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# AEROSPACE MATERIALS SPECIFICATION

Submitted for recognition as an American National Standard

## Aluminum-Beryllium Alloy, Sheet and Plate 38Al - 62Be

### 1. SCOPE:

#### 1.1 Form:

This specification covers an aluminum-beryllium alloy in the form of sheet and plate consolidated from powder by extrusion and then rolled.

#### 1.2 Application:

These products have been used typically for parts requiring high thermal conductivity, low density, and high modulus of elasticity, but usage is not limited to such applications.

#### 1.3 Safety - Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

- 1.3.1 **WARNING: Beryllium Alloy:** Inhalation of dust or fumes may cause serious chronic lung disease. Potential cancer hazard based principally on animal tests.

### 2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

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## 2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2806 Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steel and Heat and Corrosion Resistant Steels and Alloys

## 2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B 311 Density Determination for Powder Metallurgy (P/M) Materials Containing Less Than Two Percent Porosity

ASTM E 8 Tension Testing of Metallic Materials

ASTM E 8M Tension Testing of Metallic Materials (Metric)

## 2.3 ANSI Publications:

Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ANSI B46.1 Surface Texture

ANSI H35.2 Dimensional Tolerances for Aluminum Mill Products

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

ANSI Y14.5M Dimensioning and Tolerancing

## 3. TECHNICAL REQUIREMENTS:

## 3.1 Composition:

Shall conform to the percentages by weight shown in Table 1; beryllium shall be determined by wet analysis (titration), oxygen by inert gas fusion, and other elements by spectrochemical methods or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element	min	max
Aluminum (3.1.1)	36.0	40.0
Beryllium	60.0	64.0
Oxygen	--	1.0
Carbon (3.1.2)	--	0.1
Residual Metallic Impurities, each (3.1.2)	--	0.2

3.1.1 Aluminum content by difference.

3.1.2 Not required for routine analysis.

3.2 Condition:

Hot rolled, stress relieved, and ground.

3.2.1 Surface Finish: The product shall be furnished with an as-ground surface. The standard surface finish shall be no greater than 125 microinches Ra (3.2 microns), determined in accordance with ANSI B 46.1.

3.3 Heat Treatment:

Product shall be stress relieved by heating to 1100 °F ± 45 (593 °C ± 25), holding at heat for 24 hours ± 2, and cooling to room temperature.

3.4 Properties:

The product shall conform to the following requirements:

3.4.1 Tensile Properties: In-plane transverse and longitudinal tensile properties shall be as shown in Table 2, determined in accordance with ASTM E 8 or ASTM E 8M.

TABLE 2 - Minimum In-Plane Tensile Properties

Property	Value
Tensile Strength	56.0 ksi (386 MPa)
0.2% Offset Yield Strength	40.0 ksi (276 MPa)
Elongation	5.0%

3.4.1.1 Properties for plate shall be as agreed upon between purchaser and vendor.

3.4.2 Density: Starting stock for rolling shall be within the range 2.071 to 2.122 grams per cubic centimeter (0.0748 to 0.0767 pound per cubic inch), determined using a water displacement method in accordance with ASTM B 311.

3.5 Quality:

The product, as received by purchaser, shall be uniform in quality and condition and shall be free from imperfections detrimental to usage.

## 3.6 Tolerances:

Shall conform to the dimensional tolerances shown in Table 3 unless otherwise specified by agreement between purchaser and supplier (See 8.1).

## 3.6.1 Width and/or Length:

TABLE 3A - Width and/or Length Tolerances, Inch/Pound Units

Width and/or Length, Inches	Tolerances, Inch
Up to 20, incl	-0,+0.125
Over 20	-0,+0.250

TABLE 3B - Width and/or Length Tolerances, SI Units

Width and/or Length, mm	Tolerances, mm
Up to 508, incl	-0,+3.175
Over 508	-0,+6.350

## 3.6.2 Thickness Tolerances:

TABLE 4A - Thickness Tolerances, Inch/Pound Units

Thickness, Inch	Tolerances, Inch
0.020 to 0.025, incl	$\pm 0.003$
Over 0.025 to 0.034, incl	$\pm 0.004$
Over 0.034 to 0.056, incl	$\pm 0.005$
Over 0.056	$\pm 0.006$

TABLE 4B - Thickness Tolerances, SI Units

Thickness, mm	Tolerances, mm
0.508 to 0.635, incl	$\pm 0.076$
Over 0.635 to 0.864, incl	$\pm 0.102$
Over 0.864 to 1.422, incl	$\pm 0.127$
Over 1.422	$\pm 0.152$

