AEROSPACE MATERIAL SPECIFICATION

AMS4287	REV. A

Issued 2006-04
Revised 2007-12
Reaffirmed 2013-12

Superseding AMS4287

Aluminum Alloy, Extrusion
2.7Cu - 1.8Li - 0.7Zn - 0.3Mn - 0.3Mg - 0.08Zr (2099-T83)
Solution Heat Treated, Stress Relieved by Stretching 1% to 4% and Aged
(Composition similar to UNS A92099)

RATIONALE

AMS4287A 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, and profiles (shapes) produced with cross sectional area of 42 square inches (271 cm^2) maximum and a circumscribing circle diameter (circle size) of 15 inches (38 cm) maximum. See section 8.3 for definition of circumscribing circle size.

1.2 Application

These extrusions have been used typically for machined parts requiring high strength but usage is not limited to such applications.

1.3 Certain processing procedures may cause this product 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 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.

AMS 2355	Quality Assurance Sampling and Testing, 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

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (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/AMS4287A

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

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 594 Ultrasonic Inspection of Aluminum-Alloy Wrought Products for Aerospace Applications
ASTM G 34 Exfoliation Corrosion Susceptibility in 2xxx and 7xxx Series Aluminum Alloys (EXCO Test)
ASTM B 660 Standard Practices for Packaging/Packing of Aluminum and Magnesium Products.
ASTM B 666/B 666M Identification Marking of Aluminum and Magnesium Products
ASTM E 1004 Standard Practice for Determining Electrical Conductivity Using the Electromagnetic (Eddy-Current) Method
ASTM G34 Exfoliation Corrosion Susceptibility in 2xxx and 7xxx Aluminum Alloys (EXCO Test)
ASTM G 47 Standard Test Method for Determining Susceptibility to Stress-Corrosion Cracking of 2XXX and 7XXX Aluminum Alloy Products
ASTM G 85 Standard Practice for Modified Salt Spray (Fog) Testing, Annex A2 (cyclic acidified salt spray test - dry bottom MASTMAASIS)

2.3 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036, Tel: 212-642-4900, www.ansi.org.

ANSI H 35.2 Dimensional Tolerances for Aluminum Mill Products
ANSI H 35.2M 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	--	0.05
Iron	--	0.07
Copper	2.4	3.0
Manganese	0.10	0.50
Magnesium	0.10	0.50
Zinc	0.4	1.0
Titanium	--	0.10
Lithium	1.6	2.0
Zirconium	0.05	0.12
Beryllium	--	0.0003
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% to 4% and then artificial aged to T83. (See AS1990)

3.2.1 Product shall be supplied with an as-extruded surface finish; light polishing to remove minor surface conditions is permissible provided such conditions can be removed within specified dimensional tolerances.

3.2.2 Product may receive minor straightening, after stretching, of an amount necessary to meet the requirements of 3.6.

3.3 Heat Treatment

3.3.1 Heat Treatment procedures shall be in accordance with the requirements of AMS 2772 and the following:

3.3.1.1 Solution Heat Treatment Temperature

Heat to 1010 °F ± 20 (543 °C ± 11). (See Note 8.5)

3.3.1.2 Aging Heat Treatment

Heat to 250 °F ± 10 (121°C ± 6), hold at heat for a time of 10 hours to 14 hours, then heat to 305 °F ± 10 (152 °C ± 6), hold at heat for a time of 42 hours to 54 hours, and air cool.

3.4 Properties

Product shall conform to the following requirements, determined in accordance with AMS 2355 on the mill product size:

3.4.1 Longitudinal Tensile Properties shall be as shown in Table 2A and 2B.

TABLE 2A - MINIMUM LONGITUDINAL TENSILE PROPERTIES, INCH/POUND UNITS

Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Up to 0.249, incl	75.0	67.0	6
0.250 to 0.499	78.0	69.0	7
0.500 to 0.999	79.0	71.0	7
1.000 to 3.000	80.0	72.0	7

TABLE 2B - MINIMUM LONGITUDINAL TENSILE PROPERTIES, SI UNITS

Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Up to 6.32, incl	517	462	6
Over 6.35 to 12.67	538	476	7
Over 12.70 to 25.37	545	490	7
Over 25.40 to 76.20	552	496	7

3.4.2 Exfoliation Corrosion Resistance

Specimens cut from extrusions shall not exhibit exfoliation corrosion at a T/10 plane greater than that illustrated by Photo 2 (EB) from Figure 2 of ASTM G 34 when specimens are exposed for 2 weeks according to the procedures in ASTM G 85 Annex A2, using the dry-bottom MASTMAASIS Test Method. The solution used for exposure by ASTM G 34, the EXCO Test, has been determined to be inappropriate for Al-Li alloys. (See note 8.4)

3.4.3 Stress Corrosion Cracking

When specified, specimens from extrusions with section thickness 0.750 inches (19.05 mm) and greater tested in accordance with ASTM G 47, shall show no evidence of stress corrosion cracking when stressed in the short transverse direction (perpendicular to grain flow) to 35 ksi (241 MPa).

3.5 Quality

Products, 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.

3.5.1 When specified, each extrusion shall be subjected to ultrasonic inspection in accordance with ASTM B 594. Extrusions, 0.500 inch (12.7 mm) and over in nominal diameter or least distance between parallel sides, weighing 600 pounds (272 kg) and under shall meet ultrasonic Class B requirements, as described in ASTM B 594.

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 the products 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 specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (3.1), longitudinal tensile properties (3.4.1), tolerances (3.6), and ultrasonic inspection, when specified (3.5.1), are acceptance tests and, except for composition, shall be performed on each inspection lot.

4.2.2 Periodic Tests

Exfoliation corrosion resistance (3.4.2), and stress corrosion cracking (3.4.3) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing

Shall be in accordance with AMS 2355.

4.4 Reports

The vendor of product shall furnish with each shipment a report stating that the product conforms to the composition, ultrasonic inspection when required, and tolerances and showing the numerical results of tests on each inspection lot to determine conformance to the other acceptance test requirements and stating that the final product conforms to the other technical requirements. This report shall include the purchase order number, inspection lot number, AMS 4287A, size or section identification number, 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 AMS 2355.

5. PREPARATION FOR DELIVERY

5.1 Identification

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