

AEROSPACE MATERIAL SPECIFICATION

Issued 1973-05
Revised 2005-08
Reaffirmed 2010-10

Superseding AMS 4126B

Aluminum Alloy, Die and Hand Forgings and Rolled Rings
5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (7075-T6)
Solution and Precipitation Heat Treated
(Composition similar to UNS A97075)

1. SCOPE:

1.1 Form:

This specification covers an aluminum alloy in the form of die forgings, hand forgings, rolled rings, and stock for forging or rolled rings.

1.2 Application:

These products have been used typically for applications requiring high strength in light-to-medium sections, but usage is not limited to such applications.

- 1.2.1 Certain design and processing procedures may cause these products to become susceptible to stress-corrosion cracking; ARP823 recommends practices to minimize such conditions.

2. APPLICABLE DOCUMENTS:

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2010 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: <http://www.sae.org>

**SAE values your input. To provide feedback
on this Technical Report, please visit
<http://www.sae.org/technical/standards/AMS4126C>**

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

AMS 2355	Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings
AMS 2772	Heat Treatment of Aluminum Alloy Raw Materials
AMS 2808	Identification, Forgings
ARP823	Minimizing Stress-Corrosion Cracking in Wrought Heat-Treatable Aluminum Alloy Products
AS1990	Aluminum Alloy Tempers

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM B 594	Ultrasonic Inspection of Aluminum Alloy-Wrought Products for Aerospace Applications
ASTM B 660	Packaging/Packing of Aluminum and Magnesium Products
ASTM E 1417	Liquid Penetrant Examination

2.3 ANSI Publications:

Available from American National Standards Institute, Inc., 23 West 43rd 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.

TABLE 1 - Composition

Element	min	max
Silicon	--	0.40
Iron	--	0.50
Copper	1.2	2.0
Manganese	--	0.30
Magnesium	2.1	2.9
Chromium	0.18	0.28
Zinc	5.1	6.1
Titanium	--	0.20
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition:

Shall be as follows:

3.2.1 Die Forgings, Hand Forgings, and Rolled Rings: Solution and precipitation heat treated in accordance with AMS 2772 to the -T6 temper (See AS1990).

3.2.2 Stock for Forging or Rolled Rings: As ordered by the forging or rolled ring manufacturer.

3.3 Properties:

The product shall conform to the following requirements, determined on the mill product in accordance with AMS 2355:

3.3.1 Die Forgings, Hand Forgings, and Rolled Rings:

3.3.1.1 Tensile Properties: Shall be as follows:

3.3.1.1.1 Die Forgings:

3.3.1.1.1.1 With Grain Flow: Specimens, machined from forgings 4 inches (102 mm) and under in nominal thickness at time of heat treatment 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 shown in Table 2 provided the as-forged thickness is not more than twice the heat treated thickness.

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 2 Inches or 4D %
Up to 1, incl	75.0	64.0	7
Over 1 to 3, incl	74.0	63.0	7
Over 3 to 4, incl	73.0	62.0	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 50.8 mm or 4D %
Up to 25, incl	517	441	7
Over 25 to 76, incl	510	434	7
Over 76 to 102, incl	503	427	7

- 3.3.1.1.1.2 Across Grain Flow: Specimens, machined from forgings 4 inches (102 mm) and under in nominal thickness at time of heat treatment 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 shown in Table 3 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, acceptance of the forging shall be based on testing as in 3.3.1.1.1.3.

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 2 Inches or 4D %
Up to 2, incl	71.0	61.0	3
Over 2 to 3, incl	70.0	60.0	3
Over 3 to 4, incl	70.0	60.0	2

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 50.8 mm or 4D %
Up to 51, incl	490	421	3
Over 51 to 76, incl	483	414	3
Over 76 to 102, incl	483	414	2

- 3.3.1.1.1.2.1 Elongation requirements shall not apply to specimens having a gage length diameter less than 0.250 inch (6.35 mm) or located in immediate proximity to an abrupt change in thickness or located so that any part of the specimen gage length is located within 1/8 inch (3.2 mm) of the trimmed flash line.

- 3.3.1.1.1.3 At Angle to Grain Flow: Specimens, machined from forgings 4 inches (102 mm) and under in nominal thickness at time of heat treatment or from prolongations on such forgings, with axis of specimen in area of gage length varying more than 15 degrees from parallel and also more than 15 degrees from perpendicular to the forging flow lines, shall have the properties shown in Table 3 provided the as-forged thickness is not more than twice the heat treated thickness. Such test results shall be identified as neither longitudinal nor transverse tensile properties.
- 3.3.1.1.2 Hand Forgings: Specimens, machined from forgings having an essentially square or rectangular cross-section, shall have the properties shown in Table 4 provided the as-forged thickness does not exceed 6 inches (152 mm).

