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

AEROSPACE MATERIAL SPECIFICATION

AMS 4125F
Superseding AMS 4125E
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UNS A96151

ALUMINUM ALLOY FORGINGS
0.90Si - 0.62Mg - 0.25Cr (6151-T6)

1. SCOPE:

1.1 Form: This specification covers an aluminum alloy in the form of die forgings, rolled rings, and forging stock.

1.2 Application: Primarily for complex-shaped parts requiring moderate strength and good forgeability of the material. Corrosion resistance of this alloy is superior to that of the copper-containing alloys.

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, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2201 - Tolerances, Aluminum and Aluminum Alloy Bar, Rod, Wire, and Forging Stock, Rolled or Drawn
AMS 2350 - Standards and Test Methods
AMS 2375 - Approval and Control of Critical Forgings
AMS 2630 - Ultrasonic Inspection
AMS 2645 - Fluorescent Penetrant Inspection
AMS 2808 - Identification, Forgings

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM B557 - Tension Testing Wrought and Cast Aluminum and Magnesium Alloy Products
ASTM E10 - Brinell Hardness of Metallic Materials
ASTM E34 - Chemical Analysis of Aluminum and Aluminum-Base Alloys

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

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

2.3.2 Military Specifications:

MIL-H-6088 - Heat Treatment of Aluminum Alloys

Printed in U.S.A.

2.3.3 Military Standards:

MIL-STD-649 - Aluminum and Magnesium Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E34, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

	min	max
Silicon	0.6	1.2
Magnesium	0.45	0.8
Chromium	0.15	0.35
Iron	--	1.0
Copper	--	0.35
Zinc	--	0.25
Manganese	--	0.20
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 Die Forgings and Rolled Rings: Solution and precipitation heat treated in accordance with MIL-H-6088.

3.2.2 Forging Stock: As fabricated.

3.3 Properties: The product shall conform to the following requirements:

3.3.1 Die Forgings and Rolled Rings:

3.3.1.1 Tensile Properties: Shall be as follows, determined in accordance with ASTM B557:

3.3.1.1.1 Test Specimens: Test specimens, machined from separately-forged coupons or from forging stock representing the forgings and, in either case, heat treated with the forgings or machined from prolongations on heat treated die forgings, shall conform to the following requirements:

Tensile Strength, min	44,000 psi (303 MPa)
Yield Strength at 0.2% Offset, min	37,000 psi (255 MPa)
Elongation in 2 in. (50.8 mm) or 4D, min	14%

3.3.1.1.2 Die Forgings:

3.3.1.1.2.1 With Grain Flow: Test specimens, machined from forgings not over 4 in. (102 mm) in nominal thickness at time of heat treatment with axis of specimen in the area of gage length within 15 deg (0.262 rad) of parallel to the forging flow lines, shall have properties as specified in 3.3.1.1.1 except that elongation, unless otherwise agreed upon by purchaser and vendor, may be as low as 10%.

3.3.1.1.2.2 Ø Across Grain Flow: Test specimens, machined from forgings not over 4 in. (102 mm) in nominal thickness at time of heat treatment with axis of specimen in the area of gage length varying more than 15 deg (0.262 rad) from parallel to the forging flow lines, shall have the following properties:

Tensile Strength, min	44,000 psi (303 MPa)
Yield Strength at 0.2% Offset, min	37,000 psi (255 MPa)
Elongation in 2 in. (50.8 mm) or 4D, min	6%

3.3.1.1.3 Rolled Rings:

3.3.1.1.3.1 Tangential: Test specimens, machined from rings not over 2.5 in. (64 mm) in nominal thickness at time of heat treatment with axis of specimen tangential to the ring OD (axis parallel to direction of rolling), shall have properties as specified in 3.3.1.1.1 except that elongation, unless otherwise agreed upon by purchaser and vendor, may be as low as 5%.

3.3.1.1.3.2 Axial: Test specimens, machined from rolled rings not over 2.5 in. (64 mm) in nominal thickness at time of heat treatment with axis of specimen parallel to axis of ring (axis transverse to direction of rolling), shall have the following properties:

Tensile Strength, min	44,000 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	4%

3.3.1.2 Ø Hardness: Should be not lower than 90 HB/10/500, 90 HB/14.3/1000, or 96 HB/10/1000, determined in accordance with ASTM E10, but forgings shall not be rejected on the basis of hardness if the applicable tensile property requirements are met.

3.3.2 Ø Forging Stock: When a sample of stock is forged to a test coupon and heat treated in the same manner as forgings, specimens taken from the heat treated coupon shall conform to the requirements of 3.3.1.1.1 and 3.3.1.2. If specimens taken from the stock after heat treatment in the same manner as forgings conform to the requirements of 3.3.1.1.1 and 3.3.1.2, the tests shall be accepted as equivalent to tests of a forged coupon. The forging stock supplier, however, shall not be required to conduct such tests.

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

3.4.1 Ø When specified, forgings and rolled rings shall be subjected to fluorescent penetrant inspection in accordance with AMS 2645 and/or to ultrasonic inspection in accordance with AMS 2630. Standards for acceptance shall be as agreed upon by purchaser and vendor.

3.5 Tolerances: Unless otherwise specified, tolerances for forging stock shall conform to all applicable requirements of AMS 2201.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Ø 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 4.5. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure 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) requirements Ø and of forgings to determine conformance to tensile property (3.3.1.1) requirements are classified as acceptance tests.

4.2.2 Periodic Tests: Tests of forgings to determine conformance to hardness (3.3.1.2) requirements and Ø of forging stock to determine ability to develop required properties (3.3.2) are classified as periodic tests.

4.2.3 Preproduction Tests: Tests to determine conformance to all technical requirements of this specifica- Ø tion are classified as preproduction tests.

4.2.3.1 For direct U.S. Military procurement of forgings, substantiating test data and, when requested, Ø preproduction forgings shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be as follows; a lot shall be all forgings of the same part number, size, or nominal Ø cross-section and configuration heat treated in the same batch furnace load or in a continuous furnace consecutively during an 8-hr period.

4.3.1 Composition: At least one sample shall be taken by the producer from each group of ingots poured Ø simultaneously from the same source of molten metal.

4.3.1.1 Unless compliance with 4.3.1 is established, an analysis shall be made for each 6000 lb (2724 kg) Ø or less of material comprising the lot except that not more than one analysis shall be required per piece.

4.3.2 Tensile Properties:

4.3.2.1 Die Forgings: At least one separately-forged coupon or one forging prolongation, heat treated Ø with each lot of forgings, shall be selected.

4.3.2.1.1 In lieu of a prolongation or separately-forged coupon, specimens shall be cut from one forging Ø representing each lot from the location designated on the drawing.

4.3.2.2 Rolled Rings: At least two specimens shall be taken from a ring or ring prolongation representing Ø the lot. One specimen shall be taken tangential to the ring OD and the other parallel to the axis of the ring.

Ø 4.4 Approval: When specified, approval and control of forgings shall be in accordance with AMS 2375.

4.5 Reports:

4.5.1 The vendor of forgings shall furnish with each shipment three copies of a report stating that the Ø chemical composition conforms to the requirements of this specification and showing the results of tests on each lot to determine conformance to the other acceptance test requirements of this specifca- tion. This report shall include the purchase order number, material specification number and its revision letter, lot number, size or part number, and quantity.

4.5.2 The vendor of forging stock shall furnish with each shipment three copies of a report stating that the chemical composition of the stock conforms to the requirements of this specification. This report shall include the purchase order number, material specification number and its revision letter, size, and quantity.