AEROSPACE MATERIAL SPECIFICATION

AMS4914™	REV. H

Issued 1984-04
Revised 2022-11

Superseding AMS4914G

Titanium Alloy, Cold Rolled Sheet and Strip
15V - 3Al - 3Cr - 3Sn
Solution Heat Treated
(Composition similar to UNS R58153)

RATIONALE

AMS4914H results from a Five-Year Review and update of this specification with changes to update wording to prohibit unauthorized exceptions (3.5.1.1.1, 3.5.2.1.1, 8.5), relocate definitions (2.3), and update applicable documents (Section 2).

1. SCOPE

1.1 Form

This specification covers a titanium alloy in the form of sheet and strip up to and including 0.125 inch (3.18 mm) in nominal thickness.

1.2 Application

These products have been used typically in applications requiring high strength-to-weight ratio and stability up to 550 °F (288 °C), but usage is not limited to such applications. Parts are typically formed in the solution heat treated condition and subsequently precipitation heat treated to final condition.

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.

AMS2242	Tolerances, Corrosion- and Heat-Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Sheet, Strip, and Plate
AMS2249	Chemical Check Analysis Limits, Titanium and Titanium Alloys
AMS2368	Sampling and Testing of Wrought Titanium Raw Materials, Except Forgings and Forging Stock

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/AMS4914H/

AMS2750	Pyrometry
AMS2801	Heat Treatment of Titanium Alloy Parts
AMS2809	Identification, Titanium and Titanium Alloy Wrought Products
AS6279	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 A480/A480M	General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
ASTM E8/E8M	Tension Testing of Metallic Materials
ASTM E112	Determining Average Grain Size
ASTM E290	Bend Testing of Material for Ductility
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 and as follows:

2.3.1 OIL CAN

An excess of material in a localized area of a sheet which causes the sheet to buckle in that area. When the sheet is placed on a flat surface and hand pressure applied to the buckle, the buckle will spring through to the opposite surface or spring up in another area of the sheet.

2.3.2 COMMERCIAL CORROSION-RESISTANT STEEL FINISHES

Defined in ASTM A480/A480M.

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
Vanadium	14.0	16.0
Chromium	2.5	3.5
Tin	2.5	3.5
Aluminum	2.5	3.5
Iron	--	0.25
Oxygen	--	0.13
Carbon	--	0.05
Nitrogen	--	0.05 (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. 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 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

Hot rolled with subsequent cold reduction, solution heat treated, descaled, and leveled, having a surface appearance comparable to a commercial corrosion-resistant steel ASTM No. 2D finish (see 2.3.2).

3.4 Heat Treatment

Product shall be solution heat treated by heating to a temperature within the range 1450 to 1500 °F (788 to 816 °C), holding at the selected temperature within ±25 °F (±14 °C) for 3 to 30 minutes, and cooling at a rate that will produce product meeting the requirements of 3.5 (see 8.2). Pyrometry shall be in accordance with AMS2750.

3.5 Properties

The product shall conform to the following requirements:

3.5.1 As Solution Heat Treated

3.5.1.1 Tensile Properties

Shall be as shown in Table 2 for product 0.125 inch (3.18 mm) and under in nominal thickness, 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 - Tensile properties

Property	Value
Tensile Strength	102 to 137 ksi (703 to 945 MPa)
Yield Strength at 0.2% Offset	100 to 126 ksi (689 to 869 MPa)
Elongation in 2 Inches (50.8 mm)	12% minimum

3.5.1.1.1 Mechanical property requirements for product outside the range covered by 1.1 shall be agreed upon between purchaser and producer and reported per 4.4.2 (see 8.6).

3.5.1.2 Bending

Product 0.125 inch (3.18 mm) and under in nominal thickness shall have a test sample prepared nominally 0.750 inch (19.06 mm) in width, with its axis of bending parallel to the direction of rolling. The sample shall be bend tested in accordance with the guided bend test defined in ASTM E290 through an angle of 105 degrees. The test fixture supports shall have a contact radius 0.010 inch (0.25 mm) minimum, and the plunger shall have a radius equal to the bend factor shown in Table 3 times the nominal thickness. Examination of the bent sample shall not show evidence of cracking when examined at 15 to 25X magnification.

Table 3 - Bending

Nominal Thickness Inches	Nominal Thickness Millimeters	Bend Factor
Up to 0.070, incl	Up to 1.78, incl	2
Over 0.070 to 0.125, incl	Over 1.78 to 3.18, incl	2.5

3.5.1.3 Surface Contamination

The product shall be free of any oxygen-rich layer, such as alpha case, or other surface contamination, determined by the bend test of 3.5.1.2 or other method acceptable to purchaser.

3.5.1.4 Average Grain Size

Shall be ASTM No. 6 or finer, determined by comparison of a polished and etched specimen with the chart in ASTM E112.

3.5.2 After Precipitation Heat Treatment (Capability Test)

Precipitation heat treat in accordance with AMS2801 using the parameters of Tables 4 and 5.

3.5.2.1 Tensile Properties

Shall be as shown in Tables 4 and 5 for product 0.125 inch (0.32 mm) and under in nominal thickness, 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. Properties shall be verified for both precipitation heat treatment conditions (see Tables 4 and 5).

Table 4 - Minimum tensile properties after precipitation heat treatment of heating to 950 °F ± 10 °F (510 °C ± 6 °C), holding at heat for 8 hours ± 0.5 hour, and cooling in air or faster

Property	Value
Tensile Strength	145 ksi (1000 MPa)
Yield Strength at 0.2% Offset	140 ksi (965 MPa)
Elongation in 2 Inches (50.8 mm)	7%

Table 5 - Minimum tensile properties after precipitation heat treatment of heating to 900 °F ± 10 °F (482 °C ± 6 °C), holding at heat for 16 hours ± 0.5 hour, and cooling in air

Property	Value
Tensile Strength	180 ksi (1241 MPa)
Yield Strength at 0.2% Offset	170 ksi (1172 MPa)
Elongation in 2 Inches (50.8 mm)	5%

3.5.2.1.1 Mechanical property requirements for product outside the range covered by 1.1 shall be agreed upon between purchaser and producer and reported per 4.4.2 (see 8.6).

3.6 Quality

The product, as received by purchaser, shall be uniform in quality and condition, sound, and free from “oil cans” (see 2.3.1) of depth in excess of the flatness tolerances, ripples, and foreign materials, and from imperfections detrimental to usage of the product.

3.7 Tolerances

Except for flatness, shall conform to all applicable requirements of AMS2242.

3.7.1 Flatness shall be as shown in Table 6

Table 6 - Maximum deviation from a horizontal flat surface

Specified Thickness		Variation from Flat	
Inches	Millimeters	Inches	Millimeters
Up to 0.062, excl	Up to 1.57, excl	2	51
0.062 to 0.1875, excl	1.57 to 4.762, excl	1	25

3.8 Production, distribution, and procurement of metal stock shall comply with AS6279.

3.9 Exceptions

Any exceptions shall be authorized by purchaser and reported as in 4.4.2.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of the product shall supply all samples for producer's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to specified requirements.

4.2 Classification of Tests

All technical requirements are acceptance tests and shall be performed on each heat or lot as applicable.