



# AEROSPACE MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.  
TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 10001

## AMS 7849A

Superseding AMS 7849

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### TANTALUM SHEET, STRIP, AND PLATE

#### 1. SCOPE:

- 1.1 Form: This specification covers tantalum in the form of sheet, strip, plate, and foil.
- 1.2 Application: Primarily for parts and assemblies 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 (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

- 2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., Two Pennsylvania Plaza, New York, New York 10001.

##### 2.1.1 Aerospace Material Specifications:

AMS 2242 - Tolerances, Corrosion and Heat Resistant Steel and Iron-Base Alloy  
Sheet, Strip, and Plate and 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, Pennsylvania 19103.

ASTM E8 - Tension Testing of Metallic Materials  
ASTM E92 - Vickers Hardness of Metallic Materials  
ASTM E112 - Estimating Average Grain Size of Metals  
ASTM E290 - Semi-Guided Bend Test for Ductility of Metallic Materials

#### 3. TECHNICAL REQUIREMENTS:

- 3.1 Composition: Shall conform to the following percentages by weight, determined by approved analytical methods:

- 3.1.1 Tantalum: Shall be not less than 99.85%.

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

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|            | Nominal Thickness                  |                                 |
|------------|------------------------------------|---------------------------------|
|            | Up to 0.010 in., excl<br>(0.25 mm) | 0.010 in. (0.25 mm)<br>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.

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

| Nominal Thickness     |                       | % Recrystallization |
|-----------------------|-----------------------|---------------------|
| Inch                  | (Millimeters)         |                     |
| Up to 0.060, excl     | (Up to 1.52, excl)    | 95                  |
| 0.060 to 0.1875, excl | (1.52 to 4.763, excl) | 90                  |
| 0.1875 and over       | (4.763 and over)      | 85                  |

3.4 Properties: The product shall conform to the following requirements:

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 in. per in. per min. (0.003 - 0.007 mm/mm/min.) 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 in. per in. per min. (0.005 mm/mm/min.) through the yield strength and a minimum crosshead speed of 0.10 in. per min. (2.5 mm/min.) above the yield strength.

TABLE I

| Nominal Thickness<br>Inch | Tensile<br>Strength<br>psi, min | Yield Strength<br>at 0.2% Offset<br>psi, min | Elongation<br>in 2 in. or 4D<br>%, min |
|---------------------------|---------------------------------|----------------------------------------------|----------------------------------------|
| Up to 0.005, excl         | 30,000                          | 20,000                                       | 15                                     |
| 0.005 to 0.016, incl      | 30,000                          | 20,000                                       | 20                                     |
| 0.016 to 0.1875, incl     | 30,000                          | 20,000                                       | 25                                     |

TABLE I (SI)

| Nominal Thickness<br>Millimeters | Tensile<br>Strength<br>MPa, min | Yield Strength<br>at 0.2% Offset<br>MPa, min | Elongation<br>in 50.8 mm or 4D<br>%, min |
|----------------------------------|---------------------------------|----------------------------------------------|------------------------------------------|
| Up to 0.13, excl                 | 207                             | 138                                          | 15                                       |
| 0.13 to 0.34, incl               | 207                             | 138                                          | 20                                       |
| 0.34 to 4.763, incl              | 207                             | 138                                          | 25                                       |

- 3.4.1.1 Tensile properties of product over 0.1875 in. (4.763 mm) in 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 deg (3.14 rad) 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, incl | (Up to 4.763, incl) | 5                      |
| Over 0.1875        | (Over 4.763)        | 4                      |

- 3.5 Quality: The product shall be uniform in quality and condition, clean, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts.
- 3.6 Tolerances: Unless otherwise specified, 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 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 perform such confirmatory testing as he deems necessary to assure 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 or routine control tests.
- 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.
- 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 Tensile Property, Hardness, Bending, and Grain Size Requirements: One sample from each lot.
- 4.3.2.1 Tensile test specimens from widths 9 in. (229 mm) and over shall be taken with axis of specimen perpendicular to the direction of rolling; for widths less than 9 in. (229 mm), tensile test specimens shall be taken with axis parallel to the direction of rolling.
- 4.3.2.2 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 in. (25 mm).

#### 4.4 Reports:

- 4.4.1 The vendor of the product shall furnish with each shipment three copies of a report of the results of tests for chemical composition of each heat in the shipment, the results of tests on each lot to determine conformance to the carbon, oxygen, nitrogen, and hydrogen requirements and the tensile, hardness, bending, and grain size requirements, and a statement that the product conforms to all other technical requirements of this specification. This report shall include the purchase order number, heat number, material specification number and its revision letter, thickness, size, and quantity from each heat.
- 4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number and its revision letter, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.
- 4.5 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the product may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented and no additional testing shall be permitted. Results of all tests shall be reported.

#### 5. PREPARATION FOR DELIVERY:

##### 5.1 Identification: The product shall be identified as follows:

- 5.1.1 Sheet, Strip, and Plate: Each sheet, strip, and plate shall be marked on one face, in the respective location indicated below, with AMS 7849A, heat number, manufacturer's identification, and nominal thickness. The characters shall be of such size as to be clearly legible, shall be applied using a suitable marking fluid, and shall be capable of being removed in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the material or its performance and shall be sufficiently stable to withstand normal handling.

- 5.1.1.1 Flat Strip 6 In. (152 mm) and Under in Width: Shall be marked in one or more lengthwise rows of characters recurring at intervals not greater than 3 ft (914 mm).

- 5.1.1.2 Flat Sheet, Flat Strip Over 6 In. (152 mm) in Width, and Plate: Shall be marked in lengthwise rows of characters recurring at intervals not greater than 3 ft (914 mm), the rows being spaced not more than 6 in. (152 mm) apart and alternately staggered.

- 5.1.1.3 Coiled Sheet and Strip: Shall be marked near the outside end of the coil. The inside end of the coil also shall be marked or shall have a tag or label attached and marked with the information of 5.1.1.

- 5.1.2 Foil: As agreed upon by purchaser and vendor.

- 5.2 Packaging: The product shall be prepared for shipment in accordance with commercial practice to assure carrier acceptance and safe transportation to the point of delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Material not conforming to this specification or to authorized modifications will be subject to rejection.