Designation: B427 – 02

Standard Specification for Gear Bronze Alloy Castings[1]

This standard is issued under the fixed designation B427; 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[2] establishes requirements for alloys whose copper alloy numbers and nominal compositions are shown in Table 1. The castings may be furnished as one of three types: static chill, centrifugal chill, or sand cast.

1.2 The values stated in inch-pound units are to be regarded as the standard. Metric values given in parentheses are for information purposes only.

2. Referenced Documents

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

2.1 *ASTM Standards:* [3]

B208 Practice for Preparing Tension Test Specimens for Copper Alloy Sand, Permanent Mold, Centrifugal, and Continuous Castings [3]

B824 Specification for General Requirements for Copper Alloy Castings [4]

E8 Test Methods for Tension Testing of Metallic Materials [4]

E10 Test Method for Brinell Hardness of Metallic Materials [5]

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

3. Ordering Information

3.1 Orders for material to this specification shall include the following information:

3.1.1 Quantity of castings required,

3.1.2 Copper Alloy UNS No. (Table 1),

TABLE 1 Nominal Composition

Copper Alloy UNS No.	Previously Used Designation	Composition, %				
		Copper	Tin	Nickel	Lead	Phos-phorus
C90800	A	87.8	12.0	...	0	0.2
C91700	B	86.3	12.0	1.5	0	0.2
C90700	...	87.8	11.0	...	0	0.2
C91600	C	88.0	10.3	1.5	0	0.2
C92900	D	83.5	10.0	3.5	2.8	0.2

3.1.3 Specification title, number, and year of issue,

3.1.4 Pattern or drawing number and casting type (Section 1),

3.1.5 Repair of castings (Section 7),

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

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

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

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

4. Chemical Composition

4.1 The castings shall conform to the requirements as to chemical composition prescribed in Table 2.

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

5. Mechanical Properties

5.1 Mechanical properties shall be determined from separately cast test bar castings and shall meet the requirements shown in Table 4.

6. Dimensions, Weights, and Permissible Variations

6.1 Variations in dimensions and weights shall be as agreed upon between the producer and the consumer but shall not be more than 3 % in the as-cast condition.

[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.

Current edition approved Dec. 10, 2002. Published February 2003. Originally approved in 1965. Discontinued June 2002 and reinstated as B427 – 02. Last previous edition approved in 1993 as B427 – 93a. DOI: 10.1520/B0427-02.

[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] *Annual Book of ASTM Standards*, Vol 02.01.

[4] *Annual Book of ASTM Standards*, Vol 03.01.

[5] *Annual Book of ASTM Standards*, Vol 01.01.

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

TABLE 2 Chemical Requirements

Element	Composition, max % (Unless Shown as a Range or Minimum) Copper Alloy UNS No.				
	C90800[A]	C91700[A]	C90700[A]	C91600[A]	C92900[A]
Copper	remainder	remainder	remainder	remainder	remainder
Tin	11.0–13.0	11.3–12.5	10.0–12.0	9.7–10.8	9.0–11.0
Lead	0.25	0.25	0.50	0.25	2.0–3.2
Zinc	0.25	0.25	0.50	0.25	0.25
Iron	0.15	0.20	0.15	0.20	0.20
Antimony	0.20	0.20	0.20	0.20	0.25
Nickel	0.50	1.2–2.0	0.50	1.2–2.0	2.8–4.0
Sulfur	0.05	0.05	0.05	0.05	0.05
Phosphorus	0.30	0.30	0.30	0.30	0.50
Aluminum	0.005	0.005	0.005	0.005	0.005
Silicon	0.005	0.005	0.005	0.005	0.005

[A] Ingot for remelting specifications vary from the ranges shown.

TABLE 3 Copper Plus Sum of All Named Elements Analyzed

Copper Alloy UNS No.	Copper Plus Named Elements, % min
C90800	99.4
C91700	99.4
C90700	99.4
C91600	99.4
C92900	99.3

6.2 The manufacturer shall not be responsible for the dimensional accuracy of patterns or molds furnished by the purchaser.

7. Casting Repair

7.1 The castings shall not be repaired, plugged, welded, or burned-in without the written approval of the purchaser.

8. General Requirements

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

9. Sampling

9.1 Test bar casting representing sand castings in the Copper Alloy UNS Nos. under this specification shall be cast to the form and dimensions shown in Figs. 2, Figs. 3, or Figs. 4 of Practice B208.

9.2 Test bar castings representing castings produced in chill molds of metal or graphite may be cast in open keel-block molds of the same material as the molds used for the castings.

9.3 Separate centrifugally cast test bars shall be made in accordance with Practice B208.

9.4 At the manufacturer's option test bar specimens may be removed from centrifugal castings instead of separate centrifugally cast test coupons (9.3).

10. Number of Tests

10.1 One Brinell hardness reading shall be made for each lot of castings.

11. Test Methods

11.1 Brinell readings shall be taken on the grip end of the tension test bar, at or within 1 in. (25.4 mm) of the casting outside diameter, or as indicated on the purchaser's drawing and shall be made in accordance with Test Method E10.

12. Certification

12.1 In the case of a product manufactured in advance and supplied for sale from stock by the manufacturer, jobber or other dealer, the product may upon request of the purchaser be certified by the manufacturer as conforming to this specification subject to the following procedure. Not less than two tension tests, and two hardness tests, from different heats, and not less than one chemical analysis shall be made by the manufacturer from each day's melt. Records of the tension test results, hardness, and chemical analysis shall be systematically made and maintained and shall be the basis for certification. In lieu of the manufacturer's certification and upon written request by the purchaser, these records may be examined on the manufacturer's premises by the purchaser or his accredited representative.

13. Keywords

13.1 bronze castings; copper-base castings; gear castings