SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS4398

Issued 2010-10

Magnesium Alloy Welding Wire
8.7Al - 0.70Zn - 0.26Mn (AZ91E)

(Composition similar to UNS M11919)

RATIONALE

AMS4398 is a new specification for magnesium alloy welding wire for composition AZ91E.

1. SCOPE

1.1 Form

This specification covers a magnesium alloy in the form of welding wire.

1.2 Application

This wire has been used typically as filler metal for gas-metal-arc and gas-tungsten-arc welding of magnesium alloys with aluminum as a significant alloying element (particularly those parts requiring consistently high-quality joints), 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 form 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.

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/AMS4398

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 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
ARP1876	Weldability Test for Weld Filler Metal Wire
ARP4926	Alloy Verification and Chemical Composition Inspection of Welding Wire

3. TECHNICAL REQUIREMENTS

3.1 Composition

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

TABLE 1 - COMPOSITION

Element	min	max
Aluminum	8.1	9.3
Zinc	0.40	1.0
Manganese	0.17	0.35
Iron (See 3.1.1)	--	0.005
Silicon	--	0.30
Copper	--	0.030
Nickel	--	0.0010
Other Elements, Each (3.1.2)	--	0.01
Magnesium	remainder	

3.1.1 If iron exceeds 0.005, iron to manganese ratio shall not exceed 0.032, determined using Equation 1.

Example calculation:

$$\frac{0.006 \text{ wt \% Fe}}{0.20 \text{ wt \% Mn}} = 0.030, \text{ which is less than } 0.032 \qquad \text{(Eq.1)}$$

3.1.2 Determination not required for routine acceptance.

3.1.3 Chemical analysis of initial ingot, bar, or rod stock is acceptable provided the processes used for manufacture and cleaning are controlled to ensure conformance to composition requirements, and the facility employs procedures to ensure traceability of wire to the originally analyzed ingot.

3.2 Condition

Wire for cut lengths shall be extruded and for spooled wire shall be extruded and sized.

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 Oxides, dirt, and extruding 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.

3.4 Properties

Wire shall conform to the following requirements:

3.4.1 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 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 conform to the tolerances shown in Table 2.

TABLE 2A - TOLERANCES, INCH-POUND UNITS

Form	Nominal Diameter Inch	Tolerance, Inch plus	Tolerance, Inch minus
Cut Lengths	0.062 to 0.250, incl	0.007	0.007
Spools	0.040 to 0.125, incl	0.003	0.004
	Over0.125 to 0.187, incl	0.007	0.007

TABLE 2B - TOLERANCES, SI UNITS

Form	Nominal Diameter Millimeters	Tolerance, Millimeter plus	Tolerance, Millimeter minus
Cut Lengths	1.57 to 6.25, incl	0.18	0.18
Spools	1.00 to 3.00, incl	0.076	0.10
	Over3.00 to 4.75, incl	0.18	0.18

3.6.2 Length

Cut lengths shall be furnished in 36-inch (914-mm) lengths, or as ordered, and shall not vary more than +0, -1 inch (-25 mm).

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) are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests

Weldability (3.3.1) 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 AMS2355.

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 of this specification. This report shall include the purchase order number, lot number, AMS4398, nominal size, and quantity.

4.5 Resampling and Retesting

Shall be in accordance with AMS2355.

5. PREPARATION FOR DELIVERY

5.1 Wire shall be supplied on spools in one continuous length for machine welding or in cut lengths for manual welding, as ordered.

5.2 Wire on each spool shall be of one continuous length from the same heat of alloy. Packages of cut lengths shall not contain wire from more than one heat of alloy.

5.3 Wire furnished on spools shall be closely wound in layers but adjacent turns within a layer need not necessarily be touching. Wire 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.

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

5.4.1 An 8-inch (203-mm) length of wire shall be made accessible at both ends of each spool for alloy verification.

5.5 Packaging and Marking

Shall be in accordance with AMS2813.

6. ACKNOWLEDGMENT

A vendor shall mention this specification number 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.