Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 4174

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Revised

UNS A97075

ALUMINUM ALLOY FLASH WELDED RINGS
5.6Zn - 2.5Mg - 1.6Cu - 0.26Cr (7075-T73)

1. SCOPE:

1.1 Form: This specification covers an aluminum alloy in the form of flash welded rings.

1.2 Application: Primarily for parts requiring high strength and resistance to stress-corrosion cracking.

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) 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., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods
AMS 2355 - Quality Assurance Sampling and Testing of Aluminum-Base and Magnesium-Base Alloys, Wrought Products (Except Forgings and Forging Stock) and Flash Welded Rings
AMS 2770 - Heat Treatment of Aluminum and Aluminum Alloys
AMS 7488 - Rings, Flash Welded, Aluminum and Aluminum Alloys

2.2 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.2.1 Federal Standards:

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

2.2.2 Military Standards:

MIL-STD-649 - Aluminum and Magnesium Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

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

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3.1 (Continued)

	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
Zirconium + Titanium	--	0.25
Other Impurities, each	--	0.05
Other Impurities, Total	--	0.15
Aluminum	remainder	

3.2 Condition: Rings shall be manufactured in accordance with AMS 7488 and solution and precipitation heat treated in accordance with AMS 2770.

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

3.3.1 Tensile Properties:

3.3.1.1 Longitudinal (See 8.1): Shall be as specified in Table I.

TABLE I

Nominal Dimensions		Tensile Strength	Yield Strength at 0.2% Offset	Elongation in 2 in. or 4D
Radial Thickness Inches	Cross Sectional Area Square Inches	psi, min	psi, min	%, min
0.062 to 0.249, incl	Up to 20, incl	68,000	58,000	7
Over 0.249 to 1.499, incl	Up to 25, incl	70,000	61,000	8
Over 1.499 to 2.999, incl	Up to 25, incl	69,000	59,000	8
Over 2.999 to 4.499, incl	Up to 20, incl	68,000	57,000	7
Over 2.999 to 4.499, incl	Over 20 to 32, incl	65,000	55,000	7

TABLE I (SI)

Nominal Dimensions		Tensile Strength	Yield Strength at 0.2% Offset	Elongation in 50.8 mm or 4D
Radial Thickness Millimetres	Cross Sectional Area Square Centimetres	MPa, min	MPa, min	%, min
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 (See 8.1): Shall be as specified in Table II.

TABLE II

Nominal Dimensions		Tensile Strength	Yield Strength at 0.2% Offset	Elongation in 2 in. or 4D
Radial Thickness Inches	Cross Sectional Area Square Inches	psi, min	psi, min	%, min
0.062 to 0.249, incl	Up to 20, incl	66,000	55,000	3
Over 0.249 to 0.499, incl	Up to 20, incl	67,000	56,000	4
Over 0.499 to 0.749, incl	Up to 25, incl	67,000	56,000	4
Over 0.749 to 1.499, incl	Up to 25, incl	66,000	55,000	4
Over 1.499 to 2.999, incl	Up to 25, incl	65,000	54,000	4
Over 2.999 to 4.499, incl	Up to 20, incl	60,000	49,000	3
Over 2.999 to 4.499, incl	Over 20 to 32, incl	60,000	47,000	3

TABLE II (SI)

Nominal Dimensions		Tensile Strength	Yield Strength at 0.2% Offset	Elongation in 50.8 mm or 4D
Radial Thickness Millimetres	Cross Sectional Area Square Centimetres	MPa, min	MPa, min	%, min
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 (See 8.1): Shall be as specified in Table III.

TABLE III

Nominal Dimensions		Tensile Strength	Yield Strength at 0.2% Offset	Elongation in 2 in. or 4D
Radial Thickness Inches	Cross Sectional Area Square Inches	psi, min	psi, min	%, min
1.500 to 2.999, incl	Up to 25, incl	60,000	48,000	2
Over 2.999 to 4.499, incl	Up to 20, incl	57,000	44,000	2
Over 2.999 to 4.499, incl	Over 20 to 32, incl	54,000	41,000	2

TABLE III (SI)

Nominal Dimensions		Tensile Strength	Yield Strength at 0.2% Offset	Elongation in 50.8 mm or 4D
Radial Thickness Millimetres	Cross Sectional Area Square Centimetres	MPa, min	MPa, min	%, min
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

3.3.1.4 Tensile property requirements for rings with cross-sections exceeding the size limits of 3.3.1.1, 3.3.1.2 and 3.3.1.3 shall be as agreed upon by purchaser and vendor.

3.3.2 Hardness: Should be not lower than 125 HB/10/500, 125 HB/14.3/1000, or 130 HB/10/1000 but the rings shall not be rejected on the basis of hardness if the tensile property requirements are met.

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

3.3.3.1 If the conductivity is 40% IACS (International Annealed Copper Standard) or higher and tensile properties meet specified requirements, rings are acceptable.

3.3.3.2 If the conductivity is 38 - 40% IACS, excl, if the tensile properties meet specified requirements, and if the yield strength does not exceed the specified minimum by more than 11,900 psi (82 MPa), rings are acceptable.

3.3.3.3 If the conductivity is below 40% IACS and the yield strength exceeds the specified minimum value by more than 11,900 psi (82 MPa), rings are suspect.

3.3.3.3.1 When rings are suspect, rings shall either be reprocessed or a sample from the rings shall be heated for not less than 30 min. at 870°F ± 10 (465.6°C ± 5.6) and quenched in cold water. Conductivity shall be measured within 15 min. after quenching. If the difference between this measurement and the original measurement on the product is 6% IACS or more, the rings are satisfactory. If the difference is less than 6% IACS, rings shall be reprocessed.

3.3.3.4 If the conductivity is below 38% IACS, rings are unsatisfactory and must be reprocessed, regardless of mechanical property level.

3.3.4 Resistance to Stress-Corrosion Cracking: A test specimen, 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 yield strength value given in 3.3.1.1, held at constant strain in a suitable fixture, and subjected to cyclic immersion for 30 days in a 3-1/2% solution of sodium chloride in accordance with Federal Test Method Standard No. 151, Method 823.

3.4 Quality: Rings 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 the rings.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of rings 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 4.4. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the rings conform to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to composition (3.1), longitudinal tensile property (3.3.1.1), and conductivity (3.3.3) requirements are classified as acceptance or routine control tests.

4.2.2 Qualification Tests: Tests to determine conformance to transverse tensile property (3.3.1.2 and 3.3.1.3), hardness (3.3.2), and stress-corrosion cracking (3.3.4) requirements are classified as qualification or periodic control tests.