

# AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

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Superseding AMS 4068B

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

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 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.

AMS 2355 Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings

MAM 2355 Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings, Metric (SI) Units

AMS 2770 Heat Treatment of Wrought Aluminum Alloy Parts

AMS 2811 Identification, Aluminum and Magnesium Alloy Wrought Products

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## 2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-H-6088 Heat Treatment of Aluminum Alloys

## 2.3 ANSI Publications:

Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

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 or MAM 2355.

TABLE 1 - Composition

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

### 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 MIL-H-6088.

## 3.3 Properties:

Tubing shall conform to the following requirements, determined in accordance with AMS 2355 or MAM 2355:

## 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<br>Inch | Tensile Strength<br>ksi | Yield Strength<br>at 0.2% Offset<br>ksi | Elongation<br>in 2 Inches<br>%<br>Strip | Elongation<br>in 2 Inches<br>%<br>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<br>Millimeters | Tensile Strength<br>MPa | Yield Strength<br>at 0.2% Offset<br>MPa | Elongation<br>in 50.8 mm<br>%<br>Strip | Elongation<br>in 50.8 mm<br>%<br>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 2770 to the T8511 temper, shall have properties shown in Table 3.

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

| Nominal Wall Thickness<br>Inch | Tensile Strength<br>ksi | Yield Strength<br>at 0.2% Offset<br>ksi | Elongation<br>in 2 Inches<br>%<br>Strip | Elongation<br>in 2 Inches<br>%<br>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<br>Millimeters | Tensile Strength<br>MPa | Yield Strength<br>at 0.2% Offset<br>MPa | Elongation<br>in 50.8 mm<br>%<br>Strip | Elongation<br>in 50.8 mm<br>%<br>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:

(R)

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:

All technical requirements are acceptance tests and shall be performed on each lot.

## 4.3 Sampling and Testing:

Shall be in accordance with AMS 2355 or MAM 2355.

## 4.4 Reports:

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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 4068C, size, and quantity.