



AEROSPACE MATERIAL SPECIFICATION

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

AMS 4126

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Revised

ALUMINUM ALLOY FORGINGS 5.6Zn - 2.5Mg - 1.6Cu - 0.26Cr (7075-T6)

1. SCOPE:

- 1.1 Form: This specification covers an aluminum-base alloy in the form of die forgings, hand forgings, rolled rings, and forging stock.
- 1.2 Application: Primarily for structural applications requiring material with high strength in light-to-medium sections. Certain design and processing procedures may cause this material to be susceptible to stress corrosion cracking; ARP 823 recommends practices to minimize such conditions.

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) and Aerospace Recommended Practices (ARP) 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., 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 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

2.1.2 Aerospace Recommended Practices:

ARP 823 - Minimizing Stress Corrosion in Wrought Heat-Treatable Aluminum Alloy Products

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

ASTM B557 - Tension Testing Wrought 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, Pennsylvania 19120.

2.3.1 Federal Standards:

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

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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
Zinc	5.1	6.1
Magnesium	2.1	2.9
Copper	1.2	2.0
Chromium	0.18	0.35
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 and Rolled Rings: Solution and precipitation heat treated.

3.2.2 Forging Stock: As ordered by the forging manufacturer.

3.3 Properties:

3.3.1 Tensile Properties: Shall be as follows; test specimens and testing procedures shall be in accordance with ASTM B557:

3.3.1.1 Die Forgings:

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 forgings, shall conform to the following requirements:

Tensile Strength, min	75,000 psi (517 MPa)
Yield Strength at 0.2% Offset, min	64,000 psi (441 MPa)
Elongation in 2 in. (50.8 mm) or 4D, min	10%

3.3.1.1.2 Forgings, With Grain Flow: Test specimens machined from forgings, with the axis varying not more than 15 deg (0.262 rad) from parallel to the forging flow lines in the area of the gage length of the specimen, shall conform to the requirements shown in Table I:

TABLE I

Nominal Thickness At Time of Heat Treatment Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset, psi, min	Elongation in 2 in. or 4D, %, min
Up to 1, incl	75,000	64,000	7
Over 1 to 3, incl	74,000	63,000	7
Over 3 to 4, incl	73,000	62,000	7

TABLE I (SI)

Nominal Thickness At Time of Heat Treatment Millimeters	Tensile Strength MPa, min	Yield Strength at 0.2% Offset, MPa, min	Elongation in 50.8 mm or 4D %, min
Up to 25, incl	517	441	7
Over 25 to 76, incl	510	434	7
Over 76 to 102, incl	503	427	7

3.3.1.1.3 Forgings, Across Grain Flow: Test specimens, machined from forgings with the axis varying more than 15 deg (0.262 rad) from parallel to the forging flow lines, shall conform to the requirements shown in Table II:

TABLE II

Nominal Thickness At Time of Heat Treatment Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset, psi, min	Elongation in 2 in. or 4D, %, min
Up to 2, incl	71,000	61,000	3
Over 2 to 3, incl	70,000	60,000	3
Over 3 to 4, incl	70,000	60,000	2

TABLE II (SI)

Nominal Thickness At Time of Heat Treatment Millimeters	Tensile Strength MPa, min	Yield Strength at 0.2% Offset, MPa, min	Elongation in 50.8 mm or 4D %, min
Up to 51, incl	490	421	3
Over 51 to 76, incl	483	414	3
Over 76 to 102, incl	483	414	2

3.3.1.2 Rolled Rings: Test specimens, machined from rolled rings with axis approximately tangential to the ring OD (axis parallel to direction of rolling) or with axis approximately parallel to the axis of the ring (transverse to direction of rolling), shall conform to the requirements shown in Table III:

TABLE III

Nominal Wall Thickness At Time of Heat Treatment Inches	Test Direction	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
Up to 2, incl	Tangential	73,000	62,000	7
	Axial	72,000	61,000	3
Over 2 to 3.5, incl	Tangential	71,000	60,000	6
	Axial	70,000	59,000	3

TABLE III (SI)

