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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 4107E

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Superseding AMS 4107D

Submitted for recognition as an American National Standard

Aluminum Alloy Die Forgings
(7050-T74)
Solution Heat Treated and Overaged

UNS A97050

1. SCOPE:

1.1 Form:

This specification covers an aluminum alloy in the form of die forgings and forging stock.

1.2 Application:

These products have been used typically for structural applications requiring good resistance to stress-corrosion cracking, but usage is not limited to such applications.

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 publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2355	Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, (Except Forging Stock) and Flash Welded Rings
MAM 2355	Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, (Except Forging Stock) and Flash Welded Rings, Metric (SI) Units
AMS 2772	Heat Treatment of Aluminum Alloy Raw Materials
AMS 2808	Identification, Forgings

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7154 FAX: (724) 776-0243
TO PLACE A DOCUMENT ORDER: (724) 776-4970 FAX: (724) 776-0790
SAE WEB ADDRESS: http://www.sae.org

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B 557	Tension Testing Wrought and Cast Aluminum and Magnesium Alloy Products
ASTM B 557M	Tension Testing Wrought and Cast Aluminum and Magnesium Alloy Products, Metric
ASTM B 594	Ultrasonic Inspection of Aluminum-Alloy Products for Aerospace Applications
ASTM E 1417	Liquid Penetrant Examination
ASTM G 34-72	Exfoliation Corrosion Susceptibility in 2xxx and 7xxx Series Aluminum Alloys (EXCO Test)
ASTM G 47	Determining Susceptibility to Stress-Corrosion Cracking of High-Strength Aluminum Alloy Products

2.3 ANSI Publications:

Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

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

3. TECHNICAL REQUIREMENTS:

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	--	0.12
Iron	--	0.15
Copper	2.0	2.6
Manganese	--	0.10
Magnesium	1.9	2.6
Chromium	--	0.04
Zinc	5.7	6.7
Titanium	--	0.06
Zirconium	0.08	0.15
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition:

The product shall be supplied in the following condition:

3.2.1 Forgings: Solution heat treated and overaged in accordance with MIL-H-6088.

3.2.2 Forging Stock: As ordered by the forging manufacturer.

3.3 Properties:

The product shall conform to the following requirements determined in accordance with AMS 2355 or MAM 2355. The applicable limits are those that apply to the specified dimensions as ordered.

3.3.1 Forgings: The following requirements apply to forgings having an as-forged thickness not more than twice the nominal thickness at time of heat treatment:

3.3.1.1 Tensile Properties: Shall be as follows when tested in accordance with ASTM B 557 or ASTM B 557M.

3.3.1.1.1 With Grain Flow: Specimens, machined from forgings or from prolongations on such forgings, with axis of specimen in area of gage length varying not more than 15 degrees from parallel to the forging flow lines, shall have the properties specified in Table 2.

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

Nominal Thickness At Time Of Heat Treatment Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 4D %
Up to 2, incl	72.0	62.0	7
Over 2 to 4, incl	71.0	61.0	7
Over 4 to 5, incl	70.0	60.0	7
Over 5 to 6, incl	70.0	59.0	7

TABLE 2B - Minimum Tensile Properties, SI Units

Nominal Thickness At Time Of Heat Treatment Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 5D %
Up to 51, incl	496	427	6
Over 51 to 102, incl	490	421	6
Over 102 to 127, incl	483	414	6
Over 127 to 152, incl	483	407	6

3.3.1.1.2 Across Grain Flow: Specimens, machined from forgings or from prolongations on such forgings with axis of specimen in area of gage length varying not more than 15 degrees from perpendicular to the forging flow lines, shall have the properties specified in Table 3.

TABLE 3A - Minimum Tensile Properties, Inch/Pound Units

Nominal Thickness At Time Of Heat Treatment Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 4D %
Up to 2, incl	68.0	56.0	5
Over 2 to 4, incl	67.0	55.0	4
Over 4 to 6, incl	66.0	54.0	3

TABLE 3B - Minimum Tensile Properties, SI Units

Nominal Thickness At Time Of Heat Treatment Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 5D %
Up to 51, incl	469	386	5
Over 51 to 102, incl	462	379	4
Over 102 to 152, incl	455	372	3

3.3.1.1.3 Special Purpose Forgings: Tensile specimens cut from special purpose forgings or from forgings beyond the size and configuration limits of 3.3.1.1.1 or 3.3.1.1.2 shall meet tensile property requirements specified on the drawing or as agreed upon by purchaser and vendor.

