



# AEROSPACE MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.  
TWO PENNSYLVANIA PLAZA, NEW YORK, N. Y. 10001

**AMS 4115C**  
Superseding AMS 4115B

Issued 1-15-60  
Revised 5-15-73

## ALUMINUM ALLOY BARS AND RINGS 1.0Mg - 0.60Si - 0.28Cu - 0.20Cr (6061-0)

### 1. SCOPE:

- 1.1 Form: This specification covers an aluminum-base alloy in the form of rolled, drawn, or cold finished bars, rods, and wire, flash welded rings, and stock for flash welded rings.
- 1.2 Application: Primarily for parts requiring moderate strength, especially 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.

- 2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., Two Pennsylvania Plaza, New York, New York 10001.

#### 2.1.1 Aerospace Material Specifications:

- AMS 2201 - Tolerances, Aluminum and Aluminum Alloy Bar, Rod, Wire, and Forging Stock, Rolled or Drawn  
AMS 2355 - Quality Assurance Sampling and Testing of Wrought Aluminum and Magnesium Products, Except Forgings  
AMS 7488 - Rings, Flash Welded, Aluminum and Aluminum Alloys

### 3. TECHNICAL REQUIREMENTS:

- 3.1 Composition: Shall conform to the following percentages by weight, determined in accordance with AMS 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, drawn, or cold finished, as ordered, and annealed.
- 3.2.2 Flash Welded Rings: Annealed.

SAE Technical Board rules provide that: "All technical reports, including standards, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against infringement of patents."

3.2.2.1 Flash welded rings shall not be supplied unless specified or permitted on purchaser's part drawing. When supplied, they shall be manufactured in accordance with AMS 7488.

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

### 3.3 Properties:

3.3.1 Bars, rods, and wire, 8.0 in. (203 mm) and under in diameter or least distance between parallel sides and flash welded rings 8.0 in. (203 mm) and under in radial thickness shall conform to the following requirements, determined in accordance with AMS 2355:

#### 3.3.1.1 An Annealed:

##### 3.3.1.1.1 Tensile Properties:

Tensile Strength, max	22,000 psi (152 MPa)
Elongation in 2 in. (50.8 mm) or 4D, min	18%

3.3.1.1.2 Hardness: Should be not higher than 40 HB/10/500, 40 HB/14.3/1000, or 45 HB/10/1000 but 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 following requirements apply to product solution heat treated by heating to  $985\text{ F} \pm 10$  ( $529.4\text{ C} \pm 5.6$ ), holding at heat for a time commensurate with section thickness but not less than 15 min., and quenching in water, and precipitation heat treated by heating to  $320\text{ F} \pm 10$  ( $160\text{ C} \pm 5.6$ ), holding at heat for  $18\text{ hr} \pm 1\text{ hr}$ , and cooling in air.

##### 3.3.1.2.1 Tensile Properties:

Tensile Strength, min	42,000 psi (290 MPa)
Yield Strength at 0.2% Offset, min	35,000 psi (241 MPa)
Elongation in 2 in. (50.8 mm) or 4D, min	10%

3.3.1.2.2 Hardness: Should be not lower than 80 HB/10/500, 80 HB/14.3/1000, or 85 HB/10/1000, but 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 Bars and rods over 8.0 in. (203 mm) in diameter or least distance between parallel sides and flash welded rings over 8.0 in. (203 mm) in radial thickness shall have properties as agreed upon by purchaser and vendor.

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

3.4 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.

3.5 Tolerances: Unless otherwise specified, tolerances for bars, rods, and wire shall conform to all applicable requirements of AMS 2201.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples 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 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 bars, rod, wire, and flash welded rings to determine conformance to all technical requirements of this specification and of stock for flash welded rings to determine conformance to composition (3.1) requirements of this specification are classified as acceptance or routine control tests.

4.2.2 Qualification Tests: Tests of stock for flash welded rings to determine capability of developing the required properties (3.3.3) are classified as qualification or periodic control tests, but the vendor of such stock shall not be required to make such tests unless otherwise agreed upon by purchaser and vendor of the stock.

4.3 Sampling: Shall be in accordance with the following:

4.3.1 Bars, Rods, and Wire: AMS 2355.

4.3.2 Flash Welded Rings: When sampling is on a lot basis, a lot shall consist of all rings of the same size heat treated in the same batch furnace load or charged into a continuous furnace consecutively during an 8 hr period.

4.3.2.1 Composition: Unless a report conforming to 4.4.1 is available, an analysis shall be made for each 6000 lb (2724 kg) or less of rings comprising the lot except that no more than one analysis shall be required per piece.

4.3.2.2 Tensile Properties: At least two tensile test specimens shall be taken from the parent metal of a flash welded ring representing the lot.

4.4 Reports:

4.4.1 The vendor of bars, rods, wire, and stock for flash welded rings 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, and quantity.

4.4.2 The vendor of flash welded rings shall furnish with each shipment three copies of a report stating that the rings conform to the chemical composition requirements of this specification and showing the results of tests on each size or part number to determine conformance to the tensile property and hardness requirements. This report shall include the purchase order number, material specification number and its revision letter, size or part number, and quantity.

4.4.3 The vendor of 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 material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.