AEROSPACE MATERIAL SPECIFICATION

AMS4087™	REV. K

Issued 1945-11
Reaffirmed 2015-05
Revised 2025-02

Superseding AMS4087J

Aluminum Alloy Tubing, Seamless, Drawn, 4.4Cu - 1.5Mg - 0.60Mn (2024-O), Annealed

(Composition similar to UNS A92024)

RATIONALE

AMS4087K results from a Five-Year Review and update of this specification with changes to update standard language related to unauthorized exceptions (see 3.3.3, 4.4.1, and 8.4), relocate Definitions (see 2.4), and update Applicable Documents (see Section 2 and 3.3.2), Condition (see 3.2), and Ordering Information (see 8.5).

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of seamless drawn tubing having nominal wall thickness of 0.018 to 0.500 inch (0.46 to 12.70 mm), inclusive (see 8.4).

1.2 Application

These products have been used typically for parts requiring a high-strength, non-weldable alloy. Parts are usually solution heat treated and aged before use, 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.

AMS2355 Quality Assurance, Sampling and Testing, Aluminum Alloys and Magnesium Alloy, Wrought Products (Except Forging Stock), and Rolled, Forged, or Flash Welded Rings

AMS2772 Heat Treatment of Aluminum Alloy Raw Materials

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/AMS4087K/

AS4330 Tubing, Flared, Standard Dimensions for, Design Standard

AS7766 Terms Used in Aerospace Metals Specifications

AS33583 Tubing End, Double Flare, Standard Dimensions for

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 B660 Packaging/Packing of Aluminum and Magnesium Product

ASTM B666/B666M Identification Marking of Aluminum and Magnesium Products

2.3 ANSI Accredited Publications

Copies of these documents are available online at https://webstore.ansi.org/.

ANSI H35.1/H35.1M Standard Alloy and Temper Designation System For Aluminum

ANSI H35.2 Dimensional Tolerances for Aluminum Mill Products

ANSI H35.2M Dimensional Tolerances for Aluminum Mill Products (Metric)

2.4 Definitions

Terms used in AMS are defined in AS7766 and as follows:

2.4.1 A double flare is similar to a standard single flare except that the flare is folded back on itself such that the cut edge is inside the flare near the ID of the tube. Definitions and illustrations of single flaring are shown in AS4330; double flaring is defined and illustrated in AS33583.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined in accordance with AMS2355.

Table 1 - Composition

Element	Min	Max
Silicon	--	0.50
Iron	--	0.50
Copper	3.8	4.9
Manganese	0.30	0.9
Magnesium	1.2	1.8
Chromium	--	0.10
Zinc	--	0.25
Titanium	--	0.15
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition

Annealed in accordance with AMS2772.

3.3 Properties

Tubing shall conform to the following requirements, determined in accordance with AMS2355 on the mill-produced size:

3.3.1 As Annealed

3.3.1.1 Tensile Properties

Shall be as shown in Table 2 for tubing having nominal wall thickness of 0.018 to 0.500 inch (0.46 to 12.70 mm), inclusive.

Table 2 - As annealed, maximum tensile properties

Property	Value
Tensile Strength	32.0 ksi (221 MPa)
Yield Strength at 0.2% Offset	15.0 ksi (103 MPa)

3.3.1.2 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 the flattening factor shown in Table 3 times the nominal wall thickness.

Table 3 - Flattening factor

Nominal Wall Thickness Inches	Nominal Wall Thickness Millimeters	Factor
Up to 0.049, incl	Up to 1.24, incl	3
Over 0.049	Over 1.24	4

3.3.1.2.1 Retesting Procedure

If tubing does not pass the flattening test of 3.3.1.2, a section of tube not less than 1/2 inch (12.7 mm) in length and including 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 the bend factor shown in Table 4 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.

