AEROSPACE MATERIAL SPECIFICATION

AMS4922™	REV. D

Issued 1990-10
Reaffirmed 2017-04
Revised 2022-07

Superseding AMS4922C

Titanium Alloy, Seamless, Hydraulic Tubing
15V - 3.0Cr - 3.0Al - 3.0Sn
Cold Worked and Precipitation Heat Treated
(Composition similar to UNS R58153)

RATIONALE

AMS4922D results from a Five-Year Review and update of this specification. Changes have been made to prohibit unauthorized exceptions (3.7, 4.5.1, 5.1, 8.5), update applicable documents (Section 2, 3.5.1.1), nondestructive testing (3.5.1, 4.3.7, 8.3), tolerances (3.6.1.1), and ordering information (8.7), and allow use of immediate prior specification revision (8.6).

1. SCOPE

1.1 Form

This specification covers a titanium alloy in the form of seamless tubing.

1.2 Application

This tubing has been used typically for parts, such as high-pressure hydraulic lines, requiring high strength and oxidation resistance up to 550 °F (288 °C) and weldability, 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.

AMS2244 Tolerances, Titanium and Titanium Alloy Tubing

AMS2249 Chemical Check Analysis Limits, Titanium and Titanium Alloys

AMS2634 Ultrasonic Inspection, Thin Wall Metal Tubing

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/PRODCODE/

AMS2750 Pyrometry

AMS2809 Identification, Titanium and Titanium Alloy Wrought Products

AS7766 Terms Used in Aerospace Metals Specifications

AS33611 Tube Bend Radii

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 E384 Microindentation Hardness of Materials

ASTM E426 Electromagnetic (Eddy Current) Examination of Seamless and Welded Tubular Products, Titanium, Austenitic Stainless Steel and Similar Alloys

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

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

2.3 ASME Publications

Available from ASME, P.O. Box 2900, 22 Law Drive, Fairfield, NJ 07007-2900, Tel: 800-843-2763 (U.S./Canada), 001-800-843-2763 (Mexico), 973-882-1170 (outside North America), www.asme.org.

ASME B46.1 Surface Texture

2.4 Definitions

Terms used in AMS are defined in AS7766.

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 E2371. Other analytical methods may be used if acceptable to the purchaser.

Table 1 - Composition

Element	Min	Max
Vanadium	14.0	16.0
Chromium	2.5	3.5
Aluminum	2.5	3.5
Tin	2.5	3.5
Iron	--	0.25
Carbon	--	0.05
Oxygen	--	0.13
Nitrogen	--	0.050 (500 ppm)
Hydrogen	--	0.015 (150 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. Melting cycle(s) prior to the final melting cycle shall be made using vacuum consumable electrode, nonconsumable electrode, electron beam cold hearth, or plasma arc cold hearth melting practice(s). The final melting cycle shall be made under vacuum using vacuum arc remelting (VAR) practice with no alloy additions permitted.

3.2.1 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.

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

3.3 Condition and Heat Treatment

Cold worked and precipitation heat treated by heating to a temperature within the range 900 to 1250 °F (482 to 677 °C) and holding at the selected temperature within ±25 °F (±14 °C) for not less than 2 hours. Pyrometry shall be in accordance with AMS2750.

3.4 Properties

Tubing shall conform to the following requirements:

3.4.1 Tensile Properties

Shall be as shown in Table 2, determined in accordance with ASTM E8/E8M with the rate of strain set at 0.005 in/in/min (0.005 mm/mm/min) and maintained within a tolerance of ±0.002 in/in/min (±0.002 mm/mm/min) through the 0.2% offset yield strain.

Table 2 - Minimum tensile properties

Property	Value
Tensile Strength	135 ksi (931 MPa)
Yield Strength at 0.2% Offset	125 ksi (862 MPa)
Elongation in 2 Inches (50.8 mm)	
Nominal Wall Thickness	
Up to 0.020 Inch (0.51 mm), incl	10%
Over 0.020 Inch (0.51 mm)	12%