SAE Aerospace
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# AEROSPACE MATERIAL SPECIFICATION

AMS 7849D

Issued 1960-06
Revised 2006-06
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Superseding AMS 7849C

## Tantalum Sheet, Strip, and Plate Annealed

(Composition similar to UNS R05210)

RATIONALE

AMS 7849D is a Five Year Review and update of this specification.

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 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, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), or www.sae.org.

| | |
|---|---|
| AMS 2242 | Tolerances, Corrosion and Heat-Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Sheet, Strip, and Plate |
| AMS 2350 | Standards and Test Methods |
| AMS 2809 | Identification, Titanium and Titanium Alloy Wrought Products |





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

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**http://www.sae.org/technical/standards/AMS7849D**

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, or www.astm.org.

| | |
|---|---|
| ASTM E 8 | Tension Testing of Metallic Materials |
| ASTM E 112 | Determining Average Grain Size |
| ASTM E 290 | Bend Testing for Ductility of Materials |

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the following percentages by weight Shown in Table 1, 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):

TABLE 1 - COMPOSITION

| Element | Nominal Thickness Up to 0.010 Inch (0.25 mm), excl | Nominal Thickness 0.010 Inch (0.25 mm) and Over |
|---|---|---|
| Columbium | 1000 | 1000 |
| Tungsten | 300 | 300 |
| Oxygen | 150 | 100 |
| Iron | 100 | 100 |
| Zirconium | 100 | 100 |
| Molybdenum | 100 | 100 |
| Carbon | 75 | 50 |
| Nitrogen | 75 | 50 |
| Titanium | 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 μm) mercury) to produce a recrystallized microstructure, meeting the requirements of Table 2.

TABLE 2

| Nominal Thickness Inch | Nominal Thickness Millimeters | Percent Recrystallization |
|---|---|---|
| Up to 0.060, excl | Up to 1.52, excl | 95 |
| 0.060 to 0.1875, excl | 1.52 to 4.76, excl | 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 3, determined in accordance with ASTM E 8 with the rate of strain maintained at 0.003 to 0.007 inch/inch/minute (0.003 to 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 3A – INCH/POUND UNITS

| Nominal Thickness Inch | Tensile Strength ksi, min | Yield Strength at 0.2% Offset ksi, min | Elongation in 2 Inches or 4D %, min |
|---|---|---|---|
| Up to 0.005, incl | 30 | 20 | 15 |
| 0.005 to 0.016, incl | 30 | 20 | 20 |
| 0.016 to 0.1875, incl | 30 | 20 | 25 |

TABLE 3B – SI UNITS

| Nominal Thickness Millimeters | Tensile Strength MPa, min | Yield Strength at 0.2% Offset MPa, minimum | Elongation in 50.8 mm or 4D %, minimum |
|---|---|---|---|
| Up to 0.13, incl | 207 | 138 | 15 |
| 0.13 to 0.41, incl | 207 | 138 | 20 |
| 0.41 to 4.76, incl | 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 E 92, 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 0.1875 inches (4.76 mm) and under shall withstand, without evidence of cracking when examined at 20X magnification, bending in accordance with ASTM E 290 at room temperature 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. In case of dispute, results of bend tests using the end supported guided bend test shall govern.

3.4.4 Average Grain Size

Shall be not coarser than specified in Table 4, determined in accordance with ASTM E 112.

TABLE 4

| Nominal Thickness Inch | Nominal Thickness Millimeters | Average Grain Size |
|---|---|---|
| Up to 0.1875, incl | Up to 4.76, incl | 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.

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 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

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 Average 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).