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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 4232A

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Reaffirmed APR 2006

Superseding AMS 4232

Aluminum Alloy Extrusions
2.7Cu - 2.2Li - 0.12Zr (2090-T86)
Solution Heat Treated, Cold Worked, and Precipitation Heat Treated

(Composition similar to UNS A92090)

1. SCOPE:

1.1 Form:

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

1.2 Application:

These extrusions have been used typically for parts in structural applications requiring strength similar to 7050-T6 alloy with good exfoliation resistance and with a lower density of approximately 7.8%, 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 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.

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 2750	Pyrometry

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7161 FAX: (724) 776-0243
TO PLACE A DOCUMENT ORDER: (724) 776-4970 FAX: (724) 776-0790
SAE WEB ADDRESS: http://www.sae.org

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

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
ASTM G 34-72	Exfoliation Corrosion Susceptibility in 2XXX and 7XXX Series Aluminum Alloys (EXCO Test)
ASTM G 38	Making and Using C-Ring Stress Corrosion Test Specimen
ASTM G 44	Exposure of Metals and Alloys by Alternate Immersion in Neutral 3.5% Sodium Chloride Solution
ASTM G 85	Modified Salt Spray (Fog) Testing

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 or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element	min	max
Silicon	--	0.10
Iron	--	0.12
Copper	2.4	3.0
Manganese	--	0.05
Magnesium	--	0.25
Chromium	--	0.05
Zinc	--	0.10
Titanium	--	0.15
Lithium	1.9	2.6
Zirconium	0.08	0.15
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition:

Solution heat treated, cold worked, and precipitation heat treated to the -T86 temper (See 8.2).

3.2.1 Product shall be furnished with an as-extruded surface finish. Light polishing to remove minor surface imperfections is permissible provided such imperfections can be removed within the dimensional tolerances.

3.3 Heat Treatment:

Pyrometry shall be in accordance with AMS 2750 (See 8.2).

3.4 Properties:

Extrusions, 0.499 inch (12.67 mm) and under in nominal diameter or least thickness and under 10 square inches (65 cm^2) in cross-sectional area, shall conform to the following requirements, determined on the mill product in accordance with AMS 2355 or MAM 2355 and as specified in 3.4.1, 3.4.2, and 3.4.3.

3.4.1 Tensile Properties: Shall be as specified in Table 2.

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

Nominal Diameter or Least Thickness Inch	Specimen Orientation	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Up to 0.124, incl	Longitudinal	77	71	4
Over 0.124 to 0.249, incl	Longitudinal	77	72	4
Over 0.249 to 0.499, incl	Longitudinal	78	72	5
	Long-Trans.	75	70	3

TABLE 2B - Minimum Tensile Properties, SI Units

Nominal Diameter or Least Thickness Millimeters	Specimen Orientation	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Up to 3.15, incl	Longitudinal	531	490	4
Over 3.15 to 6.32, incl	Longitudinal	531	496	4
Over 6.32 to 12.67, incl	Longitudinal	538	496	5
	Long-Trans.	517	483	3

3.4.2 Longitudinal Compressive Yield Strength: Shall be as shown in Table 3.

TABLE 3 - Minimum Tensile Properties

Nominal Diameter or Least Thickness Inch	Nominal Diameter or Least Thickness Millimeters	Longitudinal Compressive Yield Strength
0.200 to 0.249, incl	5.08 to 6.32, incl	70.0 ksi (483 MPa)
Over 0.249 to 0.499, incl	Over 6.32 to 12.67, incl	73.0 ksi (503 MPa)

3.4.3 Exfoliation Resistance: Product shall exhibit exfoliation corrosion not greater than Level B, Photo 2 of ASTM G 34-72 when exposed for two weeks in accordance with ASTM G 85, Annex A2. Exposure shall be on the T/10 plane for thicknesses under 0.100 inch (2.54 mm) and T/2 for thicknesses 0.100 inch (2.54 mm) and over.

3.5 Quality:

Extrusions, 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 extrusions.

3.6 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 extrusions conform to the specified requirements.

4.2 Classification of Tests:

All technical requirements, except heat treatment, are acceptance tests and, except for composition, shall be performed on each lot.

4.3 Sampling and Testing:

Shall be in accordance with AMS 2355 or MAM 2355 and the following:

4.3.1 For Tensile Properties: From extrusions having a nominal weight under 1 pound per linear foot (1.5 kg/m), one tensile specimen shall be selected from each lot weighing 1,000 pounds (454 kg) or less; from lots weighing more than 1,000 pounds (454 kg) one additional specimen shall be taken from each 1,000 pounds (454 kg) or each fraction thereof in excess of the first 1,000 pounds (454 kg). From extrusions having a nominal weight of 1 pound per linear foot (1.5 kg/m) or over, one tensile specimen shall be taken from each lot consisting of 1,000 feet (305 m) or less; from lots consisting of more than 1,000 feet (305 m), one additional specimen shall be taken for each 1,000 feet (305 m) or fraction thereof in excess of the first 1,000 feet (305 m). Only one specimen shall be taken from any one piece when only one piece is available.

4.4 Reports:

The vendor of extrusions shall furnish with each shipment a report stating that the extrusions conform to the chemical composition, tolerances and 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(s), AMS 4232A, size, and quantity. The report shall also identify the producer, the product form, and the size of the mill product.