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400 Commonwealth Dr., Warrendale, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS 4396C

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Superseding AMS 4396B

MAGNESIUM ALLOY WELDING WIRE
3.3Ce - 2.5Zn - 0.72Zr (EZ33A)

UNS M12330

1. SCOPE:

1.1 Form: This specification covers a magnesium 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 magnesium alloys of similar composition.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications shall apply.

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

2.1.1 Aerospace Material Specifications:

AMS 2355 - Quality Assurance Sampling and Testing of Aluminum and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings
MAM 2355 - Quality Assurance Sampling and Testing of Aluminum 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
AMS 4384 - Magnesium Alloy Sheet and Plate, 3.2Th - 0.70Zr (HK31A-O), Annealed Recrystallized

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
Cerium (Total Rare Earths)	2.5	4.0
Zinc	2.0	3.1
Zirconium, total	0.45	1.0
Zirconium, soluble (3.1.1), (3.1.2)	0.45	--
Other Impurities, total (3.1.2)	--	0.30
Magnesium	remainder	

3.1.1 Soluble zirconium is that portion of zirconium which is soluble in 1:4 hydrochloric acid held below its boiling point.

3.1.2 Determination not required for routine acceptance.

3.2 Condition: Wire for cut lengths shall be extruded and for spooled wire shall be extruded and sized. Wire shall be furnished on disposable spools for machine welding and in cut lengths for manual welding, as ordered.

3.2.1 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.

3.3 Properties: Wire shall conform to the following requirements:

3.3.1 Weldability: Melted wire shall flow smoothly and evenly and shall produce, on panels of AMS 4384 magnesium alloy, a pool of molten metal of uniform appearance and form. Welding of parts by a qualified welding operator shall produce a weld bead of uniform appearance and form, free from oxide, excessive or unacceptable porosity, entrapped slag, and other defects.

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

Form	Nominal Diameter Inch	Tolerance, Inch plus and minus
Cut Lengths	Up to 0.250, incl	0.007
Spools	Up to 0.065, excl	0.003
	0.065 to 0.125, incl	0.004
	Over 0.125 to 0.187, incl	0.007

TABLE I (SI)

Form	Nominal Diameter Millimetres	Tolerance, Millimetre plus and minus
Cut Lengths	Up to 6.25, incl	0.18
Spools	Up to 1.65, excl	0.08
	1.65 to 3.00, incl	0.10
	Over 3.00 to 4.75, incl	0.18

3.5.2 Length: Cut lengths shall be furnished in 36 in. (900 mm) lengths and shall not vary more than +0, -1/2 in. (-12 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 reponsible 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 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 to determine conformance to requirements for composition (3.1) and sizes and tolerances (3.5) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for weldability (3.3.1) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling: Shall be in accordance with AMS 2355 or MAM 2355.

4.4 Reports:

4.4.1 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, AMS 4396C, nominal size, and quantity.

4.4.2 When parts made of this wire or assemblies requiring use of this welding wire are supplied, the part or assembly manufacturer shall inspect each lot of wire to determine conformance to the requirements of this specification and shall furnish with each shipment a report stating that the wire conforms. This report shall include the purchase order number, AMS 4396C, part or assembly number, and quantity.

4.5 Resampling and Retesting: Shall be in accordance with AMS 2355 or MAM 2355.

5. PREPARATION FOR DELIVERY:

5.1 Layer Winding: Wire furnished on spools shall be closely wound in layers but adjacent turns within a layer need not necessarily be 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 spooled wire shall be so treated that it may be readily located. An 8-in. (200-mm) length of wire shall be made accessible at both ends of each spool for alloy verification.

5.2 Wire on each spool shall be of one continuous length from the same heat of alloy. Butt welding is permissible provided both ends to be joined are verified and the weld will not interfere with uniform, uninterrupted feeding of the wire in welding equipment. Packages of cut lengths shall not contain wire from more than one heat of alloy.

5.3 Identification: Wire shall be identified in accordance with AMS 2816 unless identification in accordance with AMS 2815 is specified by purchaser. Tab marking of cut lengths is permissible.

5.3.1 Alloy verification shall be performed by a method agreed upon by purchaser and vendor.

5.4 Packaging and Marking: Shall be in accordance with AMS 2313.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchaser 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: This revision is a five-year editorial update and, therefore, no phi (Ø) symbol has been used to indicate technical changes from the previous issue of this specification.