



AEROSPACE MATERIAL SPECIFICATION

AMS7015™

Issued

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Titanium 6-Aluminum 4-Vanadium Powder for Additive Manufacturing
(Compositions similar to UNS R56400)

RATIONALE

This SAE Aerospace Material Specification is intended to provide the technical requirements such as alloy composition for Ti-6Al-4V feedstock materials for use in additive manufacturing processes. No such specification currently exists.

1. SCOPE

1.1 Form

This specification covers a titanium alloy in the form of pre-alloyed powder.

1.2 Application

This powder is intended to be used for the additive manufacturing of lightweight aerospace parts, but usage is not limited to such applications.

1.3 Classification

Class A: Standard interstitial content

Class B: Lower interstitial content

Class C: Higher aluminum content (see 8.15)

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 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.

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Full document details: SAE AMS7015

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Documents
Document Sharing Hub

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.

AMS2249	Chemical Check Analysis Limits Titanium and Titanium Alloys
AMS7002	Process Requirements for Production of Metal Powder Feedstock for Use in Additive Manufacturing of Aerospace Parts
AMS7025	Metal Powder Feedstock Size Classifications
AS7766	Terms Used in Aerospace Metals Specifications

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 B212	Apparent Density of Free-Flowing Metal Powders Using the Hall Flowmeter
ASTM B213	Flow Rate of Metal Powders Using the Hall Flowmeter
ASTM B417	Standard Test Method for Apparent Density of Non-Free-Flowing Metal Powders Using the Carney Funnel
ASTM B527	Standard Test Method for Tap Density of Metal Powders and Compounds ASTM B822 Particle Size Determination of Metal Powders by Light Scattering
ASTM E539	Standard Test Method for Analysis of Titanium Alloys by X-Ray Fluorescence 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 E1941	Standard Test Method for Determination of Carbon in Refractory and Reactive Metals and Their Alloys by Combustion Analysis
ASTM E2371	Standard Test Method for Analysis of Titanium and Titanium Alloys by Direct Current Plasma and Inductively Coupled Plasma Atomic Emission Spectrometry (Performance-Based Test Methodology)
ISO/ASTM 52900	Additive Manufacturing - General Principles - Terminology

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Tables 1, 2, 3, and 4. Carbon shall be determined in accordance with ASTM E1941, hydrogen in accordance with ASTM E1447, oxygen and nitrogen in accordance with ASTM E1409 and other elements in accordance with ASTM E539, ASTM E2371, or by other analytical methods authorized by the CEO.

Table 1 - Composition

	Min	Max
Aluminum	See Table 2	
Vanadium	3.50	4.50
Iron	-	0.30
Oxygen	See Table 3	
Carbon	-	0.08
Nitrogen	See Table 4	
Hydrogen (3.1.2)	-	0.015
Yttrium	-	0.005
Other Elements, each (3.1.1)	-	0.10
Other Elements, total (3.1.1)	-	0.40
Titanium	remainder	

Table 2 - Aluminum limits based on powder classification

Class	Min	Max
A, B	5.50	6.75
C	6.00	6.75

Table 3 - Oxygen limits based on powder classification

Class	Min	Max
A, C	0.11	0.20
B	0.11	0.18

Table 4 - Nitrogen limits based on powder classification

Class	Min	Max
A, C	-	0.05
B	-	0.03

3.1.1 Determination not required for routine acceptance with the exception of B, Co, Cr, Cu, Mn, Mo, Nb, Ni, Si, Sn, W, Zr (see 8.14), which shall be measured but reported collectively, with any other measured elements, as "Other Elements, total."

3.1.2 When performing hydrogen analysis per ASTM E1447, the sample size shall be 0.35 gram maximum.

3.1.3 Check Analysis

Composition variations shall meet the applicable requirements of AMS2249.

3.2 Powder Production

Powder shall be manufactured in accordance with AMS7002, with the additional requirements defined in 3.2.1.

3.2.1 Melting

Metal shall be melted in an enclosed vessel under vacuum, argon, or helium gas atmosphere. An argon, or helium gas backfill after pulling vacuum is permissible. Air melting under a cover gas is not permitted. Only argon and/or helium gas (see note 8.13) shall be used for liquid metal atomization or powder spheroidization.

3.3 Particle Size Distribution (PSD)

The particle size distribution shall be in accordance with the fine and coarse tolerances or limits for the Metal Powder Feedstock Size Class, per AMS7025, specified in the purchase documents (see 8.3).