SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 4183

Issued OCT 2005

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)

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 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, 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
AS1990	Aluminum Alloy Tempers

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: custsvc@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

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2.1 (Continued):

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

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM B 594	Ultrasonic Inspection of Aluminum Alloy Wrought Products for Aerospace Applications
ASTM B 645	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	Plane Strain Fracture Toughness Testing of Metallic Materials

2.3 ANSI Publications:

Available from ANSI, 25 West 43rd Street, 4th Floor, New York, NY 10036 or 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	--	0.12
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 AMS 2772 as applicable to 2XXX alloys, except the solution heat treating temperature shall be 915 to 935 °F (491 to 502 °C).

3.4 Properties:

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

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 √inch	K_{IC} MPa √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 AMS 2355.