Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 4510D
Superseding AMS 4510C
Issued 12-5-39
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UNS C51000

PHOSPHOR BRONZE SHEET, STRIP, AND PLATE
94.8Cu - 5.0Sn - 0.19P (CDA510)
Spring Temper

1. SCOPE:

1.1 Form: This specification covers one type of phosphor bronze in the form of sheet, strip, and plate.

1.2 Application: Primarily for stampings and springs.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2222 - Tolerances, Copper and Copper Alloy Sheet, Strip, and Plate
AMS 2350 - Standards and Test Methods

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM B248 - General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar
ASTM E8 - Tension Testing of Metallic Materials
ASTM E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
ASTM E54 - Chemical Analysis of Special Brasses and Bronzes

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

2.3.2 Military Specifications:

MIL-C-3993 - Copper and Copper-Base Alloy Mill Products; Packaging of

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E54, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

	min	max
Copper	93.0	--
Tin	4.2	- 5.8
Phosphorus	0.03	- 0.35
Zinc	--	0.30
Iron	--	0.10
Lead	--	0.05
Antimony	--	0.01
Total Named Elements	99.9	--

3.2 Condition: Cold rolled, spring temper.

3.3 Properties: The product shall conform to the following requirements:

3.3.1 Tensile Strength: Shall be 91,000 - 105,000 psi (627 - 724 MPa), determined in accordance with ASTM E8.

3.3.2 Hardness: Should be as follows or equivalent, determined in accordance with ASTM E18, but the product shall not be rejected on the basis of hardness if the tensile strength requirement is met.

Nominal Thickness		
Inches	(Millimetres)	Hardness
0.010 to 0.030, excl	(0.25 to 0.76, excl)	75 - 79 HR30T
0.030 to 0.040, excl	(0.76 to 1.02, excl)	77 - 81 HR30T
0.040 and over	(1.02 and over)	90 - 96 HRB

3.4 Quality: The product, as received by the purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections detrimental to usage of the product.

3.5 Tolerances: Unless otherwise specified, tolerances shall conform to AMS 2222 as applicable to refractory alloys.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests.

4.3 Sampling: Shall be in accordance with ASTM B248.

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment three copies of a report of the results of tests for chemical composition, tensile strength, and hardness of each lot, and stating that the Ø product conforms to the other technical requirements of this specification. This report shall include the purchase order number, material specification number and its revision letter, size, and quantity.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number and its revision letter, contractor or other direct supplier of material, part number, and quantity. When material for Ø making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified require- ments, disposition of the product may be based on the results of testing three additional specimens Ø for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Each sheet and strip shall be identified as in 5.1.1 unless line marking as in 5.1.2 is Ø specified by purchaser.

5.1.1 Each sheet and strip shall be marked near one end, coils being marked near the outside end, with AMS 4510D, manufacturer's identification, and nominal thickness, using any suitable marking fluid. Ø As an alternate method, individual pieces shall have attached a durable tag or label marked with the above information or shall be boxed and the box marked with the same information.

5.1.2 When specified by purchaser, each sheet and strip shall be marked on one face, in the respective location indicated below, with AMS 4510D, lot number, manufacturer's identification, and nominal thickness. The characters shall be of such size as to be clearly legible, shall be applied using a Ø suitable marking fluid, and shall be removable in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the product or its performance and shall be suffi- ciently stable to withstand normal handling. The specification number, manufacturer's identification, and nominal thickness shall be continuously line marked; the lot number may be included in the line marking or may be marked at one location on each piece.

5.1.2.1 Flat Strip 6 In. (152 mm) and Under in Width: Shall be marked in one or more lengthwise rows Ø of characters recurring at intervals not greater than 3 ft (914 mm).

5.1.2.2 Flat Sheet and Flat Strip Over 6 In. (152 mm) in Width: Shall be marked in lengthwise rows of Ø characters recurring at intervals not greater than 3 ft (914 mm), the rows being spaced not more than 6 in. (152 mm) apart and alternately staggered.

5.1.2.3 Coiled Sheet and Strip: Shall be marked near both the outside and inside ends of the coil; the markings shall be applied as in 5.1.2 or shall appear on a durable tag or label attached to the Ø coil and marked with the information of 5.1.2. When the inside end of the coil is inaccessible, as when the product is wound on cores, the tag or label may be attached to the core.

5.2 Packaging:

5.2.1 The product shall be prepared for shipment in accordance with commercial practice to ensure carrier Ø acceptance and safe transportation to the point of delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.