



AEROSPACE MATERIAL SPECIFICATION

AMS4962™**REV. B**

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Superseding AMS4962A

Titanium Alloy, Investment Castings
6Al - 4V
Hot Isostatically Pressed

RATIONALE

AMS4962B is stabilized as there are not any users of the document.

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1. SCOPE:

1.1 Form:

This specification covers a premium grade titanium alloy in the form of investment castings.

1.2 Application:

These castings have been used typically for parts of intricate design requiring a combination of good strength-to-weight ratio and corrosion resistance up to 550 °F (288 °C), but usage is not limited to such applications.

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.

2.1 SAE Publications:

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

AMS 2249	Chemical Check Analysis Limits, Titanium and Titanium Alloys
AMS 2694	Repair Welding, of Aerospace Castings
AMS 2750	Pyrometry
AMS 2804	Identification, Castings

2.2 ASTM Publications:

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

ASTM E 8	Tension Testing of Metallic Materials
ASTM E 8M	Tension Testing of Metallic Materials (Metric)
ASTM E 120	Chemical Analysis of Titanium and Titanium Alloys
ASTM E 1320	Reference Radiographs for Titanium Castings
ASTM E 1409	Determination of Oxygen in Titanium and Titanium Alloys by the Inert Gas Fusion Techniques
ASTM E 1417	Liquid Penetrant Examination
ASTM E 1447	Determination of Hydrogen in Titanium and Titanium Alloys by the Inert Gas Fusion Thermal Conductivity Method
ASTM E 1742	Radiographic Examination

2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

AMS-H-81200B Heat Treatment of Titanium and Titanium Alloys
AMS-STD-2175 Castings, Classification and Inspection of

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Castings shall conform to the percentages by weight shown in Table 1. Oxygen shall be determined in accordance with ASTM E 1409; hydrogen in accordance with ASTM E 1447 (See 3.1.3), and other elements by wet chemical methods in accordance with ASTM E 120, by spectrochemical methods, or by other analytical methods acceptable to purchaser (See 8.1.2).

TABLE 1 - Composition

Element	min	max
Aluminum	5.75	6.50
Vanadium	3.60	4.50
Oxygen	0.13	0.17
Nitrogen	0.01	0.03 (100 ppm to 300 ppm)
Iron	--	0.25
Carbon	--	0.07
Yttrium	--	0.005 (50 ppm)
Hydrogen	--	0.01 (100 ppm)
Residual Elements, each (3.1.1)	--	0.10
Residual Elements, total (3.1.1)	--	0.40
Titanium	remainder	

3.1.1 Determination not required for routine acceptance.

3.1.2 Check Analysis: Compositional variations shall meet the requirements of AMS 2249.

3.1.3 Sample size when using ASTM E 1447 may be as large as 0.35 gram.

3.2 Melting Practice:

3.2.1 Castings and specimens shall be poured, at the casting vendor's facility, either from a remelt of a master heat or directly from a master heat.

- 3.2.1.1 Remelt for Casting: The metal for castings and specimens shall be remelted and poured under inert gas pressure in accordance with 3.2.3 or under vacuum without loss of vacuum between melting and pouring.
- 3.2.1.2 If authorized by purchaser, portions of two or more qualified master heats may be remelted together and poured into castings using a procedure acceptable to purchaser.
- 3.2.1.3 Remelt for casting shall be performed using consumable electrode practice or other method authorized by purchaser.
- 3.2.1.4 The atmosphere for nonconsumable electrode melting shall be vacuum or shall be argon and/or helium at an absolute pressure not higher than 1000 mm of mercury.
- 3.2.1.5 The electrode tip for nonconsumable electrode melting shall be water-cooled copper.
- 3.2.2 Portions of two or more qualified master heats may be melted together and poured into castings using a procedure authorized by purchaser (See 8.1.6).
- 3.2.3 Casting shall be poured under vacuum, or under partial inert gas pressure (See 3.2.1) without loss of vacuum or atmosphere control between melting and pouring.
- 3.2.4 Vendor shall have a written procedure, approved by purchaser (See 8.1.6) in accordance with 4.4, which defines the process control factors, tests, and traceability criteria for castings. All production castings shall be poured at the vendor's facility in accordance with the written procedure. Changes to the written procedure shall be made only as approved by purchaser in accordance with 4.4.
- 3.2.5 Revert (gates, sprues, risers, and rejected castings) may be used in the preparation of master heats.

3.3 Condition:

Castings shall be furnished in the hot isostatically pressed (HIP) condition (See 3.5).

3.4 Test Specimens:

- 3.4.1 Chemical Analysis Specimens: Shall be removed from castings, casting prolongations, or gating as required to determine conformance to 3.1 for each casting lot or master heat as applicable (See 4.3). Specimens shall be of any convenient size and shape suitable for the methods of analysis. HIP processing shall be completed prior to removing specimens for analysis for oxygen, nitrogen, and hydrogen. Chemical or electrochemical processing, if used, shall be completed prior to removal of specimens for hydrogen analysis.
- 3.4.2 Tensile Specimens: Shall be removed from castings as required to determine conformance to 3.6 for each casting lot (See 4.3). Specimens shall be machined or cast to standard proportions in accordance with ASTM E 8 or ASTM E 8M. Where ASTM E 8M is used, the gage length shall be equal to four times the nominal diameter of the reduced section of the tensile specimen.