

AEROSPACE MATERIAL SPECIFICATION



AMS 4174D

Issued 1976-01
Revised 2005-08
Reaffirmed 2010-10

Superseding AMS 4174C

Aluminum Alloy, Flash Welded Rings
5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (7075-T73)
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 flash welded rings.

1.2 Application:

These rings have been used typically for parts requiring high strength and resistance to stress-corrosion cracking, but usage is not limited to such applications.

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.

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 7488 Rings, Flash Welded, Aluminum and Aluminum Alloys
AMS 2772 Heat Treatment of Aluminum and Aluminum Alloys

AS1990 Aluminum Alloy Tempers

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/AMS4174D>**

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 660 Packaging/Packing of Aluminum and Magnesium Products

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
Copper	--	0.50
Iron	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:

Rings shall be manufactured in accordance with AMS 7488 and solution and precipitation heat treated to the T73 temper in accordance with AMS 2772 (See AS1990).

3.3 Properties:

Rings shall conform to the following requirements, determined on the mill produced size in accordance with AMS 2355.

- 3.3.1 Tensile Properties: Shall be as follows; longitudinal tensile properties apply to specimens taken in the circumferential direction. Long-transverse and short-transverse properties apply to specimens taken in the greater and lesser, respectively, of the axial and radial directions.

3.3.1.1 Longitudinal: Shall be as specified in Table 2.

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

Nominal Radial Thickness Inches			Nominal Cross-Sectional Area Square Inches		Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 4D %
0.062	to	0.249, incl	Up	to 20, incl	68.0	58.0	7
Over 0.249	to	1.499, incl	Up	to 25, incl	70.0	61.0	8
Over 1.499	to	2.999, incl	Up	to 25, incl	69.0	59.0	8
Over 2.999	to	4.499, incl	Up	to 20, incl	68.0	57.0	7
Over 2.999	to	4.499, incl	Over 20	to 32, incl	65.0	55.0	7

TABLE 2B - Minimum Longitudinal Tensile Properties, SI Units

Nominal Radial Thickness Millimeters			Nominal Cross-Sectional Area Square Centimeters		Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 4D %
1.57	to	6.32, incl	Up	to 129, incl	469	400	7
Over 6.32	to	38.07, incl	Up	to 161, incl	483	421	8
Over 38.07	to	76.17, incl	Up	to 161, incl	476	407	8
Over 76.17	to	114.27, incl	Up	to 129, incl	469	393	7
Over 76.17	to	114.27, incl	Over 129	to 206, incl	448	379	7

3.3.1.2 Long-Transverse: Shall be as specified in Table 3.

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

Nominal Radial Thickness Inches			Nominal Cross-Sectional Area Square Inches		Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 4D %
0.062	to	0.249, incl	Up	to 20, incl	66.0	55.0	3
Over 0.249	to	0.499, incl	Up	to 20, incl	67.0	56.0	4
Over 0.499	to	0.749, incl	Up	to 25, incl	67.0	56.0	4
Over 0.749	to	1.499, incl	Up	to 25, incl	66.0	55.0	4
Over 1.499	to	2.999, incl	Up	to 25, incl	65.0	54.0	4
Over 2.999	to	4.499, incl	Up	to 20, incl	60.0	49.0	3
Over 2.999	to	4.499, incl	Over 20	to 32, incl	60.0	47.0	3

TABLE 3B - Minimum Long-Transverse Tensile Properties, SI Units

Nominal Radial Thickness Millimeters			Nominal Cross-Sectional Area Square Centimeters		Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 4D %
1.57	to	6.32, incl	Up	to 129, incl	455	379	3
Over 6.32	to	12.67, incl	Up	to 129, incl	462	386	4
Over 12.67	to	19.02, incl	Up	to 161, incl	462	386	4
Over 19.02	to	38.07, incl	Up	to 161, incl	455	379	4
Over 38.07	to	76.17, incl	Up	to 161, incl	448	372	4
Over 76.17	to	114.27, incl	Up	to 129, incl	414	338	3
Over 76.17	to	114.27, incl	Over 129	to 206, incl	414	324	3

3.3.1.3 Short-Transverse: Shall be as specified in Table 4.

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

Nominal Radial Thickness Inches		Nominal Cross-Sectional Area Square Inches		Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 4D %
1.500	to 2.999, incl	Up to 25, incl		60.0	48.0	2
Over 2.999	to 4.499, incl	Up to 20, incl		57.0	44.0	2
Over 2.999	to 4.499, incl	Over 20 to 32, incl		54.0	41.0	2

TABLE 4B - Minimum Short-Transverse Tensile Properties, SI Units

Nominal Radial Thickness Millimeters		Nominal Cross-Sectional Area Square Centimeters		Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 4D %
38.10	to 76.17, incl	Up to 161, incl		414	331	2
Over 76.17	to 114.27, incl	Up to 129, incl		393	303	2
Over 76.17	to 114.27, incl	Over 129 to 206, incl		372	283	2

3.3.2 Conductivity: Shall be as follows, determined on the surface of test specimens:

3.3.2.1 If the conductivity is 40.0% IACS (International Annealed Copper Standard) (23.2 MS/m) or higher and longitudinal tensile properties meet specified requirements, rings are acceptable.

3.3.2.2 If the conductivity is 38.0 to 39.9% IACS (22.0 to 23.1 MS/m), if the longitudinal tensile properties meet specified requirements, and if the longitudinal yield strength does not exceed the specified minimum by more than 11.9 ksi (82 MPa), rings are acceptable.

3.3.2.3 If the conductivity is below 40.0% IACS and the longitudinal yield strength exceeds the specified minimum value by more than 11.9 ksi (82 MPa), rings shall be given additional precipitation heat treatment. If after such treatment, rings meet the requirements of 3.3.1.1 and 3.3.2.1 or 3.3.2.2, rings are acceptable.

3.3.2.4 If the conductivity is below 38.0% IACS (22.0 MS/m), rings are not acceptable but may be re-heat treated or given additional precipitation heat treatment to meet the requirements of 3.3.1.1 and 3.3.2.1 or 3.3.2.2.

3.3.3 Stress-Corrosion Cracking Resistance: Specimens, cut from a ring so that the axis of loading of the specimen is parallel to the short-transverse direction of the ring, shall show no evidence of stress-corrosion cracking when stressed to 75% of the specified minimum longitudinal yield strength.

3.4 Quality:

Rings, 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 rings.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of rings 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 rings conform to specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Composition (3.1), longitudinal tensile properties (3.3.1.1), and conductivity (3.3.2) are acceptance tests and, except for composition, shall be performed on each lot.

4.2.2 Periodic Tests: Transverse tensile properties (3.3.1.2 and 3.3.1.3) and stress-corrosion resistance (3.3.3) 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.

4.4 Reports:

The vendor of rings shall furnish with each shipment a report stating that the product conforms to the composition, tolerances, and nondestructive tests, and showing the numerical results of tests on each inspection lot to determine conformance to the other acceptance test requirements. This report shall include the purchase order number, inspection lot number(s), AMS 4174D, size, and quantity. The report shall also identify the producer, the product form, and the size of the mill product.

4.5 Resampling and Retesting:

Shall be in accordance with AMS 2355.

5. PREPARATION FOR DELIVERY:

5.1 Identification:

Shall be as agreed upon by purchaser and vendor.

5.2 Packaging:

Rings shall be prepared for shipment in accordance with ASTM B 660 and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the rings to ensure carrier acceptance and safe delivery.