



AEROSPACE MATERIAL SPECIFICATION

AMS4331

Issued 2003-10
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Aluminum Alloy Extrusions
7.8Zn - 2.6Mg - 2.0Cu - 0.10Zr - (7068-T6511)
Solution Heat Treated, Stress Relieved, and Precipitation Heat Treated

RATIONALE

This document has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE:

1.1 Form:

This specification covers an aluminum alloy in the form of extruded bars, rods, shapes (profiles), and tubing.

1.2 Application:

These extrusions have been used typically for structural parts requiring a combination of high tensile strength and moderate fatigue strength, but usage is not limited to such applications.

1.2.1 Certain design and processing procedures may cause these products to become susceptible to stress-corrosion cracking; ARP823 recommends practices to minimize such conditions.

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 canceled 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 of Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged or Flash Welded Rings
AMS 2772	Heat Treatment of Aluminum Alloy Raw Materials

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2.1 (Continued):

ARP823	Minimizing Stress-Corrosion in Wrought Heat-Treatable Aluminum Alloy Products
AS1990	Aluminum Alloy Tempers

2.2 ASTM Publications:

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

ASTM B 594	Ultrasonic Inspection of Aluminum Alloy Wrought Products for Aerospace Applications
ASTM B 660	Packaging/Packing of Aluminum and Magnesium Products
ASTM B 666/B 666M	Identification Marking of Aluminum and Magnesium Products.

2.3 ANSI Publications:

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	--	0.12
Iron	--	0.15
Copper	1.6	2.4
Manganese	--	0.10
Magnesium	2.2	3.0
Chromium	--	0.05
Zinc	7.3	8.3
Titanium	--	0.10
Zirconium	0.05	0.15
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition:

Extruded, solution heat treated, and stress relieved by stretching to produce a nominal permanent set of 1.5%, but not less than 1% nor more than 3%, and precipitation heat treated to the T6511 temper (see AS1990). Heat treatment shall be in accordance with AMS 2772.

3.2.1 Extrusions may receive minor straightening, after stretching, of an amount necessary to meet the requirements of 3.5.

3.2.2 Extrusions shall be supplied with an as-extruded surface finish; light polishing to remove minor surface imperfections is permissible provided such imperfections can be removed within the dimensional tolerance.

3.3 Properties:

Extrusions shall conform to the following requirements, determined in accordance with AMS 2355 on the mill produced size.

3.3.1 Longitudinal Tensile Properties: Shall be as shown in Table 2A/2B.

Table 2A – Minimum Longitudinal Tensile Properties, Inch/Pound Units

Nominal Diameter or Least Thickness (bars, rods, wire, profiles) or Nominal Wall Thickness (tubing) inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation 4D %
0.250 to 3.000, incl	99.0	95.0	5

Table 2B – Minimum Longitudinal Tensile Properties, SI Units

Nominal Diameter or Least Thickness (bars, rods, wire, shapes) or Nominal Wall Thickness (tubing) Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation 4D %
6.35 to 76.20	683	655	5

3.4 Quality:

Extrusions, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from conditions detrimental to usage of the extrusions. Any detrimental conditions found during the customer's manufacturing process are subject to rejection.

3.4.1 When specified, extrusions 0.500 inch (12.70 mm) and over in nominal diameter or least distance between parallel sides, shall be subjected to ultrasonic inspection in accordance with ASTM B594. Standards for acceptance shall be as shown in Table 3.

TABLE 3 – Ultrasonic Class Requirements

Nominal Thickness Inches	Nominal Thickness Millimeters	Ultrasonic Class
0.500 to 1.500, excl	12.70 to 38.10, excl	B
1.500 to 3.000, incl	38.10 to 76.20, incl	A

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 extrusions 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 products conform to the specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Composition (3.1), tensile properties (3.3.1), ultrasonic inspection (3.4.1) when specified, and tolerances (3.5) are acceptance tests and, except for composition, shall be performed on each inspection lot.

4.3 Sampling and Testing:

Shall be in accordance with AMS 2355.

4.4 Reports:

4.4.1 The vendor of extrusions shall furnish with each shipment a report stating that the extrusions conform to the composition requirements and tolerances, results of ultrasonic inspection (when specified), and showing the numerical results on each inspection lot to determine conformance to the other acceptance tests. This report shall include the purchase order number, inspection lot number, AMS 4331, size or section identification number, and quantity. The report shall also include the producer, product form and 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.