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400 Commonwealth Dr., Warrendale, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS 4065G

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Superseding AMS 4065F

ALUMINUM ALLOY TUBING, SEAMLESS, DRAWN
1.2Mn - 0.12Cu (3003-0)
Annealed

UNS A93003

1. SCOPE:

1.1 Form: This specification covers an aluminum alloy in the form of seamless, drawn tubing.

1.2 Application: Primarily for parts requiring low strength and good formability.

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

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2203 - Tolerances, Aluminum Alloy Drawn Tubing
MAM 2203 - Tolerances, Metric, Aluminum Alloy Drawn Tubing
AMS 2350 - Standards and Test Methods
AMS 2355 - Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings
MAM 2355 - Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings, Metric (SI) Units

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

2.2.1 Military Standards:

MIL-STD-649 - Aluminum and Magnesium Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined in accordance with AMS 2355 or MAM 2355:

	min	max
Manganese	1.0	1.5
Copper	0.05	0.20
Iron	--	0.7
Silicon	--	0.6
Zinc	--	0.10
Other Impurities, each	--	0.05
Other Impurities, total	--	0.15
Aluminum	remainder	

3.2 Condition: Annealed.

3.3 Properties: Tubing shall conform to the following requirements, determined in accordance with AMS 2355 or MAM 2355:

3.3.1 Tensile Properties: Shall be as follows:

Tensile Strength 14,000 - 19,000 psi (95 - 130 MPa)

3.3.2 Flattening (Round Tubing Only): Round tubing having nominal wall thickness less than 10% of the nominal OD shall withstand, without cracking, flattening sideways under a load applied gradually at room temperature flat upon itself while under load.

3.3.2.1 If tubing does not pass the flattening test of 3.3.2, a section of tube not less than 1/2 in. (12 mm) in length and embracing one-third to one-half the circumference of the tube shall withstand, without cracking, bending at room temperature through an angle of 180 deg around a diameter equal to the nominal wall thickness of the tubing with axis of bend parallel to axis of tube and with inside of tube on inside of bend.

3.3.3 Flarability (Round Tubing Only): Tubing with nominal OD of 0.375 in. (9.50 mm) and under shall withstand double-flaring and tubing wth nominal OD over 0.375 in. (9.50 mm) shall withstand single-flaring without formation of cracks or other visible defects by being forced, at room temperature, axially with steady pressure over a hardened and polished tapered steel pin having a 74 deg included angle to produce a flare having a permanent expanded OD not less than specified in Table I.

TABLE I

Nominal OD Inches	Expanded OD Inches	Nominal OD Inches	Expanded OD Inches
0.125	0.224	1.000	1.187
0.188	0.302	1.250	1.500
0.250	0.359	1.500	1.721
0.312	0.421	1.750	2.106
0.375	0.484	2.000	2.356
0.500	0.656	2.500	2.856
0.625	0.781	3.000	3.356
0.750	0.937		

TABLE I (SI)

Nominal OD Millimetres	Expanded OD Millimetres	Nominal OD Millimetres	Expanded OD Millimetres
3.00	5.60	25.00	29.70
4.70	7.55	31.25	37.50
6.25	9.00	37.50	43.00
7.75	10.50	43.75	52.65
9.50	12.15	50.00	58.90
12.50	16.40	62.50	71.40
15.50	19.50	75.00	83.90
18.75	23.40		

3.3.3.1 Tubing with nominal OD between any two standard sizes shown in Table I shall take the same percentage flare as shown for the larger of the two sizes.

3.3.3.2 Flarability requirements for tubing having nominal OD less than 0.125 in. (3.00 mm) or greater than 3.000 in. (75.00 mm) shall be as agreed upon by purchaser and vendor.

3.4 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.

3.5 Tolerances: Shall conform to all applicable requirements of AMS 2203 or MAM 2203.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of tubing shall supply all samples for vendor's tests 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 sample and to perform any confirmatory testing deemed necessary to ensure that the tubing conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for composition (3.1), tensile properties (3.3.1), and tolerances (3.5) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for flattening (3.3.2) and flarability (3.3.3) are classified as periodic tests and shall be performed at a frequency selected by the manufacturer unless frequency of testing is specified by purchaser.

4.3 Sampling: Shall be in accordance with AMS 2355 or MAM 2355 and the following:

4.3.1 Specimens for flarability test shall be full tubes or sections cut from tubes. The end of the specimen to be flared shall be cut square, with the cut end smooth and free from burrs but, except for sizes 0.375 in. (9.50 mm) and under, not rounded.

4.4 Reports:

4.4.1 The vendor of tubing shall furnish with each shipment a report stating that the tubing conforms to the chemcial composition and other technical requirements of this specification. This report shall include the purchase order number, AMS 4065G, size, and quantity.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 4065G, contractor or other direct supplier of tubing, part number, and quantity. When tubing for making parts is produced by the parts vendor, that vendor shall inspect each lot of tubing to determine conformance to the requirements of this specification and shall include in the report either a statement that the tubing conforms or copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: Shall be in accordance with AMS 2355 or MAM 2355.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Tubing shall be identified as follows:

5.1.1 Straight Tubes 0.029 In. (0.75 mm) and Over in Wall Thickness and 0.500 In. (12.50 mm) and Over in OD, Minor Axis, or Least Width of Flat Surface: Shall be marked in a row of characters recurring at intervals not greater than 3 ft (900 mm) with the alloy number and temper, AMS 4065, and manufacturer's identification. The characters shall be of such size as to be legible, shall be applied using a suitable marking fluid, and shall be sufficiently stable to withstand normal handling. The markings shall have no deleterious effect on the tubing or its performance.