

AEROSPACE MATERIAL SPECIFICATION

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Superseding AMS 4068C

Aluminum Alloy, Drawn Seamless Tubing
6.3Cu - 0.30Mn - 0.18Zr - 0.10V - 0.06Ti (2219-T3511)
Solution Heat Treated and Stress Relieved by Stretching
(Composition similar to UNS A92219)

1. SCOPE:

1.1 Form:

This specification covers an aluminum alloy in the form of drawn seamless tubing 0.029 to 0.500 inch (0.74 to 12.70 mm) in nominal wall thickness.

1.2 Application:

This tubing has been used primarily for structures requiring good fusion weldability and a combination of good strength and resistance to stress-corrosion cracking after precipitation heat treatment, 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, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

AMS 2355	Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings
AMS 2772	Heat Treatment of Wrought Aluminum Alloy Raw Materials
AS1990	Aluminum Alloy Tempers

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2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM B 660 Packaging/Packing of Aluminum and Magnesium Products

ASTM B 666/B 666M Identification of Aluminum and Magnesium Alloy Products

2.3 Available from ANSI, 25 West 43rd Street, New York, NY 10036 or www.ansi.org.

ANSI H35.2 Dimensional Tolerances for Aluminum Mill Products

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

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Shall conform to the percentages by weight shown in Table 1, determined in accordance with AMS 2355:

TABLE 1 – Composition

Element	min	max
Silicon	--	0.20
Iron	--	0.30
Copper	5.8	6.8
Manganese	0.20	0.40
Magnesium	--	0.02
Zinc	--	0.10
Titanium	0.02	0.10
Vanadium	0.05	0.15
Zirconium	0.10	0.25
Other Elements, each	--	0.05
Other Elements, total	--	0.15

3.2 Condition:

Solution heat treated and stress relieved by stretching to produce a permanent set of 1/2 to 3%; solution heat treatment shall be performed in accordance with AMS 2772 to the T3511 temper (see AS1990).

3.3 Properties:

Tubing shall conform to the following requirements, determined in accordance with AMS 2355 on the mill product:

3.3.1 Tensile Properties:

3.3.1.1 As Solution Heat Treated and Stress-Relieved: Shall be as shown in Table 2.

TABLE 2A - Minimum Tensile Properties, Inch/Pound Units

Nominal Wall Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches % Strip	Elongation in 2 Inches % Full Section
0.029 to 0.049, incl	45.0	26.0	--	12
Over 0.049 to 0.500, incl	45.0	26.0	12	14

TABLE 2B - Minimum Tensile Properties, SI Units

Nominal Wall Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm % Strip	Elongation in 50.8 mm % Full Section
0.74 to 1.24, incl	310	179	--	12
Over 1.24 to 12.70, incl	310	179	12	14

3.3.2 Response to Heat Treatment: Tubing, precipitation heat treated in accordance with AMS 2772 to the T8511 temper, shall have properties shown in Table 3.

TABLE 3A - Minimum Tensile Properties, Inch/Pound Units

Nominal Wall Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches % Strip	Elongation in 2 Inches % Full Section
0.029 to 0.049, incl	60.0	42.0	--	6
Over 0.049 to 0.500, incl	60.0	42.0	6	8

TABLE 3B - Minimum Tensile Properties, SI Units

Nominal Wall Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm % Strip	Elongation in 50.8 mm % Full Section
0.74 to 1.24, incl	414	290	--	6
Over 1.24 to 12.70, incl	414	290	6	8

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 ANSI H35.2 or ANSI H35.2M.

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 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 (3.3.1.1), and tolerances (3.5) are acceptance tests and except for composition, shall be performed on each inspection lot.

4.2.2 Periodic Tests: Response to precipitation heat treat (3.3.2) shall be performed at a frequency selected by the vendor unless frequency of testing is specified by the purchaser.

4.3 Sampling and Testing:

Shall be in accordance with AMS 2355.

4.4 Reports:

The vendor of tubing shall furnish with each shipment a report stating that the tubing conforms to the chemical composition and tolerances and showing the numerical results of tests on each inspection lot to determine conformance to the other acceptance test requirements. This report shall include the purchase order number, inspection lot number, AMS 4068D, size, and quantity. The report shall also identify the producer and the size of the mill product.

4.5 Resampling and Retesting:

Shall be in accordance with AMS 2355.

5. PREPARATION FOR DELIVERY:

5.1 Identification:

Shall be in accordance with ASTM B 666/B 666M.