Table 4 - Bending factor

Nominal Wall Thickness Inches	Nominal Wall Thickness Millimeters	Factor
Up to 0.049, incl	Up to 1.24, incl	1
Over 0.049	Over 1.24	2

3.3.1.3 Flarability

Tubing 0.375 inch (9.52 mm) and under in nominal OD shall withstand double-flaring and tubing over 0.375 inch (9.52 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-degree included angle, to produce a flare having a permanent expanded OD not less than specified in Table 5 (see 2.4.1).

Table 5A - Flarability, inch/pound units

Nominal OD Inches	Expanded OD Inches	Nominal OD Inches	Expanded OD Inches
0.125	0.200	0.750	0.937
0.188	0.302	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 5B - Flarability, SI units

Nominal OD Millimeters	Expanded OD Millimeters	Nominal OD Millimeters	Expanded OD Millimeters
3.18	5.08	19.05	23.80
4.78	7.67	25.40	30.15
6.35	9.12	31.75	38.10
7.92	10.69	38.10	43.71
9.52	12.29	44.45	53.49
12.70	16.66	50.80	59.84
15.88	19.84	63.50	72.54
		76.20	85.24

3.3.1.3.1 Tubing with nominal OD between any two standard sizes shown in 3.3.1.3 shall take the same percentage flare as shown for the larger of the two sizes.

3.3.2 After Solution Heat Treatment and Aging

Tubing, as received by the purchaser, after solution heat treatment in accordance with AMS2772 and aging for not less than 4 days at room temperature to the T42 temper (refer to ANSH H35.1/H35.1M), shall have the following properties:

3.3.2.1 Tensile Properties

Shall be as specified in Table 6.

Table 6A - Minimum tensile properties, inch/pound units

Nominal Wall Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D % Cutout Specimen	Elongation in 2 Inches or 4D % Full Section Specimen
0.018 to 0.024, incl	64.0	40.0	--	10
Over 0.024 to 0.049, incl	64.0	40.0	10	12
Over 0.049 to 0.259, incl	64.0	40.0	10	14
Over 0.259 to 0.500, incl	64.0	40.0	12	16

Table 6B - Minimum tensile properties, SI units

Nominal Wall Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D % Cutout Specimen	Elongation in 50.8 mm or 4D % Full Section Specimen
0.46 to 0.61, incl	441	276	--	10
Over 0.61 to 1.24, incl	441	276	10	12
Over 1.24 to 6.58, incl	441	276	10	14
Over 6.58 to 12.70, incl	441	276	12	16

3.3.3 Mechanical property requirements for product outside the range covered by 1.1 shall be agreed upon between the purchaser and producer and reported per 4.4.1 (see 8.5)

3.4 Quality

Tubing, as received by the 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 cross-hatching (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 ANSI H35.2 or ANSI H35.2M.

3.6 Exceptions

Any exceptions shall be authorized by the 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 the producer's tests and shall be responsible for the performance of all required tests. The 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 (see 3.1), tensile properties as annealed (see 3.3.1.1), after solution heat treatment and aging (see 3.3.2), quality (see 3.4), and tolerances (see 3.5) are acceptance tests and, except for composition, shall be performed on each lot of tubing.

4.2.2 Periodic Tests

Tests for flattening (see 3.3.1.2) and flarability (see 3.3.1.3) are periodic tests and shall be performed at a frequency selected by the producer unless frequency of testing is specified by the purchaser.

4.3 Sampling and Testing

Shall be in accordance with AMS2355 and the following:

4.3.1 Specimens for the flarability test (see 3.3.1.3) 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 inch (9.52 mm) and under in nominal diameter, not rounded.

4.4 Reports

The producer of tubing shall furnish with each shipment a report stating that the tubing conforms to the composition and tolerances (and NDT inspection, when required) and showing the numerical results of tests on each inspection lot to determine conformance to the other acceptance test requirements and periodic test requirements when performed. This report shall include the purchase order number, inspection lot number(s), AMS4087K, size, and quantity. The report shall also identify the producer, the product form, and the size of the mill product.