AEROSPACE MATERIAL SPECIFICATION

AMS4921™ REV. R

Issued 1951-11
Revised 2021-07

Superseding AMS4921P

Titanium Bars, Wire, Forgings, and Rings
Commercially Pure
70 ksi (483 MPa) Yield Strength
(Composition similar to UNS R50700)

RATIONALE

AMS4921R corrects composition (3.1) to address an error in the specification reference for ASTM E539 added in Revision P.

1. SCOPE

1.1 Form

This specification covers one grade of commercially pure titanium in the form of bars, wire, forgings, flash welded rings, up to 4.000 inches (101.60 mm), inclusive, in nominal diameter or least distance between parallel sides, and stock for forging or flash welded rings.

1.2 Application

These products have been used typically for parts requiring high corrosion resistance and moderate strength up to 400 °F (204 °C), and oxidation resistance up to 600 °F (316 °C), but usage is not limited to such applications.

1.3 Classification

1.3.1 Melting Practice

Product covered by this specification is classified by melting practice as follows:

Type 1 - Multiple melted with at least one of the melting cycles under vacuum.

Type 2 - Electron beam cold hearth or plasma arc cold heath melted.

1.3.1.1 Unless a specific type is ordered, either type may be supplied.

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

For more information on this standard, visit
https://www.sae.org/standards/content/AMS4921R

1.3.2 Ultrasonic Inspection

Product covered by this specification is classified by test requirements as follows:

Class 1 - Ultrasonic inspection is not required.

Class 2 - Product shall be ultrasonically inspected (see 3.6.2).

1.3.2.1 Class 1 may be provided unless Class 2 is specified.

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
AMS2368	Sampling and Testing of Wrought Titanium Raw Material Except Forgings and Forging Stock
AMS2631	Ultrasonic Inspection Titanium and Titanium Alloy Bar, Billet and Plate
AMS2750	Pyrometry
AMS2808	Identification Forgings
AMS2809	Identification Titanium and Titanium Alloy Wrought Products
AMS7498	Rings, Flash Welded Titanium and Titanium Alloys
ARP1917	Clarification of Terms Used in Aerospace Metals Specifications
AS6279	Standard Practice for Production, Distribution, and Procurement of Metal Stock

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 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 the 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

ASTM E2994 Analysis of Titanium and Titanium Alloys by Spark Atomic Emission Spectrometry and Glow Discharge Atomic Emission Spectrometry

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
Iron	--	0.50
Oxygen	--	0.40
Carbon	--	0.08
Nitrogen	--	0.05 (500 ppm)
Hydrogen	--	0.0125 (125 ppm)
Other Elements, each (3.1.1)	--	0.10
Other Elements, total (3.1.1)	--	0.30
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

3.2.1 Type 1

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 using vacuum arc remelting (VAR) practice with no alloy additions.

3.2.1.1 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.

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

3.2.2 Type 2

Alloy shall be single cold hearth melted. Either electron beam cold hearth or plasma arc cold hearth melting may be used.

3.3 Condition

The product shall be supplied in the following condition:

3.3.1 Bars

Hot finished with or without subsequent cold reduction, annealed, and descaled. A machined or ground surface is permitted unless prohibited by purchaser. The product shall be produced using standard industry practices for the production of bar to the procured thickness/diameter. Cut plate shall not be substituted for bar.