3.3.1.2 Corrosion Resistance: Resistance to stress-corrosion cracking and to exfoliation-corrosion is acceptable if the conditions of 3.3.1.2.1 and 3.3.1.2.2 are met.

3.3.1.2.1 Electrical conductivity shall be not lower than 38.0% IACS (International Annealed Copper Standard) (22.0 MS/m) and yield strength with grain flow shall not exceed 72.0 ksi (496 MPa).

3.3.1.2.2 Stress-Corrosion Susceptibility Factor (SCF): Shall be not greater than 32.0 (220), determined by subtracting the electrical conductivity, AA.A% IACS (12 times BB.B MS/m) from the with-grain-flow yield strength, XX.X ksi (YYY MPa).

Examples:	72.0 ksi - 38.5% IACS = 33.5	Unacceptable
	68.0 ksi - 40.2% IACS = 27.8	Acceptable
(SI)	496 MPa - 12 X 22.3 MS/m = 228.4	Unacceptable
	469 MPa - 12 X 23.3 MS/m = 189.4	Acceptable

3.3.1.2.3 Forgings not conforming to 3.3.1.2.1 and 3.3.1.2.2 may be given additional overaging and retested to determine conformance to 3.3.1.1 and 3.3.1.2.

3.3.1.3 Exfoliation-Corrosion Resistance: Specimens cut from forgings shall exhibit exfoliation-corrosion, at any plane, not greater than that illustrated by photograph B, Figure 2, of ASTM G 34-72.

3.3.1.4 Stress-Corrosion Resistance: Specimens cut from forgings 0.750 inch (19.05 mm) and over in nominal thickness, shall show no evidence of stress-corrosion cracking when tested in accordance with ASTM G 47 and stressed at 35.0 ksi (241 MPa) in the short-transverse direction.

3.3.2 Forging Stock: When a sample of stock is forged to a test coupon having a degree of mechanical working not greater than the forging 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. If specimens taken from the stock after heat treatment in the same manner as forgings conform to the requirements of 3.3.1.1, the tests shall be accepted as equivalent to tests of a forged coupon.

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.

3.4.1 When specified, forgings shall be subjected to fluorescent penetrant inspection in accordance with ASTM E 1417. Standards for acceptance shall be specified by purchaser.

3.4.2 When specified, forgings shall be subjected to ultrasonic inspection in accordance with ASTM B 594 or other method specified by purchaser and shall meet the following acceptance standards:

3.4.2.1 Forgings with nominal section thicknesses from 0.500 to 4.000 inches (12.70 to 101.60 mm) and weight per piece up to 300 pounds (136 kg) shall meet ultrasonic Class B of ASTM B 594. The ultrasonic class for nominal thicknesses over 4.000 inches (101.60 mm) or for weight per piece 300 pounds (136 kg) and over shall be as agreed upon by purchaser and vendor.

3.4.3 Grain flow of die forgings, except in the areas which contain flash-line end grain, shall follow the general contour of the forgings showing no evidence of re-entrant grain flow.

3.5 Tolerances:

Forging stock shall conform to all applicable requirements of ANSI H35.2 or ANSI H35.2M.

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 the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: The following requirements are acceptance tests and except for composition, shall be performed on each lot:

4.2.1.1 Composition (3.1):

4.2.1.2 Tensile properties (3.3.1.1), corrosion resistance (3.3.1.2) and, when specified, fluorescent penetrant inspection (3.4.1) and ultrasonic inspection (3.4.2) of each lot of forgings.

4.2.1.3 Tolerances (3.5) of forging stock.

4.2.2 Periodic Tests: Exfoliation-corrosion resistance (3.3.1.3), stress-corrosion resistance (3.3.1.4), and grain flow (3.4.3) and test of forging stock to demonstrate ability to develop required properties (3.3.2) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing:

Shall be in accordance with AMS 2355 or MAM 2355 and 4.3.1.

4.3.1 When specified, fluorescent penetrant inspection (3.4.1) and ultrasonic inspection (3.4.2) shall be performed on each forging.