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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS-4088 REV H

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Superseding AMS-4088G

Submitted for recognition as an American National Standard

ALUMINUM ALLOY TUBING, SEAMLESS, DRAWN
4.4Cu - 1.5Mg - 0.60Mn (2024-T3)
Solution Heat Treated and Cold Worked

UNS A92024

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 a high-strength, non-weldable alloy.

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.

2.1.1 Aerospace Material Specifications:

AMS-2203 - Tolerances, Aluminum Alloy Drawn Tubing
MAM-2203 - Tolerances, Metric, Aluminum Alloy Drawn Tubing
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
AMS-2811 - Identification, Aluminum and Magnesium Alloy Wrought Products

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

ASTM B 660 - Packaging/Packing of Aluminum and Magnesium Products

2.3 U.S. Government Publications: Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

2.3.1 Military Specifications:

MIL-H-6088 - Heat Treatment of Aluminum Alloys

3. TECHNICAL REQUIREMENTS:

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

	min	max
Copper	3.8	4.9
Magnesium	1.2	1.8
Manganese	0.30	0.9
Iron	--	0.50
Silicon	--	0.50
Zinc	--	0.25
Titanium	--	0.15
Chromium	--	0.10
Other Impurities, each	--	0.05
Other Impurities, total	--	0.15
Aluminum	remainder	

3.2 Condition: Solution heat treated in accordance with MIL-H-6088 and cold Ø worked.

3.3 Properties: The product shall conform to the following requirements, Ø determined in accordance with AMS-2355 or MAM-2355:

3.3.1 Tensile Properties: Shall be as specified in Table I and 3.3.1.1.

TABLE I

Nominal Wall Thickness Inch	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 Inches or 4D %, min	
			Strip	Full Section
0.018 to 0.024, incl	64,000	42,000	--	10
Over 0.024 to 0.049, incl	64,000	42,000	10	12
Over 0.049 to 0.259, incl	64,000	42,000	10	14
Over 0.259 to 0.500, incl	64,000	42,000	12	16

TABLE I(SI)

Nominal Wall Thickness Millimetres	Tensile Strength MPa, min	Yield Strength At 0.2% Offset MPa, min	Elongation in 50.8 mm or 4D %, min	
			Strip	Full Section
0.46 to 0.61, incl	441	290	--	10
Over 0.61 to 1.24, incl	441	290	10	12
Over 1.24 to 6.58, incl	441	290	10	14
Over 6.58 to 12.70, incl	441	290	12	16

3.3.1.1 Tensile property requirements for tubing under 0.018 inch (0.46 mm) or over 0.500 inch (12.70 mm) in nominal wall thickness shall be as agreed upon by purchaser and vendor.

3.3.2 Flattening: 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 until the outside dimension under load is equal to eight times the nominal wall thickness.

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 inch (12.7 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 degrees around a diameter equal to six times 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.

3.4 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.

3.4.1 Detrimental imperfections include, but are not limited to, cracks, splits, seams, inclusions, or severe crosshatching (surface breaks) that cannot be removed by lightly hand-sanding, using 180 grit or finer sandpaper.

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 Ø 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 tubing conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests for composition (3.1), tensile properties (3.3.1), quality (3.4), and tolerances (3.5) are acceptance tests and shall be performed on each lot of tubing.

4.2.2 Periodic Tests: Tests for flattening (3.3.2) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing: Shall be in accordance with AMS-2355 or MAM-2355.
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4.4 Reports: The vendor of tubing shall furnish with each shipment a report stating that the tubing conforms to the chemical composition and other technical requirements. This report shall include the purchase order number, lot number, AMS-4088H, size, and quantity.

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

5. PREPARATION FOR DELIVERY:

5.1 Identification: Shall be in accordance with AMS-2811.
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5.2 Protective Treatment: Tubing shall be oiled, prior to shipment, with a light corrosion-inhibiting oil.

5.3 Packaging:

5.3.1 Tubing shall be prepared for shipment in accordance with commercial
Ø practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the tubing to ensure carried acceptance and safe delivery.

5.3.2 For direct U. S. Military procurement, packaging shall be in accordance
Ø with ASTM B 660, Commercial Level, unless Level A is specified in the request for procurement.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Tubing not conforming to this specification, or to modifications authorized by purchaser, will be subject to rejection.

8. NOTES:

8.1 Marginal Indicia: The phi (Ø) symbol is used to indicate technical changes from the previous issue of this specification.

8.2 Dimensions and properties in inch/pound units are primary; dimensions and properties in SI units are shown as the approximate equivalents of the primary units and are presented only for information.