

**AEROSPACE
MATERIAL
SPECIFICATION**



MAM 4141B

Issued JAN 1982
Revised JAN 1990
Cancelled MAR 2003

Superseding MAM 4141A

Aluminum Alloy Die Forgings
5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (7075-T73)
Solution and Precipitation Heat Treated

UNS A97075

CANCELLATION NOTICE

This specification has been declared "CANCELLED" by the Aerospace Materials Division, SAE, as of March, 2003. By this action, this document will remain listed in the Numerical Section of the Index of Aerospace Material Specifications.

AMS XXXX covers the same material.

"CANCELLED" specifications are available from SAE.

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1. SCOPE:

1.1 Form: This specification covers an aluminum alloy in the form of die forgings and forging stock ordered to metric (SI) units.

1.1.1 AMS-4141 is the inch/pound version of this MAM.

1.2 Application: Primarily for parts requiring good resistance to stress-corrosion cracking but with lower strength than AMS-4139.

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.

2.1.1 Aerospace Material Specifications:

MAM-2201 - Tolerances, Aluminum and Aluminum Alloy Bar, Rod, Wire, and Forging Stock, Rolled, Drawn, or Cold Finished

MAM-2355 - Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Product (Except Forging Stock) and Flash Welded Rings, Metric (SI) Units

AMS-2630 - Ultrasonic Inspection

AMS-2645 - Fluorescent Penetrant Inspection

AMS-2808 - Identification, Forgings

- 2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM B 660 - Packaging/Packing of Aluminum and Magnesium Products

- 2.3 U.S. Government Publications: Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

- 2.3.1 Military Specifications:

MIL-H-6088 - Heat Treatment of Aluminum Alloys

- 2.3.2 Military Standards:

MIL-STD-2154 - Inspection, Ultrasonic, Wrought Metals, Process for

3. TECHNICAL REQUIREMENTS:

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

	min	max
Zinc	5.1	- 6.1
Magnesium	2.1	- 2.9
Copper	1.2	- 2.0
Chromium	0.18	- 0.28
Iron	--	0.50
Silicon	--	0.40
Manganese	--	0.30
Titanium	--	0.20
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 Forgings: Solution and precipitation heat treated 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 MAM-2355:

- 3.3.1 Forgings:

- 3.3.1.1 Tensile Properties: Shall be as follows:

- 3.3.1.1.1 With Grain Flow: Specimens, machined from forgings 150 mm and under in nominal thickness at time of heat treatment or from prolongations on such forgings, with axis of specimen in the area of gage length varying not more than 15 degrees from parallel to the forging flow lines, shall have properties specified in Table I provided the as-forged thickness is not more than twice the heat treated thickness.

TABLE I

Nominal Thickness at Time of Heat Treatment Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset Mpa, min	Elongation %, min	
			in 50 mm	in 5D
Up to 80, incl	455	385	7	6
Over 80 to 100, incl	440	380	7	6
Over 100 to 130, incl	425	365	7	6
Over 130 to 150, incl	420	350	6	5

- 3.3.1.1.2 Across Grain Flow: Specimens, machined from forgings 150 mm and under in nominal thickness at time of heat treatment or from prolongations on such forgings, with axis of specimen in the area of gage length varying not more than 15 degrees from perpendicular to the forging flow lines, shall have properties as specified in Table II provided the as-forged thickness is not more than twice the heat treated thickness. If configuration of the forging or prolongation cannot accommodate the transverse specimen described, properties of the forging shall be as agreed upon by purchaser and vendor.

TABLE II

Nominal Thickness at Time of Heat Treatment Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation %, min	
			in 50 mm	in 5D
Up to 80, incl	425	365	3	2
Over 80 to 100, incl	420	360	2	1
Over 100 to 130, incl	405	350	2	1
Over 130 to 150, incl	400	345	2	1

- 3.3.1.1.3 Tensile property requirements for specimens cut from forgings over 150 mm in nominal thickness at time of heat treatment shall be as specified on the drawing or as agreed upon by purchaser and vendor.
- 3.3.1.2 Hardness: Should be not lower than 124 HB/10/500 but forgings shall not be rejected on the basis of hardness if the tensile property requirements are met.

