



Designation: B770 – 10

# Standard Specification for Copper-Beryllium Alloy Sand Castings for General Applications<sup>1</sup>

This standard is issued under the fixed designation B770; 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 ( $\epsilon$ ) 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 establishes requirements for copper-beryllium alloy sand castings for general applications and nominal compositions alloys defined by this specification are shown in [Table 1](#).<sup>2</sup>

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.

1.3 The following safety hazard caveat pertains only to the test methods described in this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

## 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*:<sup>3</sup>

[B30 Specification for Copper Alloys in Ingot Form](#)

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

[B601 Classification for Temper Designations for Copper and](#)

[Copper Alloys—Wrought and Cast](#)

[B824 Specification for General Requirements for Copper Alloy Castings](#)

[B846 Terminology for Copper and Copper Alloys](#)

[E527 Practice for Numbering Metals and Alloys in the Unified Numbering System \(UNS\)](#)

## 3. General Requirements

3.1 The following sections of Specification [B824](#) constitute a part of this specification:

- 3.1.1 Terminology,
- 3.1.2 Material and Manufacture,
- 3.1.3 Chemical Composition,
- 3.1.4 Dimensions and Permissible Variations,
- 3.1.5 Workmanship, Finish and Appearance,
- 3.1.6 Sampling,
- 3.1.7 Number of Tests and Retests,
- 3.1.8 Specimen Preparation,
- 3.1.9 Test Methods,
- 3.1.10 Significance of Numerical Limits,
- 3.1.11 Inspection,
- 3.1.12 Rejection and Reheating,
- 3.1.13 Certification,
- 3.1.14 Mill Test Report, and
- 3.1.15 Packaging and Package Marking.

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

## 4. Terminology

4.1 For definitions of terms relating to copper and copper alloys, refer to Terminology [B846](#).

## 5. Ordering Information

5.1 Include the following information for orders for product:

- 5.1.1 ASTM designation number, title, and year of issue,
- 5.1.2 Copper Alloy UNS Number designation,
- 5.1.3 Temper,
- 5.1.4 Quantity of castings required,

<sup>1</sup> 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 April 1, 2010. Published May 2010. Originally approved in 1987. Last previous edition approved in 2009 as B770–09. DOI: 10.1520/B0770-10.

<sup>2</sup> 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.

<sup>3</sup> 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**

Copper Alloy UNS No.	Previous Designation	Copper	Nickel	Silicon	Beryllium	Cobalt	Chromium	Iron	Zirconium	Tin	Manganese
C81400	70C	99.1	...	...	0.06	...	0.8	...	...	...	...
C82000	10C	97	...	...	0.5	2.5	...	...	...	...	...
C82200	3C, 14C	98	2.0	...	0.5	...	...	...	...	...	...
C82400 <sup>A</sup>	165C, 165CT <sup>A</sup>	97.8	...	...	1.7	0.5	...	...	...	...	...
C82500 <sup>A</sup>	20C, 20CT <sup>A</sup>	97.2	...	0.3	2.0	0.5	...	...	...	...	...
C82510	21C	96.6	...	0.3	2.0	1.1	...	...	...	...	...
C82600 <sup>A</sup>	245C, 245CT <sup>A</sup>	96.8	...	0.3	2.4	0.5	...	...	...	...	...
C82800 <sup>A</sup>	275C, 275CT <sup>A</sup>	96.6	...	0.3	2.6	0.5	...	...	...	...	...
C96700	72C	67.2	31.0	...	1.2	...	...	0.6	0.3	0.3	0.6

<sup>A</sup> When fine-grained castings are specified, 0.02 to 0.12 titanium is added for grain refinement, usually in the remelt ingot. See Specification B30.

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

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 contract or purchase order when required.

5.2.1 Chemical analysis of residual elements, if specified in the purchase order (Specification B824),

5.2.2 Mechanical requirements, if specified in the purchase order (Section 10),

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

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

5.2.5 Repair of castings (Section 12),

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

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

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

5.2.9 Product marking, if specified in the purchase order (Specification B824).

## 6. Materials and Manufacture

6.1 *Material*—The material of manufacture shall be castings of the copper alloys listed in Table 1, as specified in the purchase order or contract, and of such purity and soundness as to be suitable for the products prescribed herein.

6.2 *Manufacture*—The product shall be manufactured by casting and thermal treatment to meet the properties specified.

## 7. Chemical Composition

7.1 The castings shall conform to the chemical composition requirements prescribed in Table 2 for the Copper Alloy UNS Number designations specified in the ordering information.

7.2 These composition limits do not preclude the presence of other elements. Limits may be established for unnamed elements by agreement between manufacturer or supplier and purchaser.

7.3 Copper is customarily given as remainder but may be taken as the difference between the sum of all elements analyzed and 100 %.

7.4 When all elements in Table 2 are analyzed, their sum shall be 99.5 % minimum.

7.5 It is recognized that residual elements may be present in cast copper-base alloys. Analysis shall be made for residual elements only when specified in the purchase order (Specification B824).

## 8. Temper

8.1 The standard tempers are listed as follows:

8.1.1 *TF00*—Cast, solution heat treated and precipitation heat treated.

8.1.2 *MO1*—As sand cast.

8.1.3 Special or non-standard tempers are subject to negotiation between the supplier and purchaser. Standard temper designations are in accordance with Classification B601.

## 9. Precipitation Heat Treatment

9.1 For the purpose of determining conformance to the appropriate requirement in Table 3, the castings and test specimens shall be precipitation heat-treated at a uniform temperature from the solution heat-treated condition. Solution heat-treatment and precipitation heat-treatments are listed in Table 4. Other treatment times and temperatures may be preferable for end products made from this material.

9.2 Special combinations of properties such as increased ductility, electrical conductivity, dimensional accuracy, and endurance life may be obtained by special precipitation heat-treatments. The mechanical requirements of Table 3 do not apply to such special heat-treatments. Specific test requirements as needed shall be agreed upon between the manufacturer or supplier and purchaser of the end product.

## 10. Mechanical Property Requirements

10.1 When tension tests are required, separately cast test-bar specimens shall be used to determine mechanical properties and shall meet the requirements shown in Table 3 in the as cast or solution heat-treated and precipitation heat-treated condition.

## 11. Purchases for U. S. Government

11.1 When specified in the contract or purchase order, product purchased for an agency of the U. S. government shall conform to the special government regulations specified in the Special Requirements.