Nominal Wall Thickness At Time of Heat Treatment Millimeters	Test Direction	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50.8 mm or 4D %, min
Up to 51, incl	Tangential	503	427	7
	Axial	496	421	3
Over 51 to 89, incl	Tangential	490	414	6
	Axial	483	407	3

3.3.1.3 Hand Forgings: Test specimens machined from forgings having a rectangular cross section heat treated in the indicated thickness, provided the as-forged thickness does not exceed 6 in. (152 mm), shall conform to the requirements shown in Table IV:

TABLE IV

Nominal Thickness At Time of Heat Treatment Inches	Test Direction	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
Up to 2, incl	Longitudinal	74,000	63,000	9
	Long Trans.	73,000	61,000	4
Over 2 to 3, incl	Longitudinal	73,000	61,000	9
	Long Trans.	71,000	59,000	4
	Short Trans.	69,000	58,000	3
Over 3 to 4, incl	Longitudinal	71,000	60,000	8
	Long Trans.	70,000	58,000	3
	Short Trans.	68,000	57,000	2
Over 4 to 5, incl	Longitudinal	69,000	58,000	7
	Long Trans.	68,000	56,000	3
	Short Trans.	66,000	56,000	2
Over 5 to 6, incl	Longitudinal	68,000	56,000	6
	Long Trans.	66,000	55,000	3
	Short Trans.	65,000	55,000	2

TABLE IV (SI)

Nominal Thickness At Time of Heat Treatment Millimeters	Test Direction	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50.8 mm or 4D %, min
Up to 51, incl	Longitudinal	510	434	9
	Long Trans.	503	421	4
Over 51 to 76, incl	Longitudinal	503	421	9
	Long Trans.	490	407	4
	Short Trans.	476	400	3
Over 76 to 102, incl	Longitudinal	490	414	8
	Long Trans	483	400	3
	Short Trans	469	393	2
Over 102 to 127, incl	Longitudinal	476	400	7
	Long Trans.	469	386	3
	Short Trans.	455	386	2
Over 127 to 152, incl	Longitudinal	469	386	6
	Long Trans.	455	379	3
	Short Trans.	448	379	2

- 3.3.1.4 Special Purpose Forgings: Tensile specimens cut from special purpose forgings or forgings beyond the size and configuration limits covered by this specification shall conform to the tensile property requirements specified on the drawing or agreed upon by purchaser and vendor.
- 3.3.1.5 Forging Stock: When a sample of stock is forged to a test coupon and heat treated in the same manner as forgings, a tensile specimen taken from the heat treated coupon shall have properties not lower than those specified in 3.3.1.1.1. If a test specimen taken from the stock after heat treatment in the same manner as forgings has properties not lower than those specified in 3.3.1.1.1 or 3.3.1.1.3 as applicable, the test shall be accepted as equivalent to tests of a forged coupon.
- 3.3.2 Hardness: Forgings and rolled rings should have hardness not lower than 135 HB/10/500, 135 HB/14.3/1000, or 140 HB/10/1000, determined in accordance with ASTM E10, but the product shall not be rejected on the basis of hardness if the tensile property requirements are met.
- 3.3.3 Grain Flow: Shall be as specified on the drawing or as agreed upon by purchaser and vendor.
- 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 Nondestructive Testing: When specified, forgings shall be subjected to fluorescent penetrant inspection in accordance with AMS 2645 and/or ultrasonic inspection in accordance with AMS 2630. Standards for acceptance shall be as agreed upon by purchaser and vendor.
- 3.6 Tolerances: Unless otherwise specified, tolerances for forging stock shall be in accordance with 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 4.5. 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 forgings and rolled rings to determine conformance to all technical requirements of this specification and of forging stock 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 forging stock to determine capability of developing the required properties (3.3.1.5) are classified as qualification or periodic control tests, but the vendor of forging stock shall not be required to make such tests unless otherwise agreed upon by purchaser and vendor of the stock.
- 4.3 Sampling: When sampling of forgings and rolled rings is on a lot basis, a lot shall consist of all forgings or rolled rings of the same nominal 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 simultaneously from the same source of molten metal. Complete ingot analysis records shall be available to the purchaser.