TABLE 4A - Minimum Tensile Properties, Inch/Pound Units

Nominal Thickness at Time of Heat Treatment Inches	Specimen Orientation	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Up to 2, incl	Longitudinal	74.0	63.0	9
	Long Trans.	73.0	61.0	4
Over 2 to 3, incl	Longitudinal	73.0	61.0	9
	Long Trans.	71.0	59.0	4
	Short Trans.	69.0	58.0	3
Over 3 to 4, incl	Longitudinal	71.0	60.0	8
	Long Trans.	70.0	58.0	3
	Short Trans.	68.0	57.0	2
Over 4 to 5, incl	Longitudinal	69.0	58.0	7
	Long Trans.	68.0	56.0	3
	Short Trans.	66.0	56.0	2
Over 5 to 6, incl	Longitudinal	68.0	56.0	6
	Long Trans.	66.0	55.0	3
	Short Trans.	65.0	55.0	2

TABLE 4B - Minimum Tensile Properties, SI Units

Nominal Thickness at Time of Heat Treatment Millimeters	Specimen Orientation	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
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

- 3.3.1.1.3 Rolled Rings: Specimens machined from rings with axis of specimen 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 have the properties shown in Table 5.

TABLE 5A - Minimum Tensile Properties, Inch/Pound Units

Nominal Wall Thickness at Time of Heat Treatment Inches	Specimen Orientation	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Up to 2 , incl	Tangential	73.0	62.0	7
	Axial	72.0	61.0	3
Over 2 to 3.5, incl	Tangential	71.0	60.0	6
	Axial	70.0	59.0	3

TABLE 5B - Minimum Tensile Properties, SI Units

Nominal Wall Thickness at Time of Heat Treatment Millimeters	Specimen Orientation	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
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

- 3.3.1.1.4 Special Purpose Forgings: Tensile property requirements for specimens cut from special purpose forgings shall be as specified on the drawing or as agreed upon by purchaser and vendor.
- 3.3.1.1.5 Test Specimens: Specimens machined from separately-forged coupons or from forging stock representing the forgings and, in either case, heat treated with the forgings shall have the properties shown in Table 6.

TABLE 6 - Minimum Tensile Properties

Property	Value
Tensile Strength	75.0 ksi (517 MPa)
Yield Strength at 0.2% Offset	64.0 ksi (441 MPa)
Elongation in 4D	10%

- 3.3.1.2 Grain Flow: Grain flow of die forgings and rolled rings, except in the areas which contain end grain, shall follow the general contour of the forging or rolled ring, showing no evidence of re-entrant grain flow.

3.3.2 Stock for Forging or Rolled Rings: When a sample of stock is forged to a test coupon and heat treated in the same manner as forgings and rolled rings, specimens taken from the heat treated coupon shall conform to the requirements of 3.3.1.1.5. If specimens taken from the stock prior to forging and after heat treatment in the same manner as forgings and rolled rings conform to the requirements of 3.3.1.1.5, the tests shall be accepted as equivalent to tests of a forged coupon. The forging stock supplier, however, shall not be required to use unforged coupons when performing lot conformance testing.

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 and rolled rings shall be subjected to ultrasonic inspection in accordance with ASTM B 594 and, unless otherwise specified, shall meet the following requirements of that specification:

3.4.1.1 Die forgings and rolled rings 0.500 to 4.000 inches (12.70 to 101.60 mm), inclusive, in nominal thickness and weighing not over 300 pounds (136 kg) shall meet Class B.

3.4.1.2 Hand forgings 1.000 to 6.000 inches (25.40 to 152.40 mm), inclusive, in nominal thickness and weighing not more than 600 pounds (272 kg) shall meet Class A.

3.4.1.3 Acceptance criteria for forgings or rolled rings exceeding the limits of 3.4.1.1 or 3.4.1.2 shall be as agreed upon by purchaser and vendor.

3.4.2 When specified, forgings and rolled rings shall be subjected to fluorescent penetrant inspection in accordance with ASTM E 1417. Standards for acceptance shall be as agreed upon by purchaser and vendor.

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 specified requirements.