AEROSPACE MATERIAL SPECIFICATION

AMS6930™	REV. G
Issued 2004-01 Revised 2022-08 Superseding AMS6930F	

Titanium Alloy Bars, Forgings and Forging Stock
6.0Al - 4.0V
Solution Heat Treated and Aged
(Composition similar to UNS R56400)

RATIONALE

AMS6930G results from a Five-Year Review and update of this specification with changes to update wording to prohibit unauthorized exceptions (3.5.1.1.5, 8.5), relocate definitions (2.3) and information regarding data and statistical analysis (3.5.1.1.6), update applicable documents (Section 2), metric conversions (Tables 2 and 3), and ordering information (8.6).

1. SCOPE

1.1 Form

This specification covers a titanium alloy in the form of round, hexagon and square bars and forgings up through 3.000 inches (76.20 mm), inclusive, rectangular bar and forgings of thickness up through 4.000 inches (101.60 mm), inclusive, and forging stock of any size (see 8.6).

1.2 Application

These products have been used typically for parts that are machined after solution heat treatment and aging and are suitable for parts requiring high strength-to-weight ratios up to moderately elevated temperatures, but usage is not limited to such applications.

1.2.1 Certain processing procedures and service conditions may cause these products to become subject to stress-corrosion cracking; ARP982 recommends practices to minimize such conditions.

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.

AMS2241 Tolerances, Corrosion- and Heat-Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire

AMS2249 Chemical Check Analysis Limits, Titanium and Titanium Alloys

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS6930G/

AMS2368 Sampling and Testing of Wrought Titanium Raw Material, Except Forgings and Forging Stock

AMS2631 Ultrasonic Inspection, Titanium and Titanium Alloy Bar and Billet

AMS2643 Structural Examination of Titanium Alloys, Chemical Etch Inspection Procedure

AMS2750 Pyrometry

AMS2808 Identification, Forgings

AMS2809 Identification, Titanium and Titanium Alloy Wrought Products

ARP982 Minimizing Stress-Corrosion Cracking in Wrought Titanium Alloy Products

AS1814 Terminology for Titanium Microstructures

AS6279 Industry Standard Practices for Production, Distribution, and Procurement of Metal Stock

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 E8/E8M Tension Testing of Metallic Materials

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

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

ASTM E1447 Determination of Hydrogen in Titanium and Titanium Alloys by Inert Gas Fusion Thermal Conductivity/Infrared Detection Method

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 Plasma 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 AMS are defined in AS7766.

2.3.1 Terminology relating to titanium microstructures is presented in AS1814.

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	--	0.20	
Carbon	--	0.08	
Nitrogen	--	0.05	(500 ppm)
Hydrogen	--	0.0125	(125 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		

3.1.1 Determination not required for routine acceptance.

3.1.2 Check Analysis

Composition variations shall meet the applicable requirements of AMS2249.

3.2 Melting Practice

Alloy shall be multiple melted. The first melt shall be made by vacuum consumable electrode, nonconsumable electrode, electron beam cold hearth, or plasma arc cold hearth melting practice. The subsequent melt or melts shall be made using vacuum arc remelting (VAR) practice. Alloy additions are not permitted in the final melt cycle.

3.2.1 The atmosphere for nonconsumable electrode melting shall be vacuum or shall be argon or helium at an absolute pressure not higher than 1000 mm of mercury.

3.2.2 The electrode tip for nonconsumable electrode melting shall be water-cooled copper.

3.3 Condition

The product shall be supplied in the following condition:

3.3.1 Bars

Hot finished with or without subsequent cold reduction, solution heat treated, aged, and descaled. A machined or ground surface is permitted unless prohibited by the purchaser. The product shall be processed to the final thickness/diameter by metallurgical working operations prior to any straightening, dimensional sizing or surface finishing operations. Bar shall not be cut from plate.

3.3.2 Forgings

Solution heat treated, aged, and descaled.

3.3.3 Stock for Forging

As ordered by the forging manufacturer (see 8.6).

3.4 Heat Treatment

Bars and forgings shall be solution heat treated and aged by heating in a suitable atmosphere to 1750 °F ± 25 °F (954 °C ± 14 °C), holding at heat for 1 to 2 hours, and quenching in agitated water, and aged by heating to a temperature within the range 900 to 1150 °F (482 to 621 °C), holding at the selected temperature within ±15 °F (±8 °C) for 4 to 8 hours, and cooling in air. Pyrometry shall be in accordance with AMS2750.