

Aluminum Alloy, Extruded Profiles (2027-T3511)
4.4Cu - 1.2Mg - 0.8Mn - 0.10Zr
Solution Heat Treated and Stress Relieved by Stretching
(Composition similar to UNS A92027)

RATIONALE

AMS4183A revises heat treatment (3.3) and results from a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of extruded profiles.

1.2 Application

These extrusions have been used typically for machined parts requiring dimensional stability during machining processes, high strength and damage tolerance, but usage is not limited to such applications.

1.2.1 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.

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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.

- AMS2355 Quality Assurance, Sampling and Testing, Aluminum Alloys and Magnesium Alloy, Wrought Products (Except Forging Stock), and Rolled, Forged, or Flash Welded Rings
- AMS2772 Heat Treatment of Aluminum Alloy Raw Materials
- AS1990 Aluminum Alloy Tempers
- ARP823 Minimizing Stress-Corrosion Cracking in Wrought Heat-Treatable Aluminum Alloy Products

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 B 645 Linear-Elastic Plane Strain Fracture Toughness Testing of Aluminum Alloys
- ASTM B 660 Packaging of Aluminum and Magnesium Products
- ASTM B 666/B 666M Identification Marking of Aluminum and Magnesium Products
- ASTM E 399 Linear-Elastic Plane-Strain Fracture Toughness (K_{Ic}) Testing of Metallic Materials

2.3 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, 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 AMS2355.

TABLE 1 - COMPOSITION

Element	min	max
Silicon	--	0.12
Iron	--	0.15
Copper	3.9	4.9
Manganese	0.50	1.2
Magnesium	1.0	1.5
Zinc	--	0.20
Titanium	--	0.08
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%, to the -T3511 temper (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

Solution heat treatment shall be in accordance with AMS2772.

3.4 Properties

Product shall conform to the following requirements, determined on the mill produced size in accordance with AMS2355:

3.4.1 Longitudinal and long transverse tensile properties of extrusions, with a maximum cross-sectional area of 19 square inches (123 cm²) and a maximum circle size of 11 inches (279 mm), shall be as specified in Table 2. Products exceeding the stated size limits shall have properties as agreed upon by purchaser and vendor.

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

Nominal Thickness Inches	Specimen Orientation	Tensile Strength ksi	Yield Strength At 0.2% Offset ksi	Elongation in 2 inches or 4D %
0.750 to 1.500, incl	Longitudinal	75.0	57.0	14
	Long-Transverse	67.0	48.0	9

TABLE 2B - MINIMUM TENSILE PROPERTIES, SI UNITS

Nominal Thickness Millimeters	Specimen Orientation	Tensile Strength MPa	Yield Strength At 0.2% Offset MPa	Elongation in 50.8 mm or 5D %
Over 19.05 to 38.10, incl	Longitudinal	517	393	12
	Long-Transverse	462	331	8

3.4.2 Fracture Toughness

Plain strain fracture toughness (K_{Ic}) when tested in accordance with ASTM E 399 and ASTM B 645 shall be not lower than the values specified in Table 3.

TABLE 3 - FRACTURE TOUGHNESS PROPERTIES

Nominal Thickness Inches	Nominal Thickness Millimeters	Specimen Orientation	K_{Ic} ksi $\sqrt{\text{inch}}$	K_{Ic} MPa $\sqrt{\text{m}}$
0.750 to 1.500, incl	Over 19.05 to 38.10, incl.	L-T	40	44
		T-L	38	42

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 extruded profile having a maximum width-to-thickness ratio of 10:1 shall meet ultrasonic class B requirements, as described in ASTM B 594.

3.6 Tolerances

Shall conform to all applicable requirements of ANSI H 35.2 or ANSI H 35.2M.

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

4.2.2 Periodic Tests

Fracture toughness (3.4.2) is a periodic test 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 AMS2355.

4.4 Reports

The vendor of the product shall furnish with each shipment a report stating that the product conforms to the composition, ultrasonic inspection when specified, 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, AMS4183A, size or section identification number, and quantity. This report shall also identify the producer, the product form, and the size of the mill product.