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| AEROSPACE MATERIAL SPECIFICATION | AMS4189™ | REV. K |
| | Issued 1976-01 Cancelled 2007-08 Revised 2022-04 | |
| Superseding AMS4189J | | |
| Aluminum Alloy Welding Wire 4.1Si - 0.20Mg (4643) (Composition similar to UNS A94643) | | |

RATIONALE

AMS4189K results from a Five-Year Review and update of this specification with changes to prohibit unauthorized exceptions (3.7, 4.4.1, 5.3.1, 8.5), update applicable documents (Section 2, 8.2), and allow the use of the immediate prior specification revision (8.4).

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 International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2355 Quality Assurance, Sampling and Testing, Aluminum Alloys and Magnesium Alloy, Wrought Products (Except Forging Stock), and Rolled, Forged, or Flash Welded Rings

AMS2813 Packaging and Marking of Packages of Welding Wire, Standard Method

AMS2814 Packaging and Marking of Packages of Welding Wire, Premium Quality

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For more information on this standard, visit
<https://www.sae.org/standards/content/AMS4189K/>

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| AMS2816 | Identification, Welding Wire, Tab Marking Method |
| AMS2819 | 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 |
| AS7766 | Terms Used in Aerospace Metals Specifications |

2.2 AWS Publications

Available from American Welding Society, 8669 NW 36 Street, #130, Miami, FL 33166-6672, Tel: 1-800-443-9353 or 305-443-9353, www.aws.org.

A5.10/A5.10M Welding Consumables - Wire Electrodes, Wires and Rods for Welding of Aluminum and Aluminum Alloys - Classification

3. TECHNICAL REQUIREMENTS

3.1 Wire Composition

Shall conform to the percentages by weight shown in Table 1, determined in accordance with AMS2355.

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 only at diameters larger than final finished product size provided both ends to be joined are either alloy verified using a method or methods capable of distinguishing the alloy from all other alloys processed within the facility, 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 shown in Table 2.

Table 2A - Sizes and diameter tolerances, inch/pound units

| Form | Nominal Diameter Inches | Tolerance Inches Plus | Tolerance Inches 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 Millimeters | Tolerance Millimeters Plus | Tolerance Millimeters 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 (+0, -13 mm) from the length ordered.

3.7 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.1.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of wire shall supply all samples for producer'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 producer unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing

Shall be in accordance with AMS2355.

4.4 Reports

The producer of wire shall furnish with each shipment a report stating that the wire conforms to the composition and other technical requirements. This report shall include the purchase order number, inspection lot number, AMS4189K, nominal size, and quantity.

4.4.1 When material produced to this specification is beyond the sizes allowed in the scope or tables, or other exceptions are taken to the technical requirements listed in Section 3, the report shall contain a statement "This material is certified as AMS4189K(EXC) because of the following exceptions," and the specific exceptions shall be listed (see 5.3.1).

4.5 Resampling and Retesting

Shall be in accordance with AMS2355.

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. The outside end of the electrode (the end where welding is to begin) shall be identified so it can be located readily and shall be fastened to avoid unwinding. The winding shall be level winding.

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.

5.2.1 An 8 inch (203 mm) length of wire shall be made accessible at one end of each spool for alloy verification.

5.3 Identification

Shall be by tab marking in accordance with AMS2816 unless color coding in accordance with AMS2819 or other method is specified by purchaser.

5.3.1 When technical exceptions are taken (see 4.4.1), the material shall be identified with AMS4189(EXC).