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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Specification for Tantalum and Tantalum Alloy Plate, Sheet, and Strip[1]

This standard is issued under the fixed designation B 708; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers unalloyed and alloyed tantalum plate, sheet, and strip.

1.2 The materials covered by this specification are:

1.2.1 R05200, unalloyed tantalum, electron-beam furnace or vacuum-arc melt, or both,

1.2.2 R05400, unalloyed tantalum, powder-metallurgy consolidation,

1.2.3 R05255, tantalum alloy, 90 % tantalum, 10 % tungsten, electron-beam furnace of vacuum-arc melt, or both,

1.2.4 R05252, tantalum alloy, 97.5 % tantalum, 2.5 % tungsten, electron-beam furnace or vacuum-arc melt, or both.

1.2.5 R05240, tantalum alloy, 60 % tantalum, 40 % nobium, electron-beam furnace or vacuum-arc melt.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 The following precautionary caveat pertains only to the test methods portion, Section 13, of this specification: *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

E 8 Test Methods for Tension Testing of Metallic Materials[2]

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[3]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *plate*—a flat product more than 0.1853 in. (4.7 mm) in thickness.

3.1.2 *sheet*—a flat product 6 in. (152.4 mm) or more in width and from 0.005 in. (0.13 mm) to 0.1875 in. (4.76 mm) in thickness.

3.1.3 *strip*—a flat product, may be supplied in coil, less than 6 in. (152.4 mm) in width and from 0.005 in. (0.13 mm) to 0.1875 in. (4.76 mm) in thickness.

3.1.4 *lot*—all material produced from the same ingot or a single powder blend at one time with the same cross section, and with the same nominal metallurgical parameters.

4. Ordering Information

4.1 Orders for material under this specification shall include the following information as applicable:

4.1.1 Quantity (weight or number of pieces),

4.1.2 Name of material (tantalum plate, sheet, or strip),

4.1.3 Type (see 1.2),

4.1.4 Method of manufacture (Section 5),

4.1.5 ASTM designation,

4.1.6 Quality and finish (Section 9), and

4.1.7 Additions to the specification and supplementary requirements if required.

5. Materials and Manufacture

5.1 Material covered by this specification shall be made from vacuum-arc melted or electron-beam melted ingots or powder metallurgy consolidated unalloyed tantalum.

5.2 The various tantalum mill products covered by this specification are formed with the conventional extrusion, forging, and rolling equipment normally available in metal working plants.

6. Chemical Composition

6.1 The tantalum and tantalum alloy ingots and the tantalum powder metallurgy consolidated ingots for conversion to finished products covered by this specification shall conform to the requirements for chemical composition as prescribed in Table 1.

6.1.1 Analysis for elements not listed in Table 1 and not normally expected in tantalum shall not be required unless specified at time of purchase.

6.2 The manufacturer's ingot analysis shall be considered the chemical analysis for products supplied under this specification.

6.3 When requested by the purchaser at the time of purchase, the seller shall furnish a report certifying the values of carbon, oxygen, nitrogen, and hydrogen as specified in Table 2 for each lot of material supplied. The performance of this special provision shall be negotiated.

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[1] This specification is under the jurisdiction of ASTM Committee B-10 on Reactive and Refractory Metals and Alloysand is the direct responsibility of Subcommittee B10.03on Niobium and Tantalum.

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[2] *Annual Book of ASTM Standards*, Vol 03.01.

[3] *Annual Book of ASTM Standards*, Vol 14.02.

TABLE 1 Chemical Requirements Content, max, weight %

Element	Electron-Beam Cast (R05200) Vacuum-Arc Cast (R05200) Unalloyed Tantalum	Sintered (R05400) Unalloyed Tantalum	Electron-Beam Cast (R05255) Vacuum-Arc Cast (R05255) 90 % Tantalum 10 % Tungsten	Electron-Beam Cast (R05252) Vacuum-Arc Cast (R05252) 97.5 % Tantalum 2.5 % Tungsten	Electron Beam Cast (R05240) Vacuum-Arc Cast (R05240) 60 % Tantalum 40 % Columbium
C	0.010	0.010	0.010	0.010	0.010
O	0.015	0.03	0.015	0.015	0.020
N	0.010	0.010	0.010	0.010	0.010
H	0.0015	0.0015	0.0015	0.0015	0.0015
Nb	0.100	0.100	0.100	0.50	35.0–42.0
Fe	0.010	0.010	0.010	0.010	0.010
Ti	0.010	0.010	0.010	0.010	0.010
W	0.05	0.05	9.0–11.0	2.0–3.5	0.050
Mo	0.020	0.020	0.020	0.020	0.020
Si	0.005	0.005	0.005	0.005	0.005
Ni	0.010	0.010	0.010	0.010	0.010
Ta	remainder	remainder	remainder	remainder	remainder

TABLE 2 Additional Chemical Requirements for Finished Product (When Specified by the Purchaser)

Element	Content, max, weight %				
	Electron-Beam Cast (R05200) Vacuum-Arc Cast (R05200) Unalloyed Tantalum	Sintered (R05400) Unalloyed Tantalum	Electron-Beam Cast (R05255) Vacuum-Arc Cast (R05255) 90 % Tantalum 10 % Tungsten	Electron-Beam Cast (R05252) Vacuum-Arc Cast (R05252) 97.5 % Tantalum 2.5 % Tungsten	Electron Beam Cast (R05240) Vacuum-Arc Cast (R05240) 60 % Tantalum 40 % Columbium
O	0.025	0.035	0.025	0.025	0.025
N	0.010	0.010	0.010	0.010	0.010
H	0.0015	0.0015	0.0015	0.0015	0.0015
C	0.020	0.020	0.020	0.020	0.020

7. Mechanical Properties

7.1 Materials supplied under this specification shall conform to the requirements for mechanical properties as specified in Table 3.

7.2 The performance of mechanical tests to this requirement will be negotiated at time of purchase.

8. Weight and Permissible Variations

8.1 Tolerances for thickness, width, and length for flat-rolled products covered by this specification shall be as shown in Table 4.

8.2 Flatness tolerance for sheet and plate products supplied under this specification shall be a maximum of 6 % as determined by the following equation (see Fig. 1):

$$\text{Flatness, \%} = (H / L) \times 100 \quad (1)$$

TABLE 3 Mechanical Properties for Plate, Sheet, and Strip

Grade and Form	Annealed Condition		
	Ultimate Tensile Strength, min, psi (MPa)	Yield Strength, min, psi (MPa) (2 % Offset)	Elongation, min, % (1-in. Gage Length)
Unalloyed tantalum (R05200) (R05400)			
Plate, sheet and strip			
<0.060 in. thick	30 000 (207)	20 000 (138)	20
≥0.060 in. thick	25 000 (172)	15 000 (103)	30
90 % tantalum 10 % tungsten (R05255)			
Sheet and strip	70 000 (482)	60 000 (414)	15
Plate	70 000 (482)	55 000 (379)	20
97.5 % tantalum 2.5 % tungsten (R05252)			
<0.125 in. thick	40 000 (276)	30 000 (207)	20
≥0.125 in. thick	40 000 (276)	22 000 (152)	25
60 % tantalum 40 % columbium (R05240)			
<0.060 in. thick	35 000 (241)	20 000 (138)	25
≥0.060 in. thick	35 000 (241)	15 000 (103)	25