AEROSPACE MATERIAL SPECIFICATION

AMS4555™	REV. L

Issued 1941-09
Reaffirmed 2006-04
Revised 2021-04

Superseding AMS4555K

Leaded Brass, Seamless Tubing
66.5Cu - 32.5Zn - 0.48Pb
Light Annealed (O50)

UNS C33000

RATIONALE

AMS4555L results from a Five-Year Review and update of this specification with changes to prohibit unauthorized exceptions (3.7), revise residual stress test title (3.4.5, 4.2.2), application (1.2), composition (3.1), condition (3.2), reports (4.4.1), and identification (5.1.1).

1. SCOPE

1.1 Form

This specification covers a copper alloy (leaded brass) in the form of seamless tubing.

1.2 Application

This tubing has been used typically for parts requiring moderate strength and ductility, but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2223 Tolerances, Copper and Copper Alloy Seamless Tubing

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS4555L

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B154 Mercurous Nitrate Test for Copper and Copper Alloys

ASTM B251/B251M General Requirements for Wrought Seamless Copper and Copper-Alloy Tube

ASTM B858 Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys

ASTM E8/E8M Tension Testing of Metallic Materials

ASTM E18 Rockwell Hardness of Metallic Materials

ASTM E112 Determining Average Grain Size

ASTM E478 Chemical Analysis of Copper Alloys

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined in accordance with ASTM E478 or by other analytical methods acceptable to purchaser.

Table 1 - Composition

Element (3.1.2)	Min	Max
Copper	65.0	68.0
Lead (3.1.1)	0.25	0.7
Iron	--	0.7
Zinc	--	(see 3.1.3)
Sum of Named Elements (3.1.4)	99.6	--

3.1.1 For tubing over 5 inches (127 mm) in OD, lead may be less than 0.25%.

3.1.2 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 purchaser.

3.1.3 Zinc may be reported as “remainder,” or as the difference between the sum of results for all analyzed elements and 100%, or as the result of direct analysis.

3.1.4 When all named elements in Table 1 are analyzed, the sum shall be 99.6% minimum, but such determination is not required for routine acceptance of each lot.

3.2 Condition

In light annealed (O50) temper (see 8.2). Tubing shall be either bright-annealed or, if not, acid-cleaned after final annealing operation.

3.3 Fabrication

Tubing shall be produced by a seamless process. The external and internal surface finishes shall be produced by any method which will result in surfaces free from laps, folds, tears, and extraneous materials and which show no oxide discoloration. Processing shall not affect limits of wall thickness or corrosion resistance.

3.4 Properties

Tubing shall conform to the following requirements:

3.4.1 Tensile Properties

Shall be as shown in Table 2, determined in accordance with ASTM E8/E8M:

Table 2 - Minimum tensile properties

Property	Value
Tensile Strength	44.0 ksi (303 MPa)
Elongation in 2 Inches (50.8 mm)	35%

3.4.2 Average Grain Size

Grain size shall be not larger than 0.035 mm, determined in accordance with ASTM E112.

3.4.3 Hardness

Shall be as shown in Table 3, or equivalent, determined in accordance with ASTM E18, but tubing shall not be rejected on the basis of hardness if the tensile property and grain size requirements are met.

Table 3 - Maximum hardness

Nominal Wall Thickness Inches	Nominal Wall Thickness Millimeters	Hardness
Up to 0.030, incl	Up to 0.76, incl	60 HRB
Over 0.030	Over 0.76	90 HRF

3.4.4 Flarability

Tubing shall withstand flaring at room temperature, without formation of cracks or other visible defects, by being forced axially with steady pressure over a hardened and polished tapered steel pin having a 74 degree included angle to produce a flare having a permanent expanded OD not less than specified in Table 4.

Table 4 - Flaring parameters

Nominal OD Inches	Nominal OD Millimeters	Permanent Expanded OD
Up to 0.750, incl	Up to 19.05, incl	1.20 X nominal OD
Over 0.750 to 4.000, incl	Over 19.05 to 101.60, incl	1.15 X nominal OD

3.4.5 Residual Stress Test

Specimens of tubing, approximately 6 inches (152 mm) in length, shall withstand, without cracking, immersion in mercurous nitrate in accordance with ASTM B154, Procedure A, or the ammonia vapor test in accordance with ASTM B858.

3.5 Quality

Tubing, 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 tubing.

3.6 Tolerances

Shall conform to AMS2223 as applicable to nonrefractory alloys.

3.7 Exceptions

Any exceptions shall be authorized by purchaser and reported as in 4.4.1.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of tubing shall supply all samples for producer's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the tubing conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (3.1), tensile properties (3.4.1), average grain size (3.4.2), hardness (3.4.3), flarability (3.4.4), and tolerances (3.6) are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests

Residual stress test (3.4.5) is a periodic test and shall be performed at a frequency selected by the producer unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing

Shall be in accordance with ASTM B251/B251M and the following:

4.3.1 Specimens for flarability test (3.4.4) shall be full tubes or sections cut from a tube. The end of the specimen to be flared shall be cut square, with the cut end smooth and free from burrs, but not rounded.

4.4 Reports

The producer of tubing shall furnish with each shipment a report showing the results of tests for chemical composition, tensile properties, average grain size, hardness, and flarability of each lot, and stating that the tubing conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS4555L, nominal size, and quantity.

4.4.1 When material produced to this specification has exceptions authorized by purchaser taken to the technical requirements listed in Section 3, the report shall contain a statement “This material is certified as AMS4555L(EXC) because of the following exceptions:” and the specific exceptions shall be listed (see 5.1.1).

4.5 Resampling and Retesting

If any specimen used in the above tests fails to meet the specified requirements, disposition of the tubing 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 tubing represented. Results of all tests shall be reported.