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Standard Specification for Copper-Zirconium Alloy Sheet and Strip [1]

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 reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

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

1.2 Values stated in inch-pound units are the standard. SI values given in parentheses are for information only.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

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 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 Orders for product under this specification should include the following information:

5.1.1 ASTM designation number and year of issue,
5.1.2 Quantity (of each size),
5.1.3 Copper Alloy UNS No. (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.

6.1.2 In the event heat identification or traceability is required, the purchaser shall specify the details desired.

[1] 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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[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.

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

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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 product shall conform to the chemical composition prescribed in Table 1.

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

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 tempers, as defined in Practice B601, available under this specification are as designated in Table 2.

9. Grain Size for Annealed Temper

9.1 Grain size for OS015 temper product shall be as given in Table 2 when tested in accordance with Test Methods E112.

10. Physical Property Requirements

10.1 *Electrical Resistivity Requirements*:

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

11. Mechanical Property Requirements

11.1 *Tensile Strength Requirements*:

11.1.1 Tempers H01, H02, H03, H04, H06, and H08 shall conform to the requirements prescribed in Table 2 when tested in accordance with Test Methods E8. Tensile strength shall be the basis for acceptance or rejection of product in these tempers.

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*.

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

TABLE 2 Tensile Strength and Grain Size Requirements

Temper Designation[A]		Tensile Strength, ksi[B] (MPa)[C]		Grain Size, mm[D]
Standard	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 (430)	...
H06	extra hard	59 (405)	65 (450)	...
H08	spring	64 (440)	71 (490)	...

[A] Standard designations defined in Practice B601.
[B] ksi = 1000 psi.
[C] See Appendix X1.
[D] 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^2	Equivalent Conductivity at 20°C (68°F), % IACS, min
Annealed (OS015)	0.16136	95
Rolled (H01, H02, H03, H04, H06, H08)	0.17031	90

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*.

13. Workmanship, Finish and Appearance

13.1 The material shall be free of defects, but blemishes of a nature that do not interfere with normal commercial operations are acceptable. It shall be well-cleaned and free of dirt. A superficial film or residual light lubricant is normally present and is acceptable unless otherwise specified.

13.2 The surface finish and appearance shall be the normal commercial quality for the alloy, thickness, and temper ordered. When application information is provided with purchase order, the surface shall be that commercially producible for the application. Superficial films of discoloration, or lubricants, or tarnish inhibitors are permissible unless otherwise specified.

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