- 3.6.2.1 Thickness measurements on any plate 1.0 inch (25 mm) and over in width shall not be conducted within 0.250 inch (6.35 mm) from any edge. There shall be no restriction of thickness measurement location for sheet or plate under 1.0 inch (25.4 mm) wide.
- 3.6.3 Flatness: Shall be as shown in Table 5, determined at room temperature in accordance with methods described in ANSI H35.2 or ANSI H35.2M. Measurements will not be made within 0.250 inch (6.35 mm) from any edge on components under 12 x 12 inches (305 x 305 mm).

TABLE 5A - Flatness Tolerances, Inch/Pound Units

	Tolerances Ranges of Distance from Center to Center of Buckles or Edgewaves	Tolerances Ranges of Distance from Center to Center of Buckles or Edgewaves	Tolerances Ranges of Distance from Center to Center of Buckles or Edgewaves	Tolerances Ranges of Distance from Center to Center of Buckles or Edgewaves	Tolerances Ranges of Distance from Center to Center of Buckles or Edgewaves
Specified Thickness	Up to 2 feet, inclusive	Over 2 to 3 feet, inclusive	Over 3 to 4 feet, inclusive	Over 4 to 6 feet, inclusive	Over 6 feet
0.020 to 0.064 inch, inclusive	0.1875 inch	0.1875 inch	0.3125 inch	0.375 inch	0.500 inch
Over 0.064 to 0.250 inch, inclusive	0.1875 inch	0.3125 inch	0.375 inch	0.500 inch	0.5625 inch
Over 0.250 inch	0.250 inch in any 6 feet or less				

TABLE 5B - Flatness Tolerances, SI Units

	Tolerances Ranges of Distance from Center to Center of Buckles or Edgewaves	Tolerances Ranges of Distance from Center to Center of Buckles or Edgewaves	Tolerances Ranges of Distance from Center to Center of Buckles or Edgewaves	Tolerances Ranges of Distance from Center to Center of Buckles or Edgewaves	Tolerances Ranges of Distance from Center to Center of Buckles or Edgewaves
Specified Thickness	Up to 0.61 m, inclusive	Over 0.61 to 0.91 m, inclusive	Over 0.91 to 1.22 m, inclusive	Over 1.22 to 1.83 m, inclusive	Over 1.83 m
0.508 to 1.626 mm, inclusive	4.76 mm	4.76 mm	7.94 mm	9.53 mm	12.70 mm
Over 1.626 to 6.35 mm, inclusive	4.76 mm	7.94 mm	9.53 mm	12.70 mm	14.29 mm
Over 6.35 mm	6.35 mm in any 1.83 m or less				

#### 4. QUALITY ASSURANCE PROVISIONS:

##### 4.1 Responsibility for Inspection:

The vendor of the product 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 product conforms to specified requirements.

##### 4.2 Classification of Tests:

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

##### 4.3 Sampling and Testing:

Shall be in accordance with the following: a lot shall be all sheet or plate manufactured from a specific powder blend and rolling session in the same condition. Mechanical properties may be determined from a sample shape (component) or from material produced as an integral part of a shape (component) from the lot.

4.3.1 Composition: One or more samples from each powder blend. Chemical analysis shall be performed on a powder blend basis.

4.3.2 Tensile Properties: One or more sheet tensile specimens from each lot at any location.

4.3.3 Dimensions: Each part, unless a sampling plan has been agreed upon by purchaser and vendor.

##### 4.4 Reports:

The vendor of the product shall furnish with each shipment a report showing the results of tests for chemical composition and tensile properties of each lot. This report shall include the purchase order number, lot number, powder blend number, AMS 7913, serial numbers, and quantity.

##### 4.5 Resampling and Retesting:

If a valid test on any specimen, used in testing herein, fails to meet specified requirements, disposition of the product may be based on the results of testing two additional specimens for each nonconforming specimen except that, unless prohibited by purchaser, producer may rework and/or reheat treat the product and retest. Upon retesting, failure of any retest specimen to meet specified requirements shall be cause for rejection of the product represented. Results of all tests shall be reported.

4.5.1 Resubmittal of Rejected Lots: Lots rejected for failure to meet specified requirements may be submitted for retesting provided the producer has reworked the lots as necessary to correct the deficiencies or when 100% inspection confirms removal of nonconforming details.