



# AEROSPACE MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.  
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

## AMS 4396B

Superseding AMS 4396A

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

#### 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 (AMS) shall apply.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

#### 2.1.1 Aerospace Material Specifications:

AMS 2355 - Quality Assurance Sampling and Testing of Aluminum-Base and Magnesium-Base Alloys, Wrought Products (Except Forgings and Forging Stock) and Flash Welded Rings

AMS 2813 - Packing 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-0)

#### 3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined in accordance with AMS 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.

SAE Technical Board rules provide that: "All technical reports, including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade or their use by governmental agencies is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

- 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 internal and external imperfections detrimental to welding operations, operation of welding equipment, or properties of the deposited weld metal.

- 3.5 Sizes and Tolerances: Unless otherwise specified, 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<br>Inch  | Tolerance, Inch<br>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<br>Millimetres | Tolerance, Millimetre<br>plus and minus |
|-------------|---------------------------------|-----------------------------------------|
| Cut lengths | Up to 6.35, incl                | 0.18                                    |
| Spools      | Up to 1.65, excl                | 0.08                                    |
|             | 1.65 to 3.18, incl              | 0.10                                    |
|             | Over 3.18 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. (-13 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 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 such confirmatory testing as he deems 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 tolerances (3.5) are classified as acceptance tests and shall be performed on each lot.