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400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 4115E

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Superseding AMS 4115D

ALUMINUM ALLOY BARS, RODS, AND WIRE, ROLLED or COLD-FINISHED, AND RINGS
1.0Mg - 0.60Si - 0.28Cu - 0.20Cr (6061-0)
Annealed

UNS A96061

1. SCOPE:

1.1 Form: This specification covers an aluminum alloy in the form of rolled or cold-finished bars, rods, and wire, of flash welded rings, and of stock for flash welded rings.

1.2 Application: Primarily for parts requiring moderate strength, especially where such parts 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 SAE publications shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2201 - Tolerances, Aluminum and Aluminum Alloy Bar, Rod, Wire, and Forging Stock, Rolled, or Cold Finished
MAM 2201 - Tolerances, Metric, Aluminum and Aluminum Alloy Bar, Rod, Wire, and Forging Stock, Rolled, Drawn, or Cold Finished
AMS 2350 - Standards and Test Methods
AMS 2355 - Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings
MAM 2355 - Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings, Metric (SI) Units
AMS 2770 - Heat Treatment of Wrought Aluminum Alloy Parts
AMS 7488 - Rings, Flash Welded, Aluminum and Aluminum Alloys

2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103.

ASTM B660 - Packaging/Packing of Aluminum and Magnesium Products

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 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 or MAM 2355:

	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, and Wire: Rolled or cold-finished, as ordered, and annealed in accordance with MIL-H-6088.

3.2.2 Flash Welded Rings: Shall be manufactured in accordance with AMS 7488 and annealed in accordance with MIL-H-6088.

3.2.3 Stock for Flash Welded Rings: As ordered by the flash welded ring manufacturer.

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

3.3.1 Bars, Rods, Wire, and Flash Welded Rings:

3.3.1.1 As Annealed:

3.3.1.1.1 Tensile Properties: Shall be as follows for bars, rods, and wire 8 inches (203 mm) and under in nominal diameter or least distance between parallel sides and for flash welded rings 8 inches (203 mm) and under in radial thickness; tensile properties for bars and rods over 8 inches (203 mm) in nominal diameter or least distance between parallel sides and for flash welded rings over 8 inches (203 mm) in radial thickness shall be as agreed upon by purchaser and vendor:

Tensile Strength, maximum	22,000 psi (152 MPa)
Elongation in 4D, minimum	18%

3.3.1.1.2 Hardness: Should be not higher than 40 HB/10/500 or 45 HB/10/1000 but the product shall not be rejected on the basis of hardness if the tensile property requirements of 3.3.1.1.1 are met.

3.3.1.2 After Solution and Precipitation Heat Treatment: The product shall have the following properties after being solution and precipitation heat treated in accordance with AMS 2770:

3.3.1.2.1 Tensile Properties: Shall be as follows for rounds 8 inches (203 mm) and under in nominal diameter, for rectangular, square, hexagonal, and octagonal bar 8 inches (203 mm) and under in least distance between parallel sides and 50 square inches (322 cm^2) and under in cross-sectional area, and for flash welded rings 8 inches (203 mm) and under in radial thickness and 50 square inches (322 cm^2) and under in cross-sectional area; tensile property requirements for rounds over 8 inches (203 mm) in nominal diameter, for rectangular, square, hexagonal, and octagonal bar over 8 inches (203 mm) in least distance between parallel sides and over 50 square inches (322 cm^2) in cross-sectional area, and for flash welded rings over 8 inches (203 mm) in radial thickness and over 50 square inches (322 cm^2) in cross-sectional area shall be as agreed upon by purchaser and vendor:

Tensile Strength, minimum	42,000 psi (290 MPa)
Yield Strength at 0.2% Offset, minimum	35,000 psi (241 MPa)
Elongation in 4D, minimum	10%

3.3.1.2.2 Hardness: Should be not lower than 80 HB/10/500 or 85/HB/10/1000 but the product shall not be rejected on the basis of hardness if the tensile property requirements of 3.3.1.2.1 are met.

3.3.2 Stock for Flash Welded Rings: Specimens taken from the stock after solution and precipitation heat treatment as in 3.3.1.2 shall conform to the requirements of 3.3.1.2.1 and 3.3.1.2.2.

3.4 Quality: The product, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the product.

3.5 Tolerances: Bars, rods, and wire shall conform to all applicable requirements of AMS 2201 or MAM 2201.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples for vendor's tests and shall be 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 sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to the following requirements are classified as acceptance tests and shall be performed on each lot:

4.2.1.1 Composition (3.1) of the product.

4.2.1.2 Tensile properties (3.3.1.1.1 and 3.3.1.2.1) of each lot of bars, rods, wire, and flash welded rings.

4.2.1.3 Tolerances (3.5) of bars, rods, and wire.

4.2.2 Periodic Tests: Tests of bars, rods, wire, and flash welded rings to determine conformance to requirements for hardness (3.3.1.1.2 and 3.3.1.2.2) and of stock for flash welded rings to demonstrate ability to develop required properties are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling: Shall be in accordance with AMS 2355 or MAM 2355.

4.4 Reports:

4.4.1 The vendor of bars, rods, wire, and stock for flash welded rings shall furnish with each shipment 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, lot number, AMS 4115E, size, and quantity.

4.4.2 Ø The vendor of flash welded rings shall furnish with each shipment a report stating that the rings conform to the chemical composition of this specification and showing the results of tests for tensile properties of each lot. This report shall include the purchase order number, lot number, AMS 4115E, contractor or other direct supplier of product, size or part number, and quantity.