The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 4510F

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Superseding AMS 4510E

Submitted for recognition as an American National Standard

PHOSPHOR BRONZE, SHEET, STRIP, AND PLATE
94.5Cu - 4.0Sn - 0.19P
Spring Temper (H08)

UNS C51000

1. SCOPE:

1.1 Form:

This specification covers a copper alloy (phosphor bronze) in the form of sheet, strip, and plate.

1.2 Application:

These products have been used typically for stampings and springs, but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2222 Tolerances, Copper and Copper Alloy Sheet, Strip, and Plate
MAM 2222 Tolerances, Metric, Copper and Copper Alloy Sheet, Strip, and Plate

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM B 248 General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar
ASTM B 248M General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar (Metric)
ASTM E 8 Tension Testing of Metallic Materials
ASTM E 8M Tension Testing of Metallic Materials (Metric)
ASTM E 18 Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
ASTM E 54 Chemical Analysis of Special Brasses and Bronzes

2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

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

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

(R)

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 54, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element	min	max
Tin	4.2	5.8
Phosphorus	0.03	0.35
Zinc	--	0.30
Iron	--	0.10
Lead	--	0.05
Copper + Sum of Named Elements (3.1.2)	99.5	--
Copper (3.1.1)	remainder	

3.1.1 Applicable only when copper is not determined by analysis. The reported (certified) value is the difference between the sum of all other specified elements and 100% and will, therefore, include unnamed elements. Limits for unnamed elements may be established by agreement between purchaser and manufacturer.

3.1.2 Applicable only when copper is determined by direct analysis.

3.2 Condition:

Cold rolled, spring (H08) temper (See 8.2).

3.3 Properties:

The product shall conform to the following requirements.

3.3.1 Tensile Properties: Shall be 91.0 to 105 ksi (627 to 724 MPa), determined in accordance with ASTM E 8 or ASTM E 8M.

3.3.2 (R) Hardness: Should be as shown in Table 2, or equivalent hardness (See 8.3), determined in accordance with ASTM E 18, but the product shall not be rejected on the basis of hardness if the tensile strength requirement is met.

TABLE 2 - Hardness

Nominal Thickness Inch	Nominal Thickness Millimeters	Hardness
Over 0.003 to 0.029, incl	Over 0.08 to 0.74	76 to 80 HR30T
Over 0.029 to 0.039, incl	Over 0.74 to 0.99	92 to 97 HRB
Over 0.039	Over 0.99	94 to 98 HRB

3.4 Quality:

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

3.5 Tolerances:

Shall conform to AMS 2222 or MAM 2222 as applicable to refractory alloys.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

Tests for all technical requirements are acceptance tests and shall be performed on each lot.

4.3 Sampling and Testing:

(R) Shall be in accordance with ASTM B 248 or ASTM B 248M.

4.4 Reports:

The vendor of the product shall furnish with each shipment a report showing the results of tests for chemical composition, tensile properties, and hardness of each lot. This report shall include the purchase order number, lot number, AMS 4510F, size, and quantity.

4.5 Resampling and Retesting:

(R) If any specimen used in the above tests fails to meet the specified requirements, disposition of the product may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Identification:

The product shall be identified as in 5.1.1 unless line marking as in 5.1.2 is specified by purchaser.

5.1.1 Each sheet, strip, and plate shall be legibly marked near one end, coils being marked near the outside end, with AMS 4510F, manufacturer's identification, and nominal thickness, using any suitable marking fluid. As an alternate method, individual pieces or bundles shall have attached a durable tag 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, strip, and plate shall be legibly marked on one face, in the respective location indicated below, with AMS 4510F, lot number, manufacturer's identification, and nominal thickness. The characters shall be applied using a suitable marking fluid removable in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the product or its performance and shall be sufficiently 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 Inches (152 mm) and Under in Width: Shall be marked in one or more lengthwise rows of characters recurring at intervals not greater than 3 feet (914 mm).