SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS4068E

Issued 1997-07
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Superseding AMS4068D

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)

RATIONALE

AMS4068E results from a Five Year Review and update of this specification.

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 International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 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

AS1990 Aluminum Alloy Tempers

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS4068E

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 B 660 Packaging/Packing of Aluminum and Magnesium Products

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

2.3 ANSI Publications

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, 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 AMS2355:

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 AMS2772 to the T3511 temper (See AS1990).

3.3 Properties

Tubing shall conform to the following requirements, determined in accordance with AMS2355 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 AMS2772 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 AMS2355.

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, AMS4068E, 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 AMS2355.

5. PREPARATION FOR DELIVERY

5.1 Identification

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

5.2 Packaging

Tubing shall be prepared for shipment in accordance with ASTM B 660 and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the tubing to ensure carrier acceptance and safe delivery.

6. ACKNOWLEDGMENT

A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchaser orders.

7. REJECTIONS

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

8. NOTES

8.1 A change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.