SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 4189F

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Superseding AMS 4189E

Aluminum Alloy, Welding Wire
4.1 Si - 0.20Mg (4643)

(Composition similar to UNS A94643)

1. SCOPE:

1.1 Form:

This specification covers an aluminum alloy in the form of welding wire.

1.2 Application:

This wire has been used typically as filler metal for gas-metal-arc or gas-tungsten-arc welding of heavy sections of aluminum alloys of similar composition 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, 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.

AMS 2355	Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings
MAM 2355	Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Rings, Metric (SI) Units
AMS 2813	Packaging and Marking of Packages of Welding Wire, Standard Method

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

2.1 (Continued):

AMS 2814	Packaging and Marking of Packages of Welding Wire, Premium Quality Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded
AMS 2816	Identification, Welding Wire, Tab Marking Method
AMS 2819	Identification, Welding Wire, Direct Color Code System
ARP1876	Weldability Test for Weld Filler Metal Wire
ARP4926	Alloy Verification and Chemical Composition Inspection of Welding Wire

3. TECHNICAL REQUIREMENTS:

3.1 Wire Composition:

Shall conform to the percentages by weight shown in Table 1, determined in accordance with AMS 2355 or MAM 2355.

TABLE 1 - Composition

Element	min	max
Silicon	3.6	4.6
Iron	--	0.8
Copper	--	0.10
Manganese	--	0.05
Magnesium	0.10	0.30
Zinc	--	0.10
Titanium	--	0.15
Beryllium	--	0.0008 (8 ppm)
Other Elements,each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.1 .1 Chemical analysis of initial ingot, bar, or rod stock before drawing is acceptable provided the processes used for drawing or rolling, annealing, and cleaning are controlled to ensure continued conformance to chemical composition requirements, and the facility employs procedures to ensure traceability of wire to the originally analyzed source.

3.2 Condition:

As drawn, in a temper and with a surface finish which will provide proper feeding of the wire in machine welding equipment.

3.3 Fabrication:

3.3.1 Butt welding is permissible provided both ends to be joined are identified by chemical analysis or the repair is made at the wire processing station. The butt weld shall not interfere with uniform, uninterrupted feeding of the wire in machine welding equipment.

3.3.2 Drawing compounds, oxides, dirt, oil, and other foreign materials 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.

3.4 Weldability:

Melted wire shall flow smoothly and evenly during welding and shall produce acceptable welds. ARP1876 may be used to resolve disputes.

3.5 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.

3.6 Sizes and Tolerances:

Wire shall be supplied in the sizes and to the tolerances shown in 3.6.1 and 3.6.2.

3.6.1 Diameter: Shall be as shown in Table 2.

TABLE 2A - Sizes and Diameter Tolerances, Inch/Pound Units

Form	Nominal Diameter Inch	Tolerance Inch Plus	Tolerance Inch Minus
Cut Lengths	0.047, 0.062, 0.079, 0.094, 0.098, 0.125, 0.156, 0.188, 0.197, 0.250	0.003	0.003
Spools	0.030, 0.035, 0.039, 0.047	0.001	0.002
Spools	0.062, 0.079, 0.094, 0.098, 0.125	0.002	0.002

TABLE 2B - Sizes and Diameter Tolerances, SI Units

Form	Nominal Diameter Millimeter	Tolerance Millimeter Plus	Tolerance Millimeter Minus
Cut Lengths	1.19, 1.57, 2.00, 2.39, 2.50, 3.18, 3.96, 4.78, 5.00, 6.35	0.08	0.08
Spools	0.76, 0.89, 1.00, 1.19	0.025	0.05
Spools	1.57, 2.00, 2.39, 2.50, 3.18	0.05	0.05

3.6.2 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, -0.5 inch (-13 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 the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the wire conforms to specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Composition (3.1) and sizes and tolerances (3.6), and alloy verification (5.2) are acceptance tests and shall be performed on each inspection lot.

4.2.2 Periodic Tests: Weldability (3.4) is a periodic test 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, inspection lot number, AMS 4189F, nominal size, and quantity.

4.5 Resampling and Retesting:

Shall be in accordance with AMS 2355 or MAM 2355.

5. PREPARATION FOR DELIVERY:

5.1 Wire:

Wire shall be supplied either on spools in one continuous length for machine welding, or in cut lengths for manual welding, as ordered. Wire on each spool or in each package of cut lengths shall be from the same heat of alloy.

5.1.1 Wire furnished on spools shall be closely wound in layers but adjacent turns within a layer need not be necessarily touching, shall be wound so as to avoid producing kinks, waves, and sharp bends, and shall be free to unwind without restriction caused by overlapping or wedging.

5.2 Alloy Verification:

Wire on each spool or in each package of cut lengths shall be alloy verified by a method acceptable to purchaser. The alloy verification procedures of ARP4926 are recommended.