



AEROSPACE MATERIAL SPECIFICATION

AMS4992™**REV. D**Issued 2002-10
Revised 2023-08

Superseding AMS4992C

Casting, Structural Investment, Titanium Alloy 6Al - 4V
Hot Isostatically Pressed
(Composition similar to UNS R56401)

RATIONALE

AMS4992D results from a Five-Year Review and update of this specification with changes to update general agreement language related to unauthorized exceptions (8.6), relocate Definitions (2.3), update Applicable Documents (Section 2), Thermal Processing (3.5), and allow the use of the immediate prior specification revision (8.5).

1. SCOPE

1.1 Form

This specification covers titanium Ti 6Al-4V alloy in the form of investment castings.

1.2 Application

These castings have been used typically for structurally cast components requiring a combination of good strength-to-weight ratio and corrosion resistance, but usage is not limited to such applications.

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.

AMS2175	Castings, Classification and Inspection of
AMS2249	Chemical Check Analysis Limits, Titanium and Titanium Alloys
AMS2694	In-Process Welding of Castings
AMS2750	Pyrometry

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SAE WEB ADDRESS:

Full document details: SAE AMS4992D

For more information on this standard, visit
<https://www.sae.org/standards/content/AMS4992D>

Documents
Document Sharing Hub

AMS2804 Identification, Castings

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 B600 Descaling and Cleaning Titanium and Titanium-Alloy Surfaces

ASTM E8/E8M Tension Testing of Metallic Materials

ASTM E539 Analysis of Titanium Alloys by Wavelength Dispersive X-Ray Fluorescence Spectrometry

ASTM E1320 Reference Radiographs for Titanium Castings

ASTM E1409 Determination of Oxygen and Nitrogen in Titanium and Titanium Alloys by Inert Gas Fusion

ASTM E1417 Liquid Penetrant Testing

ASTM E1447 Determination of Hydrogen in Reactive Metals and Reactive Metal Alloys by Inert Gas Fusion with Detection by Thermal Conductivity or Infrared Spectrometry

ASTM E1742 Radiographic Examination

ASTM E1941 Determination of Carbon in Refractory and Reactive Metals and Their Alloys by Combustion Analysis

ASTM E2371 Analysis of Titanium and Titanium Alloys by Direct Current Plasma and Inductively Coupled Atomic Emission Spectrometry (Performance-Based Test Methodology)

ASTM E2994 Analysis of Titanium and Titanium Alloys by Spark Atomic Emission Spectrometry and Glow Discharge Atomic Emission Spectrometry (Performance-Based Method)

2.3 Definitions

Terms used in this AMS are clarified in AS7766 and as follows:

2.3.1 ACCEPTABLE TO THE PURCHASER

Does not require prior written approval from the purchaser but allows the producer to make a decision and the purchaser the right to disapprove the decision.

2.3.2 PURCHASER

The cognizant engineering organization responsible for casting design and fitness for use, or the designee of this engineering organization.

2.3.3 REMELT

All castings poured from a single furnace charge. Also referred to as melt, submelt, heat, or subheat.

2.3.4 AUTHORIZED BY THE PURCHASER

Requires prior written approval from the purchaser.

2.3.5 INTEGRALLY CAST SPECIMEN

An attached specimen that is cast in the mold and remains with the casting lot through the completion of all hot isostatic pressing and annealing operation(s) required by the producer. The casting drawing may identify a specific location for the attachment of each integrally cast specimen.

2.3.6 AGREED UPON BY THE PURCHASER AND PRODUCER

Requires concurrence of both the purchaser and producer; such concurrence is typically documented by way of the casting drawing, purchase order, or other engineering documentation.

2.3.7 SPECIFIED

Requires documented instruction from the purchaser through casting drawing, purchase order, specification, or other engineering documentation.

2.3.8 LOT

For room temperature tensile testing, a lot shall consist of all castings of the same part number, poured from a single master heat in one or more consecutive remelts through a furnace campaign of no longer than 12 hours and processed in a batch through each hot isostatic pressing and anneal treatment, as applicable. For hydrogen testing, a lot shall consist of all castings processed as a batch through hot isostatic pressing only, or through final anneal heat treat in inert atmosphere. For visual and nondestructive testing, an inspection lot shall consist of castings of the same part number, manufactured under the same process control parameters of 4.4.2.2.

2.3.9 CHEMICAL CLEANING

Includes processing using nitric, hydrofluoric, or nitric/hydrofluoric acid solutions where material removal exceeds 0.0004 inch (0.010 mm). This will typically exclude pickling prior to fluorescent penetrant inspection.

2.3.10 CONDITIONS OF MANUFACTURE AND INSPECTION

Producer records which document completion and conformance to the producer's procedures for control factors of 4.4.2.2, including traceability to master heat, thermal batch, sampling, and testing.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1; 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 ASTM E2994. Other analytical methods may be used if acceptable to the purchaser.

Table 1 - Composition

Element	Min	Max
Aluminum	5.50	6.75
Vanadium	3.50	4.50
Iron	--	0.30
Oxygen	0.15	0.20
Carbon	--	0.10
Nitrogen	--	0.05 (500 ppm)
Hydrogen	--	0.015 (150 ppm)
Yttrium (3.1.1)	--	0.005 (50 ppm)
Other Elements, each (3.1.1)	--	0.10
Other Elements, total (3.1.1)	--	0.40
Titanium	remainder	

