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**AEROSPACE
MATERIAL
SPECIFICATION**

AMS 4953B

Superseding AMS 4953A

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**TITANIUM ALLOY WELDING WIRE
5Al - 2.5Sn**

UNS R54520

1. SCOPE:

1.1 Form: This specification covers a titanium alloy in the form of welding wire.

1.2 Application: Primarily for gas-metal-arc and gas-tungsten-arc welding.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2249 - Chemical Check Analysis Limits, Titanium and Titanium Alloys
AMS 2350 - Standards and Test Methods
AMS 2813 - Packaging of Welding Wire, Standard Method
AMS 2815 - Identification, Welding Wire, Line Code System
AMS 2816 - Identification, Welding Wire, Color Code System

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM E120 - Chemical Analysis of Titanium and Titanium Alloys

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

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3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E120, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other analytical methods approved by purchaser:

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	min	max
Aluminum	4.50	5.75
Tin	2.00	3.00
Iron	--	0.50
Oxygen	--	0.175
Carbon	--	0.08
Nitrogen	--	0.05
Hydrogen	--	0.015 (150 ppm)
Yttrium (3.1.1)	--	0.005 (50 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: Composition variations shall meet the requirements of AMS 2249.

3.2 Condition: Cold finished, bright finish, in a temper which will provide proper feeding of the wire in machine welding equipment.

3.2.1 Wire shall be furnished on disposable spools for machine welding or in cut lengths for manual or other welding operations, as ordered.

3.2.2 In-process annealing between cold rolling or drawing operations shall be performed in a suitable protective atmosphere.

3.2.3 Oxides, dirt, and drawing compounds shall be removed by cleaning processes which will neither result in pitting nor cause gas absorption by the wire or deposition of substances harmful to welding operations.

3.3 Properties: Wire shall conform to the following requirements:

3.3.1 Weldability: Melted wire shall flow smoothly and evenly during welding and shall produce acceptable welds, determined by a procedure agreed upon by purchaser and vendor.

3.3.2 Spooled Wire: Shall conform to 3.3.2.1 and 3.3.2.2.

3.3.2.1 Cast: Wire wound on standard 12-in. (300-mm) diameter spools shall have imparted to it a curvature such that a specimen sufficient in length, 4 - 8 ft (1.2 - 2.4 m), to form one loop, when cut from the spool and laid on a flat surface, shall form a circle not less than 15 in. (375 mm) and not greater than 30 in. (750 mm) in diameter.

3.3.2.2 Helix: The specimen on which cast was determined, when laid on a flat surface and measured between adjacent turns, shall show a vertical separation not greater than 1 in. (25 mm).

3.4 Quality:

3.4.1 Alloy shall be multiple melting using consumable electrode practice unless otherwise permitted; at least one of the melting cycles shall be under vacuum.

3.4.2 Wire, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections detrimental to welding operations, operation of welding equipment, or properties of the deposited weld metal.

3.5 Sizes and Tolerances: Unless otherwise specified, wire shall be supplied in the sizes and to the tolerances shown in 3.5.1 and 3.5.2.

3.5.1 Diameter:

∅

TABLE I

Form	Nominal Diameter Inch	Tolerance, Inch	
		Plus	Minus
Cut Lengths	0.094, 0.125, 0.156, 0.188	0.003	0.003
Cut Lengths	0.030, 0.045, 0.062, 0.078	0.002	0.002
Spools	0.062, 0.078, 0.094	0.002	0.002
Spools	0.030, 0.035, 0.045	0.001	0.002
Spools	0.007, 0.010, 0.015, 0.020	0.0005	0.0005

TABLE I (SI)

Form	Nominal Diameter Millimetres	Tolerance, Millimetre	
		Plus	Minus
Cut Lengths	2.32, 3.12, 3.90, 4.70	0.008	0.008
Cut Lengths	0.75, 1.12, 1.55, 1.95	0.005	0.005
Spools	1.55, 1.95, 2.32	0.005	0.005
Spools	0.75, 0.88, 1.12	0.002	0.005
Spools	0.18, 0.25, 0.38, 0.50	0.0012	0.0012

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3.5.2 Length: Cut lengths shall be furnished in 12, 18, 27, or 36 in. (300, 450, 675, or 900 mm) lengths, as ordered, and shall not vary more than +0, -1/2 in. (-12.5 mm) from the length ordered.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of wire shall supply all samples for vendor's tests and shall be responsible for performing all
∅ required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the wire conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for
∅ composition (3.1) and sizes and tolerances (3.5) are classified as acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for
∅ weldability (3.3.1), cast (3.3.2.1) and helix (3.3.2.2) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling: Shall be as follows; a lot shall be all wire of the same nominal size from the same heat processed at the same time:

4.3.1 For Acceptance Tests:

4.3.1.1 Composition: One sample from each heat except that for hydrogen determinations one sample from each lot, obtained after thermal and chemical processing is completed.

4.3.1.2 Other Requirements: As agreed upon by purchaser and vendor.

4.3.2 For Periodic Tests: As agreed upon by purchaser and vendor.

4.4 Reports:

4.4.1 The vendor of wire shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and for the hydrogen content of each lot and stating that the wire conforms to the other technical requirements of this specification. This report shall include the purchase order number, heat number, lot number, AMS 4953B, nominal size, and quantity from each heat.