Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 4150F
Superseding AMS 4150E

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ALUMINUM ALLOY EXTRUSIONS AND RINGS
1.0Mg - 0.60Si - 0.28Cu - 0.20Cr (6061-T6)

1. SCOPE:

1.1 Form: This specification covers an aluminum alloy in the form of extruded bars, rods, wire, shapes, and tubing and of flash welded rings.

1.2 Application: Primarily for parts requiring moderate strength, expecially where such parts and assemblies require brazing or welding during fabrication.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pennsylvania 15096.

2.1.1 Aerospace Material Specifications:

AMS 2205 - Tolerances, Aluminum-Base and Magnesium-Base Alloy Extrusions
AMS 2350 - Standards and Test Methods
AMS 2355 - Quality Assurance Sampling and Testing of Aluminum-Base and Magnesium-Base Alloys, Wrought Products (Except Forgings and Forging Stock) and Flash Welded Rings
AMS 2770 - Heat Treatment of Aluminum and Aluminum-Base Alloys
AMS 7488 - Rings, Flash Welded, Aluminum and Aluminum Alloys

2.2 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

2.2.1 Military Specifications:
MIL-H-6088 - Heat Treatment of Aluminum Alloys

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined in accordance with AMS 2355:

Ø	min	max
Magnesium	0.8	1.2
Silicon	0.40	0.8
Copper	0.15	0.40
Chromium	0.04	0.35
Iron	--	0.7
Zinc	--	0.25
Manganese	--	0.15
Titanium	--	0.15
Other Impurities, each	--	0.05
Other Impurities, total	--	0.15
Aluminum	remainder	

3.2 Condition: The product shall be supplied in the following condition:

3.2.1 Bars, Rods, Wire, Shapes, and Tubing: Extruded and solution and precipitation heat treated.

3.2.1.1 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 the dimensional tolerances.

3.2.2 Flash Welded Rings: Manufactured in accordance with AMS 7488 and solution and precipitation heat treated.

3.3 Heat Treatment:

3.3.1 Bars, Rods, Wire, Shapes, and Tubing: Shall be heat treated in accordance with MIL-H-6088.

3.3.2 Flash Welded Rings: Shall be heat treated in accordance with AMS 2770.

3.4 Properties: The product shall conform to the following requirements, determined in accordance with AMS 2355:

3.4.1 Tensile Properties: Shall be as specified in Table I.

TABLE I

Nominal Diameter or Least Thickness (See 8.2) (bars, rods, wire, shapes and flash welded rings) or Nominal Wall Thickness (tubing) Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
Up to 0.250, excl	38,000	35,000	8
0.250 and over	38,000	35,000	10

TABLE I (SI)

Nominal Diameter or Least Thickness (See 8.2) (bars, rods, wire, shapes and flash welded rings) or Nominal Wall Thickness (tubing) Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50.8 mm or 4D %, min
Up to 6.35, excl	262	241	8
6.35 and over	262	241	10

3.4.2 Hardness: Should be not lower than 80 HB/10/500 or 80 HB/14.3/1000, or not lower than 85 HB/10/1000, but the product shall not be rejected on the basis of hardness if the tensile property requirements are met.

3.5 Quality: The product shall be uniform in quality and condition, clean, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts.

3.6 Tolerances: Unless otherwise specified, tolerances for bars, rods, wire, shapes, and tubing shall conform to all applicable requirements of AMS 2205.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples and shall be Ø responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to assure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests of the product to determine conformance to composition (3.1) and tensile Ø properties (3.4.1) requirements and of bars, rods, wire, shapes, and tubing to determine conformance to tolerance (3.6) requirements are classified as acceptance or routine control tests.

4.2.2 Qualification Tests: Tests to determine conformance to hardness (3.4.2) requirements are classified Ø as qualification or periodic control tests.

Ø 4.3 Sampling: Shall be in accordance with AMS 2355.

4.4 Reports:

4.4.1 The vendor of bars, rods, wire, shapes, and tubing shall furnish with each shipment three copies of a report stating that the product conforms to the chemical composition and other technical requirements of this specification. This report shall include the purchase order number, material specification number and its revision letter, size or part number, and quantity.

4.4.2 The vendor of flash welded rings and other finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number and its revision letter, contractor or other direct supplier of extrusions, part number, and quantity. When extrusions for making parts are produced or purchased by the parts vendor, that vendor shall inspect each lot of extrusions to determine conformance to the requirements of this specification, and shall include in the report a statement that the extrusions conform, or shall include copies of laboratory reports showing the results of tests to determine conformance.

Ø 4.5 Resampling and Retesting: Shall be in accordance with AMS 2355.

5. PREPARATION FOR DELIVERY:

5.1 Identification: The product shall be identified as follows:

5.1.1 Each straight bar, rod, and tube 0.500 in. (12.70 mm) and over in OD or least width of flat surface Ø and each straight shape with configuration allowing access to a flat surface at least 0.500 in. (12.70 mm) wide recessed not more than 1/8 in. (3.2 mm) below the outline of the shape shall be marked in a row of characters recurring at intervals not greater than 3 ft (914 mm) with the alloy number and temper, AMS 4150 or applicable Federal or Military specification designation, and manufacturer's identification. The characters shall be of such size as to be clearly legible, shall be applied using a suitable marking fluid, and shall be sufficiently stable to withstand normal handling. The markings shall have no deleterious effect on the product or its performance.

5.1.2 All straight extrusions other than those of 5.1.1 shall be securely bundled, boxed, or secured on Ø lifts and identified by two durable tags, marked with the information of 5.1.1 and attached, not farther than 2 ft (610 mm) from each end, to the product in each bundle, box, or lift.

5.1.3 Coiled bar, rod, wire, and tubing shall be identified with the information of 5.1.1 marked on a durable tag attached to each coil.

Ø 5.1.4 Flash Welded Rings: As agreed upon by purchaser and vendor.