AEROSPACE MATERIAL SPECIFICATION

AMS4293

Issued 2003-07
Reaffirmed 2013-12

Aluminum Alloy Extrusions
7.9Zn - 1.6Cu - 2.2Mg - 0.16Cr (7249-T76511)
Solution Heat Treated, Stress-Relieved, Straightened, and Overaged

RATIONALE

AMS4293 has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE:

1.1 Form:

This specification covers an aluminum alloy procured in the form of extruded bars, rods, wire, profiles (shapes) and tubing.

1.2 Application:

These extrusions have been used typically for structural applications requiring a combination of high tensile strength and good corrosion resistance where intergranular attack is unacceptable, 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 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
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 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/AMS4293

2.2 ASTM Publications:

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

ASTM B 557	Tensile Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products
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 E 1004	Determining Electrical Conductivity Using the Electromagnetic (Eddy Current) Method
ASTM G 34	Exfoliation Corrosion Susceptibility in 2XXX and 7XXX Series Aluminum Alloys (EXCO Test)
ASTM G 47	Determining Susceptibility to Stress-Corrosion Cracking of 2XXX and 7XXX /Aluminum Alloy Products

2.3 ANSI Publications:

Available from ANSI, 25 West 43rd Street, New York, NY 10036 or www.ansi.org.

ANSI H35.2	Dimensional Tolerances for Aluminum Mill Products
ANSI H35.2M	Dimensional Tolerances for Aluminum Mill Products (Metric)

3. TECHNICAL REQUIRMENTS:

3.1 Composition:

Shall conform to the percentages by weight shown in Table 1, determined in accordance with AMS 2355 or MAM 2355.

TABLE 1 – Composition

Element	min	max
Silicon	--	0.10
Iron	--	0.12
Copper	1.3	1.9
Manganese	--	0.10
Magnesium	2.0	2.4
Chromium	0.12	0.18
Zinc	7.5	8.2
Titanium	--	0.06
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition:

Extrusions shall be solution heat-treated, stress relieved by stretching after solution treatment to produce a nominal permanent set of 1.5 percent, but not less than 1 percent or more than 3 percent, and overaged to the –T76511 temper.

3.2.1 Extrusions may receive minor straightening, after stretching, of an amount necessary to meet tolerance requirements of 3.6.

3.2.2 Extrusions shall be supplied with an as-extruded surface finish. Light polishing to remove minor surface imperfections is permissible provided such imperfections can be removed within specified dimensional tolerances.

3.3 Heat Treatment:

Shall be performed in accordance with the requirements of AMS 2772, except as follows:

3.3.1 Solution Heat Treatment: Heat to 870 to 890 °F (466 to 477 °C), hold at heat for a time commensurate with product thickness and rapidly cool in a suitable quenching medium.

3.3.2 Overaging Heat Treatment: Overaging shall be performed at the specific times and temperatures necessary to meet the requirements of 3.4 (See 8.2).

3.4 Properties:

Extrusions shall conform to the following requirements, determined on the mill product in accordance with AMS 2355 or MAM 2355:

3.4.1 Longitudinal and long transverse tensile properties of extrusions, with a maximum cross-sectional area of 32 square inches (206 cm^2), shall be as specified in Table 2.

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

Nominal Diameter or Least Thickness (bars, rods, wire, profiles) or Nominal Wall Thickness (tubing) Inches	Specimen Orientation	Tensile Strength ksi	Yield Strength At 0.2% Offset ksi	Elongation in 2 Inches or 4D %
≤ 1.499	Longitudinal	83.0	76.0	7
	Long-Transverse (1)	78.0	72.0	7

(1) Long transverse tensile testing is not required if either the extrusion width is less than 3.0 inches or the extrusion profile (shape) makes it impossible to excise an appropriate sub-size specimen as specified in ASTM B 557.

TABLE 2B – Minimum Tensile Properties, SI Units

Nominal Diameter or Least Thickness (bars, rods, wire, profiles) or Nominal Wall Thickness (tubing) Millimeters	Specimen Orientation	Tensile Strength MPa	Yield Strength At 0.2% Offset MPa	Elongation in 50 mm %
≤ 38.07	Longitudinal	572	524	7
	Long-Transverse (1)	538	496	7

(1) Long transverse tensile testing is not required if either the extrusion width is less than 76 mm or the extrusion profile (shape) makes it impossible to excise an appropriate sub-size specimen as specified in ASTM B 557.

3.4.2 Corrosion Resistance:

3.4.2.1 Exfoliation-Corrosion Resistance: Specimens, cut from extrusions, shall not exhibit exfoliation corrosion greater than that exhibited by Photo B, Figure 2 of ASTM G 34 at a T/10 plane for section thickness up to 0.749 inches (19.02 mm) and at T/2 and T/10 planes for section thickness greater than 0.750 inches (19.05 mm).

3.4.2.2 Stress-Corrosion Cracking: When specified, specimens cut from extrusions 0.750 inches (19.04 mm) and over in diameter or thickness shall show no evidence of stress corrosion cracking when stressed in the short-transverse direction (perpendicular to grain flow) to 25.0 ksi (172 MPa) for a minimum 20 day exposure, as determined in accordance with ASTM G 47.

3.4.3 Electrical Conductivity (EC): Electrical conductivity shall be equal to or greater than 37.0% IACS (International Annealed Copper Standard) when performed in accordance with ASTM E 1004.

3.4.3.1 Extrusions with electrical conductivities less than 37% IACS may receive additional precipitation heat treatment, if, upon completion of such treatment, they meet the property requirements as specified in 3.4, they shall be acceptable.

3.5 Quality:

Product, as received by the purchaser, shall be uniform in quality and condition, sound, and free from foreign material and from imperfections detrimental to the usage of the product. Any internal defects found during the customer's manufacturing process are subject to rejection.

3.5.1 When specified, bars, rods, wire, and profiles (shapes) over 0.500 inches (12.70 mm) in thickness or diameter shall be subjected to ultrasonic inspection in accordance with ASTM B 594. Extrusions, 0.500 to 1.499 inches (12.70 to 38.07 mm), inclusive, shall meet ultrasonic Class B.