

ALUMINUM ALLOY TUBING, SEAMLESS, DRAWN, ROUND  
1.25Mn - 0.12Cu (3003-H14)  
Strain Hardened

UNS A93003

1. SCOPE:

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

1.2 Application: Primarily for parts, such as brackets, conduits, and low-pressure lines, requiring good weldability and resistance to corrosion.

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

SAE Technical Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

AMS documents are protected under United States and international copyright laws. Reproduction of these documents by any means is strictly prohibited without the written consent of the publisher.

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: Strain hardened to H14 temper.

3.3 Properties: Tubing shall conform to the following requirements:

3.3.1 Tensile Properties: Shall be as follows, determined in accordance with AMS 2355 or MAM 2355:

Tensile Strength, min                      20,000 psi (140 MPa)

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 six 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 in. (12.5 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 four times the nominal wall thickness of the tubing with axis of bend parallel to axis of tube and with ID of tube on inside of bend.

3.3.3 Flarability: Tubing 0.375 in. (9.50 mm) and under in nominal OD shall withstand double-flaring and tubing over 0.375 in. (9.50 mm) in nominal OD shall withstand single-flaring without formation of cracks or other visible defects, by being forced axially, at room temperature, 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	0.200	0.750	0.937
0.188	0.290	1.000	1.187
0.250	0.359	1.250	1.500
0.312	0.421	1.500	1.721
0.375	0.484	1.750	2.106
0.500	0.656	2.000	2.356
0.625	0.781	2.500	2.856
		3.000	3.356

TABLE I (SI)

Nominal OD Millimetres	Expanded OD Millimetres	Nominal OD Millimetres	Expanded OD Millimetres
3.00	4.95	18.75	23.40
4.70	7.25	25.00	29.70
6.25	9.00	31.25	37.50
7.75	10.50	37.50	43.00
9.50	12.15	43.75	52.65
12.50	16.40	50.00	58.90
15.50	19.50	62.50	71.40
		75.00	83.90

3.3.3.1 Tubing with nominal OD between any two standard sizes shown in 3.3.3 shall take the same percentage flare as that for the next larger standard sizes.

3.3.3.2 Flarability requirements for tubing over 3.000 in. (75.00 mm) or under 0.125 in. (3.12 mm) in nominal OD 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 vendor 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 (3.3.3) test 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, except for sizes 0.375 in. (9.50 mm) and under in nominal diameter, 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 chemical composition and other technical requirements of this specification. This report shall include the purchase order number, lot number, AMS 4067F, 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 4067F, contractor or other direct supplier of tubing, part number, and quantity. When tubing for making parts is produced or purchased 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: Shall be as follows: