

AEROSPACE MATERIAL SPECIFICATION

SAE AMS-4189

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Submitted for recognition as an American National Standard

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Superseding AMS-4189B

WIRE, ALUMINUM ALLOY WELDING
4.1Si - 0.2Mg (4643)

UNS A94643

1. SCOPE:

- 1.1 Form: This specification covers an aluminum alloy in the form of welding wire.
- 1.2 Application: Primarily for use as filler metal for gas-metal-arc and gas-tungsten-arc welding of heavy sections of aluminum alloys such as AMS-4117 to produce joints having inherently low dilution ratio of base-metal to weld-metal, and where the weldment may require solution and/or precipitation heat treatment.

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.

- 2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

2.1.1 Aerospace Material Specifications:

- AMS-2355 - Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings
- MAM-2355 - Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings, Metric (SI) Units
- AMS-2813 - Packaging of Welding Wire, Standard Method
- AMS-2815 - Identification, Welding Wire, Line Code System
- AMS-2816 - Identification, Welding Wire, Color Code System

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2.1.2 Aerospace Recommended Practices:

ARP1876 - Weldability Test for Weld Filler Metal Wire

3. TECHNICAL REQUIREMENTS:

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

	min	max
Silicon	3.6	4.6
Magnesium	0.10	0.30
Iron	--	0.8
Titanium	--	0.15
Copper	--	0.10
Zinc	--	0.10
Manganese	--	0.05
Beryllium	--	0.0008
Other Impurities, each	--	0.05
Other Impurities, total	--	0.15
Aluminum	remainder	

- 3.2 Condition: As drawn, in a temper which will provide proper feeding of the wire in machine-welding equipment.

- 3.2.1 Wire shall be furnished on disposable spools for machine welding or in cut lengths for manual welding, as ordered.

- 3.2.2 Oxides, dirt, and drawing compounds shall be removed by cleaning processes which will neither result in pitting nor cause gas absorption by the wire or deposition of substances harmful to welding operations.

- 3.3 Properties: Wire shall conform to the following requirements:

- 3.3.1 Weldability: Melted wire shall flow smoothly and evenly during welding and shall produce acceptable welds, determined by a procedure agreed upon by purchaser and vendor. The referee method of ARP1876 may be used to resolve weldability disputes.

- 3.4 Quality: Wire, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to welding operations, operation of welding equipment, or properties of the deposited weld metal.

- 3.5 Sizes and Tolerances: Wire shall be supplied in the sizes and to the tolerances shown in 3.5.1 and 3.5.2.

3.5.1 Diameter:

TABLE I

Ø	Form	Nominal Diameter Inch	Tolerance, Inch	
			plus	minus
	Cut Lengths	0.047, 0.062, 0.078, 0.094	0.003	0.003
	Cut Lengths	0.125, 0.156, 0.188, 0.250	0.003	0.003
	Spools	0.030, 0.035, 0.047	0.001	0.002
	Spools	0.062, 0.078, 0.094, 0.125	0.002	0.002

TABLE I (SI)

Ø	Form	Nominal Diameter Millimetres	Tolerance, Millimetre	
			plus	minus
	Cut Lengths	1.19, 1.57, 1.98, 2.39	0.08	0.08
	Cut Lengths	3.18, 3.96, 4.78, 6.35	0.08	0.08
	Spools	0.76, 0.89, 1.19	0.02	0.05
	Spools	1.57, 1.98, 2.39, 3.18	0.05	0.05

3.5.2 Length: Cut lengths shall be furnished in 36-inch (914 mm) lengths unless 27-inch (686 mm) or 18-inch (457 mm) lengths are ordered, and shall not vary more than +0, -1/2 inch (-12.7 mm) from the length ordered.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of wire 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 wire conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests for composition (3.1) and tolerances (3.5) are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests for weldability (3.3.1) 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 or MAM-2355.

4.4 Reports: The vendor of wire shall furnish with each shipment a report stating that the wire conforms to the chemical composition and other technical requirements. This report shall include the purchase order number, lot number, AMS-4189C, nominal size, and quantity.

5. PREPARATION FOR DELIVERY:

5.1 Heat: Wire on each spool shall be of one continuous length from the same heat of alloy.

5.1.1 Butt welding is permitted provided both ends to be joined are identified by chemical analysis, or the repair is made at the wire processing work station, and the weld will not interfere with uniform, uninterrupted feeding of the wire in machine welding equipment.

5.2 Identification: Shall be in accordance with AMS-2815 unless AMS-2816 or other method is specified by purchaser. Tab marking of cut lengths is permitted.

5.2.1 An 8-inch (203-mm) length of wire shall be made accessible at both ends of each spool for alloy verification. Alloy verification shall be performed by a method agreed upon purchaser and vendor.

5.3 Packaging and Marking: Shall be in accordance with AMS-2813.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Wire not conforming to this specification, or to modifications authorized by purchaser, will be subject to rejection.

8. NOTES:

8.1 Marginal Indicia: The phi (ϕ) symbol is used to indicate technical changes from the previous issue of this specification.

8.2 Dimensions in inch/pound units are primary; dimensions in SI units are shown as the approximate equivalents of the primary units and are presented only for information.

8.3 For direct U.S. Military procurement, purchase documents should specify not less than the following:

Title, number, and date of this specification
Size and form (spools or cut lengths) of wire desired
Length of cut lengths or weight of spools desired
Quantity of wire desired
Testing procedure and acceptance standards for weldability (See 3.3.1)
Method of testing for alloy verification (See 5.2.1)
Level A packaging, if required (See AMS-2813).

8.4 Similar Specifications: AWS 5.10, ER4643, is listed for information only and shall not be construed as an acceptable alternate unless all requirements of this AMS are met.