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| AEROSPACE MATERIAL SPECIFICATION | AMS4379™ | REV. A |
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| Superseding AMS4379 | | |
| Aluminum Alloy, Discontinuously Reinforced Extruded Bar, Rod, Wire and Shapes, 2124A/SiC/25p (3 μm) - T1P | | |

RATIONALE

AMS4379A results from a Five-Year Review and update of this specification with changes to prohibit unauthorized exceptions (see 3.4.2.1, 3.6, and 8.6), relocate Definitions (see 2.5), update Applicable Documents (see Section 2 and 3.6), note regarding units (see 8.4) and Ordering Information (see 8.7), and allow use of the immediate prior revision of the specification (see 8.5).

1. SCOPE

1.1 Form

This specification covers a discontinuously reinforced aluminum alloy (DRA) made by mechanical alloying 2124A aluminum powder and silicon carbide (SiC) particulate. It is produced in the form of extruded bar, rod, wire, and shapes with cross section inclusive of 1-inch (25.4-mm) diameter or less (see 8.7).

1.2 Application

These products have been used typically for structural parts requiring high static strength, fatigue strength, and high elastic modulus, but usage is not limited to such applications. Subsequent heat treatment to the T6P/T62P temper is required to increase strength to levels required for service (see 3.4, 3.4.1, and 8.3).

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

AMS2750 Pyrometry

AS7766 Terms Used in Aerospace Metals Specifications

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SAE WEB ADDRESS:

For more information on this standard, visit
<https://www.sae.org/standards/content/AMS4379A/>

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B660 Packaging/Packing of Aluminum and Magnesium Products

ASTM B666/B666M Identification Marking of Aluminum & Magnesium Products

ASTM E8/E8M Tension Testing of Metallic Materials

2.3 ANSI Accredited Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ANSI H35.1/H35.1M Standard Alloy and Temper Designation Systems for Aluminum

ANSI H35.2 Dimensional Tolerances for Aluminum Mill Products

ANSI H35.2M Dimensional Tolerances for Aluminum Mill Products (Metric)

ANSI H35.5 Nomenclature for Aluminum Metal Matrix Composite Materials

2.4 FEPA Publications

Available from the Federation of European Producers of Abrasives, www.fepa-abrasives.org.

FEPA-Standard 42-2 Grains of Fused Aluminum Oxide, Silicon Carbide and Other Abrasive Materials for Bonded Abrasives and for General Industrial Applications Microgrits F230 to F2000

2.5 Definitions

Terms used in AMS are defined in AS7766.

3. TECHNICAL REQUIREMENTS

3.1 Component Materials

3.1.1 Aluminum Matrix Composition

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

Table 1 - 2124A composition

| Element | Min | Max |
|-----------------------|-----------|------|
| Silicon | -- | 0.20 |
| Iron | -- | 0.30 |
| Copper | 3.8 | 4.9 |
| Manganese | 0.30 | 0.9 |
| Magnesium | 1.2 | 1.8 |
| Chromium | -- | 0.10 |
| Zinc | -- | 0.25 |
| Titanium | -- | 0.15 |
| Oxygen | -- | 0.6 |
| Other Elements, each | -- | 0.05 |
| Other Elements, total | -- | 0.15 |
| Aluminum | remainder | |

3.1.2 Reinforcement

Shall consist of silicon carbide (SiC) particulate with mean diameter of 3 μm determined in accordance with F1200 from the FEPA-Standard 42-2.

3.2 Reinforcement Volume Fraction

The content of silicon carbide particulate shall be $25\% \pm 0.5\%$ by volume determined through conversion from measured input weights (refer to ANSI H35.5).

3.2.1 The aluminum matrix alloy and reinforcement particulate shall be mechanically alloyed to produce a uniform distribution of the reinforcement particulate within the resultant discontinuously reinforced aluminum powder.

3.3 Condition

Extruded to a T1P condition (see 8.2, and refer to ANSI H35.1/H35.1M).

3.3.1 Extrusions shall be supplied with an as-extruded surface finish; light polishing to remove minor surface imperfections is permissible provided such imperfections can be removed within the dimensional tolerances.

3.4 Response to T6P/T62P Heat Treatment

Samples taken from the material (see 4.3) shall be solution heat treated followed by a water quench and artificially aged to the T6P/T62P condition. Pyrometry shall be in accordance with AMS2750.

3.4.1 Heat-Treatment Parameters

Solution treatment: $940\text{ }^\circ\text{F} \pm 9\text{ }^\circ\text{F}$ ($505\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$) for 1 hour minimum.

Quench: Water quench.

T6P/T62P artificial age at $302\text{ }^\circ\text{F} \pm 9\text{ }^\circ\text{F}$ ($150\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$) for 1 hour minimum followed by air cool.

3.4.2 Tensile Properties

A sample from a lot shall be heat treated to the T6/T6P condition and shall have the properties shown in Table 2. Tensile properties shall be determined at $75\text{ }^\circ\text{F} \pm 25\text{ }^\circ\text{F}$ ($24\text{ }^\circ\text{C} \pm 14\text{ }^\circ\text{C}$) and tested in accordance with ASTM E8/E8M.

Table 2 - Minimum tensile properties

| Property | Value |
|------------------|------------------|
| Tensile Strength | 91 ksi (627 MPa) |
| Yield Strength | 59 ksi (406 MPa) |
| Elongation in 4D | 3% |

3.4.2.1 Properties for cross-section sizes extruded to greater than 1-inch (25.4-mm) diameter shall be as agreed upon by the purchaser and producer and reported per 4.4.1 (see 8.7).

3.5 Quality

Extrusions, as received by the purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the extrusions.

3.6 Tolerances

Shall conform to all applicable requirements of ANSI H35.2 or ANSI H35.2M unless specified by agreement between the purchaser and producer (see 8.7).

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 extrusions shall supply all samples for the producer's tests and shall be responsible for the performance of all required tests. The purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the extrusions conform to specified requirements.

4.2 Classification of Tests

All technical requirements are acceptance tests and shall be performed on each lot as applicable.

4.3 Sampling and Testing

Shall be performed in accordance with the following: A lot shall consist of rod, bar, wire, or shape manufactured from a specific powder blend and processed at one time through all steps of manufacture. A powder blend is comprised of thoroughly intermingled powders of the same nominal composition.

4.3.1 Tensile Properties

One tensile specimen from any location of a lot.

4.3.1.1 Tensile specimen shall be machined from a sample heat treated to the T6P/T62P condition (see 3.4).

4.4 Reports

The producer of extrusions shall furnish with each shipment a report stating that the extrusions conform to the composition and showing the results of tests to determine conformance to the other acceptance test requirements. This report shall include the purchase order number, lot number, AMS4379A, silicon carbide particulate volume percent, serial number when specified, size, and quantity (see 8.7).

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 (see 5.1.1), the report shall contain a statement "This material is certified as AMS4379A(EXC) because of the following exceptions:" and the specific exceptions shall be listed.

4.5 Resampling and Retesting

If any specimen used in the above test fails to meet the specified requirements, disposition of the product may be based on the results of testing two additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented.

5. PREPARATION FOR DELIVERY

5.1 Identification

Shall be in accordance with ASTM B666/B666M.

5.1.1 When technical exceptions are taken (see 4.4.1), the material shall be marked with AMS4379(EXC).