standard:*[5]
Fed. Std. No. 123 Marking for Shipment (Civil Agencies)
2.4 *Military Standards:*[5]
MIL-STD-129 Marking for Shipment and Storage (Military Agencies)
MIL-P-116 Methods of Preservation

3. General Requirements

3.1 The following sections of Specification B824 constitute a part of this specification.
3.1.1 Terminology (Section 3),
3.1.2 Number of Tests and Retests (Section 10) (Note to users: Paragraph 10.3 of Specification B824 applies only when mechanical requirements are specified in the purchase order.),
3.1.3 Test Methods (Section 12),
3.1.4 Significance of Numerical Limits (Section 13),
3.1.5 Inspection (Section 14),
3.1.6 Rejection and Rehearing (Section 15),
3.1.7 Certification (Section 16),

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[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".~~"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.

[4] Available from the American Die Casting Institute, 2340 Des Plaines Ave., Des Plaines, IL 60018.

[5] Available from DLA Document Services, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, http://quicksearch.dla.mil/

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

3.1.8 Test Report (Section 17),
3.1.9 Product Marking (Section 18), and
3.1.10 Supplementary Requirements.

3.2 In addition, when a section with a title identical to that referenced in 3.1, above, appears in this specification, it contains additional requirements which supplement those appearing in Specification B824.

4. Terminology

4.1 For general terms related to copper and copper alloys, refer to Terminology B846.

5. Ordering Information

5.1 Include the following information when placing orders for die castings under this specification as applicable:
5.1.1 Specification title, number, and year of issue,
5.1.2 Part name and number,
5.1.3 Copper Alloy UNS Number,
5.1.4 Quantity and delivery schedule, as required,
5.1.5 Engineering drawing of die casting, when required, giving all necessary dimensions and tolerances and showing latest revisions and allowances for machining, if any. Location of ejector pin marks or parting lines shall be at the option of the manufacturer unless specifically designated on the drawing.
5.1.6 When die castings are purchased for agencies of the U.S. government the Supplementary Requirements of Specification B824 may be specified.

5.2 The following requirements are optional and should be specified in the purchase order when required.
5.2.1 Inspection lot sampling (Section 8),
5.2.2 Chemical analysis of residual elements (Section 4),
5.2.3 Soundness requirements (Section 9),
5.2.4 Mechanical requirements (Section 5),

TABLE 1 Chemical Requirements

Copper Alloy UNS No.	Composition, % max (unless shown as a range or min)																
	Major Elements									Residual Elements							
	Copper	Tin	Lead	Zinc	Iron	Nickel including Cobalt	Aluminum	Manganese	Silicon	Iron	Antimony	Nickel Cobalt	Sulphur	Phosphorous	Aluminum	Manganese	Silicon
C85700	58.0–64.0[A]	0.50–1.5	0.8–1.5	32.0–40.0	...	...	...	...	...	0.7	...	1.0	...	...	0.8	...	0.05
C85800	57.0 min[A]	1.5	1.5	31.0–41.0	...	...	...	...	...	0.50	0.05	0.50	0.05	0.01	0.55	0.25	0.25[B]
C86500	55.0–60.0[A]	1.0	0.40	36.0–42.0	0.40–2.0	...	0.50–1.5	0.10–1.5	...	...	...	1.0	...	...	...	...	...
C87800	80.0 min[A]	0.25	0.09	12.0–16.0	...	...	...	...	3.8–4.2	0.15	0.05	0.20	0.05	0.01	0.15	0.15	[B,C]
C99700	54.0 min[A]	1.0	2.0	19.0–25.0	...	4.0–6.0	0.50–3.0	11.0–15.0	...	1.0	...	...	...	...	...	...	...
C99750	55.0–61.0	...	0.50–2.5	17.0–23.0	...	5.0	0.25–3.0	17.0–23.0	...	1.0[D]	...	...	...	...	...	...	...

TABLE 1 Chemical Requirements

Copper Alloy UNS No.	Composition, % max (unless shown as a range or min)											
	Copper	Tin	Lead	Zinc	Iron	Nickel including Cobalt	Aluminum	Manganese	Antimony	Sulfur	Phosphorus	Silicon
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[A]	0.50–1.5	0.8–1.5	32.0–40.0	0.7	1.0	0.8	...	...	...	...	0.05
C85800	57.0 min[A]	1.5	1.5	31.0–41.0	0.50	0.50	0.55	0.25	0.05	0.05	0.01	0.25[B]
C86500	55.0–60.0[A]	1.0	0.40	36.0–42.0	0.40–2.0	1.0	0.50–1.5	0.10–1.5	...	...	...	...
C87800	80.0 min[A]	0.25	0.09	12.0–16.0	0.15	0.20	0.15	0.15	0.05	0.05	0.01	3.8–4.2[B,C]
C99700	54.0 min[A]	1.0	2.0	19.0–25.0	1.0	4.0–6.0	0.50–3.0	11.0–15.0	...	...	...	...
C99750	55.0–61.0	...	0.50–2.5	17.0–23.0	1.0[D]	5.0	0.25–3.0	17.0–23.0	...	...	...	...

[A] In determining copper min, copper may be determined as copper plus nickel.
[B] Arsenic 0.05 max.
[C] Magnesium 0.01 max.
[D] Iron content above the nickel content may cause hard spots resulting in decreased machinability.