- 3.3.1.3 Stress-Corrosion Resistance: Forgings shall meet the conductivity test of 3.3.1.3.1 and shall exhibit no evidence of stress--corrosion cracking when tested in accordance with 3.3.1.3.2. The test of 3.3.1.3.2 need not be performed on forgings meeting the requirements of 3.3.1.3.1.1, 3.3.1.3.1.2, and 3.3.1.3.1.3.
- 3.3.1.3.1 Conductivity: Shall be as follows, determined on the surface of the sample:
- 3.3.1.3.1.1 $\emptyset$ If the conductivity is 23.2 MS/m or higher and longitudinal (with grain flow) tensile properties meet specified requirements, the forgings are acceptable.
- 3.3.1.3.1.2 $\emptyset$ If the conductivity is between 22.0 - 23.1 MS/m, inclusive, if the longitudinal (with grain flow) tensile properties meet specified properties, and if the longitudinal yield strength does not exceed the specified minimum by more than 82 MPa, the forgings are acceptable.
- 3.3.1.3.1.3 $\emptyset$ If the conductivity is between 22.0 - 23.1 MS/m, inclusive, and longitudinal (with grain flow) yield strength exceeds the specified minimum value by more than 82 MPa, the forgings shall be given additional precipitation heat treatment. If, after such treatment, the forgings meet the requirements of 3.3.1.3 and 3.3.1.3.1.1 or 3.3.1.3.1.2, the forgings are acceptable.
- 3.3.1.3.1.4 $\emptyset$ If the conductivity is below 22.00 MS/m, the forgings are not acceptable but may be re-heat treated or given additional precipitation heat treatment to meet the specified requirements.
- 3.3.1.3.2 $\emptyset$ Stress-Corrosion Cracking Resistance: Specimens, cut from forgings 19 mm and over in nominal thickness, shall exhibit no evidence of stress-corrosion cracking when stressed in the short-transverse (across grain flow) direction to 75% of the specified minimum longitudinal (with grain flow) yield strength.
- 3.3.2 Forging Stock: When a sample of stock is forged to a test coupon, with degree of mechanical working not greater than that of the forgings, and heat treated in the same manner as forgings, tensile 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. a
- 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 etched to produce a surface suitable for visual inspection. Surfaces shall be evaluated for defects such as seams, laps, bursts, and quench cracks. Surface imperfections which can be removed so that they do not reappear on re-etching and the required section thickness can be maintained are acceptable.
- 3.4.2 When specified, die forgings shall be ultrasonically inspected in accordance with MIL-STD-2154 or other method acceptable to purchaser and shall meet Class B requirements of MIL-STD-2154.
- 3.4.3 When specified, forgings shall be subjected to fluorescent penetrant inspection in accordance with AMS-2645 or other method acceptable to purchaser. Standards for acceptance shall be as agreed upon by purchaser and vendor.
- 3.4.4 Grain flow of die forgings, except in 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 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. 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 for the following requirements are acceptance tests and shall be performed on each lot:
- 4.2.1.1 Composition (3.1).
- 4.2.1.2 Tensile properties (3.3.1.1), stress-corrosion resistance (3.3.1.3), surface visual examination (3.4.11), and, when specified, ultrasonic inspection (3.4.2) and fluorescent penetrant inspection (3.4.3).
- 4.2.1.3 Tolerances (3.5) of forging stock.
- 4.2.2 Periodic Tests: Tests of forgings for hardness (3.3.1.2), stress-corrosion cracking resistance (3.3.1.3.2), and grain flow (3.4.4) and of forging stock to determine 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.