



AEROSPACE MATERIAL SPECIFICATION

AMS7033™

Issued

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Aluminum Alloy Powder 4.6Cu - 3.4Ti - 1.4B - 0.75Ag - 0.27Mg

(Compositions similar to 2A05.50, 2A05.51)

RATIONALE

To provide the technical requirements for procurement of A205 powder feed stock materials, for all powder bed and directed energy deposition processes, used in the additive manufacturing of aerospace parts.

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of pre-alloyed powder.

1.2 Application

This powder has been used typically in additive manufacturing of components requiring high strength at room temperature, and moderate strength at high temperature but usage is not limited to such applications.

1.3 Classification

Powder size and maximum oxygen concentration is specified as follows:

Class A: 20 to 63 μm , maximum oxygen concentration of 0.10% (1000 ppm).

Class B: 15 to 53 μm , maximum oxygen concentration of 0.15% (1500 ppm).

Class C: 10 to 90 μm , maximum oxygen concentration of 0.15% (1500 ppm).

Class D: 20 to 90 μm , maximum oxygen concentration of 0.10% (1000 ppm).

Class E: 45 to 150 μm , maximum oxygen concentration of 0.10% (1000 ppm).

1.4 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 that 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.

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

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Documents

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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.

AMS7002 Process Requirements for Production of Metal Powder Feedstock for Use in Additive Manufacturing of Aerospace Parts

ARP1917 Clarification of Terms Used in Aerospace Metals Specifications

2.2 U.S. Government Publications

Copies of these documents are available online at <https://quicksearch.dla.mil>.

MIL-PRF-23950 Aluminum Powder, Spherical

2.3 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 B212 Apparent Density of Free-Flowing Metal Powders Using the Hall Flowmeter

ASTM B214 Sieve Analysis of Granular Metal Powders

ASTM B243 Standard Terminology of Powder Metallurgy

ASTM B329 Standard Test Method for Apparent Density of Metal Powders and Compounds Using the Scott Volumeter

ASTM B417 Standard Test Method for Apparent Density of Non-Free-Flowing Metal Powders Using the Carney Funnel

ASTM B703 Standard Test Method for Apparent Density of Metal Powders and Related Compounds Using the Arnold Meter

ASTM B822 Particle Size Determination of Metal Powders by Light Scattering

ASTM D1533 Test Method for Water in Insulating Liquids by Coulometric Karl Fischer Titration

ASTM D4928 Test Method for Water in Crude Oils by Coulometric Karl Fischer Titration

ASTM D6304 Test Method for Determination of Water in Petroleum Products, Lubricating Oils, and Additives by Coulometric Karl Fisher Titration

ASTM D6869 Test Method for Coulometric Determination of Moisture in Plastics using the Karl Fischer Reaction

ASTM E203 Standard Test Method for Water Using Volumetric Karl Fischer Titration

ASTM E1019 Determination of Carbon, Sulfur, Nitrogen and Oxygen in Steel, Iron, Nickel, and Cobalt Alloys by Various Combustion and Fusion Techniques

ASTM E1064 Test Method for Water in Organic Liquids by Coulometric Karl Fischer Titration

ASTM E1251 Standard Test Method for Analysis of Aluminum and Aluminum Alloys by Spark Atomic Emission Spectrometry

ASTM E1409	Standard Test Method for Determination of Oxygen and Nitrogen in Titanium and Titanium Alloys by Inert Gas Fusion
ASTM E1447	Standard Test Method for Determination of Hydrogen in Titanium and Titanium Alloys by Inert Gas Fusion Thermal Conductivity/Infrared Detection Method
ASTM E2792	Standard Test Method for Determination of Hydrogen in Aluminum and Aluminum Alloys by Inert Gas Fusion
ASTM E3061	Standard Test Method for Analysis of Aluminum and Aluminum Alloys by Inductively Coupled Plasma Atomic Emission Spectrometry
ISO/ASTM 52900	Additive manufacturing – General principles – Terminology

2.4 ISO Publications

Available from International Organization for Standardization, ISO Central Secretariat, 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, Tel: +41 22 749 01 11, www.iso.org.

ISO 13322-2 Particle size analysis — Image analysis methods — Part 2: Dynamic image analysis methods

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Tables 1 and 2, determined by chemical analysis in accordance with ASTM E1251, ASTM E3061, or by other analytical methods acceptable to the purchaser.

Table 1 - Composition

Element	Min	Max
Copper	4.20	5.00
Silver	0.60	0.90
Magnesium	0.20	0.33
Iron	-	0.08
Titanium	3.00	3.85
Boron	1.25	1.55
Silicon	-	0.10
Potassium	-	0.08
Oxygen	-	see Table 2
Other Elements, each (3.1.1, 8.6)	-	0.08
Other Elements, total (3.1.1, 8.6)	-	0.17
Aluminum		remainder

3.1.1 Other Elements

Determination not required for routine acceptance with the exception of Ni, Ca, V, Li, and P (see 8.13), which shall be measured but reported collectively, with any other measured elements, as "Other Elements, total."

3.1.2 Interstitial Gases

Shall conform to the percentages by weight shown in Table 2, determined by a test method or methods approved by CEO (see 8.7.1). (See 8.7.1.1 for discussion on the recognized gap for hydrogen limits.)