

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 7849C

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Superseding AMS 7849B

TANTALUM SHEET, STRIP, AND PLATE Annealed

UNS R05210

1. SCOPE:

1.1 Form: This specification covers tantalum in the form of sheet, strip, plate, and foil.

1.2 Application: Primarily for parts requiring exposure to ultra-high temperatures. Applications in oxidizing atmospheres necessitate a protective coating.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications 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 2242 - Tolerances, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Sheet, Strip, and Plate

MAM 2242 - Tolerances, Metric, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Sheet, Strip, and Plate

AMS 2350 - Standards and Test Methods

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

ASTM E8 - Tension Testing of Metallic Materials

ASTM E92 - Vickers Hardness of Metallic Materials

ASTM E112 - Determining Average Grain Size

ASTM E290 - Semi-Guided Bend Test for Ductility of Metallic Materials

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

2.3.1 Military Standards:

MIL-STD-163 - Steel Mill Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by analytical methods approved by purchaser (See 8.2):

3.1.1 Tantalum: Shall be not less than 99.85%.

3.1.2 Other Elements: Shall be not more than 0.15% (1500 ppm) total. Individual elements shall not exceed the following limits in parts per million (ppm):

	Nominal Thickness	
	Up to 0.010 Inch (0.25 mm), exc1	0.010 Inch (0.25 mm) and over
Columbi um	1000	1000
Tungsten	300	300
Oxygen	150	100
Iron	100	100
Zirconi um	100	100
Molybdenum	100	100
Carbon	75	50
Nitrogen	75	50
Titani um	50	50
Silicon	50	50
Nickel	50	50
Cobalt	20	20
Hydrogen	10	10

3.2 Condition: Cold rolled and annealed (See 8.3).

3.3 Annealing: The product shall be annealed under vacuum (less than 0.1 micron (1 μ m) mercury) to produce a recrystallized microstructure, meeting the following requirements:

Nominal Thickness		Percent Recrystallization
Inch	Millimetres	
Up to 0.60, exc1	Up to 1.52, exc1	95
0.060 to 0.1875, exc1	1.52 to 4.76, exc1	90
0.1875 and over	4.76 and over	85

3.4 Properties: The product shall conform to the following requirements (See 8.2 and 8.3):

- 3.4.1 **Tensile Properties:** Shall be as specified in Table I, determined in accordance with ASTM E8 with the rate of strain maintained at 0.003 - 0.007 inch/inch/minute (0.003 - 0.007 mm/mm/minute) through the yield strength and then increased so as to produce failure in approximately one additional minute. When a dispute occurs between purchaser and vendor over the yield strength values, a referee test shall be performed on a machine having a strain rate pacer, using a rate of 0.005 inch/inch/minute (0.005 mm/mm/minute) through the yield strength and a minimum crosshead speed of 0.10 inch (2.5 mm) per minute above the yield strength.

TABLE I

Nominal Thickness Inch	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, minimum	Elongation in 2 Inches or 4D %, minimum
Up to 0.005, exc1	30,000	20,000	15
0.005 to 0.016, inc1	30,000	20,000	20
0.016 to 0.1875, inc1	30,000	20,000	25

TABLE I (SI)

Nominal Thickness Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, minimum	Elongation in 50.8 mm or 4D %, minimum
Up to 0.13, exc1	207	138	15
0.13 to 0.41, inc1	207	138	20
0.41 to 4.76, inc1	207	138	25

- 3.4.1.1 Tensile properties of product over 0.1875 inch (4.76 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.
- 3.4.2 **Hardness:** Should be not higher than 150 HV30, or equivalent, determined in accordance with ASTM E92 but the product shall not be rejected on the basis of hardness if the tensile property requirements are met.
- 3.4.3 **Bending:** The product shall withstand, without evidence of cracking when examined at 20X magnification, bending in accordance with ASTM E290 through an angle of 180 degrees around a diameter equal to the nominal thickness of the product with axis of bend parallel to the direction of rolling.
- 3.4.4 **Grain Size:** Shall be not coarser than specified in Table II, determined in accordance with ASTM E112.

TABLE II

Nominal Thickness		ASTM Grain Size Number
Inch	Millimeters	
Up to 0.1875, inc1	Up to 4.76, inc1	5
Over 0.1875	Over 4.76	4

3.5 Quality: The product, as received by purchaser, shall be uniform in quality and condition, sound, smooth, and free from foreign materials and from imperfections detrimental to usage of the product.

3.6 Tolerances: Shall conform to all applicable requirements of AMS 2242 or MAM 2242.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product 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 product conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and shall be performed on each heat or lot as applicable.

4.3 Sampling: Shall be in accordance with the following; a lot shall be all product of the same nominal size from the same heat processed at the same time and presented for vendor's inspection at one time.

4.3.1 Composition: One sample from each heat, except that for carbon, oxygen, nitrogen, and hydrogen determinations one sample from each lot.

4.3.2 Recrystallized Microstructure: One sample from each lot.

4.3.3 Tensile Properties, Hardness, Bending, and Grain Size: One sample from each lot.

4.3.3.1 Tensile specimens from widths 9 inches (229 mm) and over shall be taken with axis of specimen perpendicular to the direction of rolling; for widths under 9 inches (229 mm), specimens shall be taken with axis parallel to the direction of rolling.

4.3.3.2 For bend tests, minimum specimen width shall, when possible, be not less than 10 times the nominal thickness; maximum width need not be greater than 1 inch (25 mm).

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment a report showing the results of tests for chemical composition of each heat, the results of tests to determine conformance to the carbon, oxygen, nitrogen, and hydrogen contents, the tensile, hardness, and bending properties, and grain size of each lot, and stating that the product conforms to the other technical requirements of this specification. This report shall include the purchase order number, heat number, AMS 7849C, thickness, size, and quantity.