



Designation: B747 – 11

# Standard Specification for Copper-Zirconium Alloy Sheet and Strip <sup>1</sup>

This standard is issued under the fixed designation B747; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

## 1. Scope\*

1.1 This specification establishes the requirements for sheet and strip of Copper Alloy UNS C15100.

1.2 *Units*—Values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units, which are provided for information only and are not considered standard.

## 2. Referenced Documents

2.1 *ASTM Standards*:<sup>2</sup>

**B193** Test Method for Resistivity of Electrical Conductor Materials

**B248** Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar

**B601** Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast

**B846** Terminology for Copper and Copper Alloys

**E3** Guide for Preparation of Metallographic Specimens

**E8/E8M** Test Methods for Tension Testing of Metallic Materials

**E53** Test Method for Determination of Copper in Unalloyed Copper by Gravimetry

**E112** Test Methods for Determining Average Grain Size

**E255** Practice for Sampling Copper and Copper Alloys for the Determination of Chemical Composition

**E478** Test Methods for Chemical Analysis of Copper Alloys

## 3. General Requirements

3.1 The following sections of Specification **B248** constitute a part of this specification:

3.1.1 Terminology,

3.1.2 Workmanship, Finish, and Appearance,

3.1.3 Sampling,

3.1.4 Number of Tests and Retests,

3.1.5 Specimen Preparation,

3.1.6 Significance of Numerical Limits,

3.1.7 Inspection,

3.1.8 Rejection and Rehearing,

3.1.9 Certification,

3.1.10 Test Reports,

3.1.11 Packaging and Package Marking, and

3.1.12 Supplementary Requirements.

## 4. Terminology

4.1 For definition of terms related to copper and copper alloys, refer to Terminology **B846**.

## 5. Ordering Information

5.1 Include the following specified choices when placing orders for product under this specification, as applicable:

5.1.1 ASTM designation number and year of issue,

5.1.2 Quantity (of each size),

5.1.3 Copper Alloy UNS No. designation (see **1.1**),

5.1.4 Form of material (sheet or strip),

5.1.5 Temper (see **8.1**),

5.1.6 Dimensions (thickness, width, length, if applicable),

5.1.7 How furnished (rolls, specific lengths with or without ends, stock lengths with or without ends),

5.1.8 Type of edge, if required (slit, sheared, sawed, square corners, rounded corners, rounded edges, or full-rounded edges),

5.1.9 Type of width and straightness tolerances, if required (slit metal tolerances, square sheared metal tolerances, sawed metal tolerances, straightened or edge-rolled metal tolerances), and

5.2 In addition, when material is purchased for the U.S. Government, it shall conform to the Supplemental requirements as defined in Specification **B248** when specified in the contract or purchase order.

## 6. Material and Manufacture

6.1 *Material*:

6.1.1 The material of manufacture shall be a cast bar, slab, cake, billet, etc. of Copper Alloy UNS No. C15100 of such purity and soundness as to be suitable for processing in to the products prescribed herein.

<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 **B05.01** on Plate, Sheet, and Strip.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto: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

6.1.2 When specified in the contract or purchase order, that heat identification or traceability is required, the purchaser shall specify the details desired.

NOTE 1—Due to the discontinuous nature of the processing of castings into wrought products, it is not always practical to identify a specific casting analysis with a specific quantity of finished material.

6.2 *Manufacture:*

6.2.1 The product shall be manufactured by such hotworking, cold-working, and annealing processes as to produce a uniform wrought structure in the finished product.

6.2.2 The product shall be hot- or cold-worked to the finished size and subsequently annealed, when required, to meet the temper properties specified.

6.3 *Edges:*

6.3.1 Slit edges shall be furnished unless otherwise specified in the contract or purchase order.

7. Chemical Composition

7.1 The material shall conform to the chemical composition prescribed in Table 1.

7.2 These composition limits do not preclude the presence of other elements. By agreement between manufacturer and purchaser, limits may be established and analysis required for unnamed elements.

7.3 When all elements listed in Table 1 are analyzed, the sum of results shall be 99.9 % minimum.

8. Temper

8.1 The standard tempers for products described in this specification are given in Table 2.

8.1.1 Cold rolled tempers H01 to H08.

8.1.2 Annealed temper OS015.

9. Grain Size for Annealed Temper

9.1 Grain size shall be the standard requirement for all product in the annealed tempers.

9.2 Acceptance or rejection based upon grain size shall depend only on the average grain size of a test specimen taken from each of two sample portions, and each specimen shall be within the limits prescribed in Table 2 when determined in accordance with Test Method E112.

10. Physical Property Requirements

10.1 *Electrical Resistivity Requirements:*

10.1.1 The product furnished shall conform to the electrical mass Resistivity requirements in Table 3 by temper when tested in accordance with Test Method B193.

TABLE 2 Tensile Strength and Grain Size Requirements

Standard	Temper Designation <sup>A</sup>	Tensile Strength, ksi <sup>B</sup> (MPa) <sup>C</sup>		Grain Size, mm <sup>D</sup>
		Former	Min Max	
OS015	annealed	...	...	0.030 max
H01	quarter hard	40 (275)	45 (310)	...
H02	half hard	43 (295)	51 (350)	...
H03	three-quarter hard	47 (325)	56 (385)	...
H04	hard	53 (365)	62 (425)	...
H06	extra hard	59 (405)	65 (450)	...
H08	spring	64 (440)	71 (490)	...

<sup>A</sup> Standard designations defined in Practice B601.

<sup>B</sup> ksi = 1000 psi.

<sup>C</sup> See Appendix X1.

<sup>D</sup> Although no minimum grain size is required, this material must be fully recrystallized.

TABLE 3 Electrical Resistivity

Temper	Electrical Resistivity at 20°C (68°F), max, Ω·g/m <sup>2</sup>	Equivalent Conductivity at 20°C (68°F), % IACS, min
Annealed (OS015)	0.16136	95
Rolled (H01, H02, H03, H04, H06, H08)	0.17031	90

11. Mechanical Property Requirements

11.1 *Tensile Strength Requirements :*

11.1.1 Product furnished under this specification shall conform to the tensile requirements prescribed in Table 2, when tested in accordance with Test Method E8/E8M.

11.1.2 Acceptance and rejection based upon mechanical properties shall depend only on tensile strength.

12. Dimensions, Mass, and Permissible Variations

12.1 The following titled sections and tables in Specification B248 are a part of this specification:

12.1.1 *Thickness.*

12.1.2 *Width—Slit metal and slit metal with rolled edges.*

12.1.3 *Square Sheared Metal; Sawed Metal.*

12.1.4 *Length:*

12.1.4.1 *Length Tolerances for Specific and Stock Lengths With and Without Ends.*

12.1.4.2 *Schedule of Lengths (Specific and Stock) With Ends.*

12.1.4.3 *Length Tolerances for Square Sheared Metal.*

12.1.4.4 *Length Tolerances for Sawed Metal.*

12.1.5 *Straightness:*

12.1.5.1 *Slit Metal or Slit Metal Either Straightness or Edge Rolled.*

12.1.5.2 *Square Sheared Metal.*

12.1.5.3 *Sawed Metal.*

12.1.6 *Edges:*

12.1.6.1 *Square Edges.*

12.1.6.2 *Rounded Corners.*

12.1.6.3 *Rounded Edges.*

12.1.6.4 *Full Rounded Edges.*

TABLE 1 Chemical Requirements

Element	Composition, %
	Copper Alloy UNS No. C15100
Copper (including Ag)	99.80 % min
Zirconium	0.05–0.15
Cu + sum of named elements	99.9 % min