



<b>AEROSPACE MATERIAL SPECIFICATION</b>	<b>AMS4232™</b>	<b>REV. E</b>
	Issued 1990-01 Reaffirmed 2006-04 Revised 2018-08 Stabilized 2024-09  Superseding AMS4232D	
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)		

RATIONALE

AMS4232E has been declared "STABILIZED" by AMS Committee D Nonferrous Alloys Committee. This document will no longer be updated and may no longer represent standard industry practice. This document was stabilized because Committee D can find no producers for this document.

NOTE: Previously this document was revised. The last technical update of this document occurred in August, 2018. Users of this document should refer to the cognizant engineering organization for disposition of any issues with reports/certifications to the specification; including exceptions listed on the certification. In many cases, the purchaser may represent a sub tier supplier and not the cognizant engineering organization.

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AMS4232E has been declared "STABILIZED" by SAE AMS Committee D Nonferrous Alloys and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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## 1. SCOPE

### 1.1 Form

This specification covers an aluminum alloy in the form of extruded bars, rods, and profiles up to 0.499 inches (12.67 mm) in nominal diameter, or least thickness, and under 10 in<sup>2</sup> (65 cm<sup>2</sup>) in cross-sectional area.

### 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 approximately 7.8% lower density, 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 +1 724-776-4970 (outside USA), [www.sae.org](http://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
AMS2750	Pyrometry
ARP1917	Clarification of Terms Used in Aerospace Metals Specifications

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## 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](http://www.astm.org).

ASTM B594	Ultrasonic Inspection of Aluminum-Alloy Wrought Products
ASTM B660	Packaging/Packing of Aluminum and Magnesium Products
ASTM B666/B666M	Identification Marking of Aluminum and Magnesium Products
ASTM G34-72	Exfoliation Corrosion Susceptibility in 2XXX and 7XXX Series Aluminum Alloys (EXCO Test)
ASTM G38	Making and Using C-Ring Stress Corrosion Test Specimens
ASTM G44	Exposure of Metals and Alloys by Alternate Immersion in Neutral 3.5% Sodium Chloride Solution
ASTM G85	Modified Salt Spray (Fog) Testing

## 2.3 ANSI Accredited Publications

Copies of these documents are available online at <http://webstore.ansi.org/>

ANSI H35.1/H35.1M	Standard Alloy and Temper Designation System for Aluminum
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, 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 (refer to ANSI H35.1/H35.1) (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 AMS2750 (see 8.2).

### 3.4 Properties

Extrusions, 0.499 inch (12.67 mm) and under in nominal diameter, or least thickness, and under 10 in<sup>2</sup> (65 cm<sup>2</sup>) in cross-sectional area, shall conform to the following requirements, determined on the mill product in accordance with AMS2355 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 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 Mechanical property requirements for extrusions outside the thickness range of 1.1 shall be as agreed upon by purchaser and producer.

3.4.4 Exfoliation Resistance

3.5 Product shall exhibit exfoliation corrosion not greater than Level B, Photo 2 of ASTM G34-72, when exposed for 2 weeks in accordance with ASTM G85, 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 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.

3.7 Any exceptions shall be authorized by purchaser and reported as in 4.4.1.

#### 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 AMS2355 and the following:

4.3.1 For Tensile Properties

From extrusions having a nominal weight under 1 lb/LF (1.5 kg/m), one tensile specimen shall be selected from each lot weighing 1000 pounds (454 kg) or less; from lots weighing more than 1000 pounds (454 kg), one additional specimen shall be taken from each 1000 pounds (454 kg) or each fraction thereof in excess of the first 1000 pounds (454 kg). From extrusions having a nominal weight of 1 lb/LF (1.5 kg/m) or over, one tensile specimen shall be taken from each lot consisting of 1000 feet (305 m) or less; from lots consisting of more than 1000 feet (305 m), one additional specimen shall be taken for each 1000 feet (305 m) or fraction thereof in excess of the first 1000 feet (305 m). Only one specimen shall be taken from any one piece when only one piece is available.