



Designation: B365 – 98 (Reapproved 2004)

Standard Specification for Tantalum and Tantalum Alloy Rod and Wire¹

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1. Scope

1.1 This specification covers unalloyed and alloyed tantalum rod and wire.

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 or 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, and

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

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*:²

E8 Test Methods for Tension Testing of Metallic Materials

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

¹ This specification is under the jurisdiction of ASTM Committee B10 on Reactive and Refractory Metals and Alloys and is the direct responsibility of Subcommittee B10.03 on Niobium and Tantalum.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3. Terminology

3.1 *Definitions of Terms Specific to This Standard*:

3.1.1 *lot, n*—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.

3.1.2 *rod, n*—material 0.125 to 2.5 in. (3.18 to 63.50 mm) in diameter in round, hexagonal, or octagonal cross section supplied in straight lengths.

3.1.3 *wire, n*—material 0.010 to 0.124 in. (0.254 to 3.15 mm) in diameter furnished in coils or on spools or reels. Material less than 0.010 in. in diameter is not covered by this specification.

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 rod or wire),

4.1.3 Type (see 1.2),

4.1.4 Method of manufacture (Section 5),

4.1.5 ASTM designation,

4.1.6 Finish and appearance (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, forming, swaging, rolling, and drawing 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.

TABLE 1 Chemical Requirements

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
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	0.10	0.10	0.10	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	0.050	0.050	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

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 will be negotiated.

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. Dimensions, Mass, and Permissible Variations

8.1 *Tolerances on Rounds*—Tolerances on tantalum and tantalum alloy round products covered by this specification shall be as specified in [Table 4](#).

8.2 *Tolerances for Square, Rectangular, or Other Shapes*—Tolerances for forged or rolled square, rectangular, or other shapes shall be as agreed upon between purchaser and seller at the time of purchase.

8.3 *Other Tolerances and Limitations:*

8.3.1 The permissible variation in cut lengths shall not exceed a total of 0.25 in. (6.35 mm).

8.3.2 The permissible variation in straightness of rounds shall not exceed 0.050 in. (1.27 mm)/ft (304.8 mm) in any length.

8.4 *Quantity or Weight*—For orders requiring up to 100 lb (45.4 kg), the manufacturer may overship by 10 %. When the order is for quantities up to 500 lb (226.8 kg), the manufacturer may overship by 5 %. The permissible overship for quantities larger than this shall be negotiated between the purchaser and the manufacturer.

9. Workmanship, Finish, and Appearance

9.1 The finished rod and wire shall be free of injurious external and internal imperfections of a nature that will interfere with the purpose for which it is intended in accordance with standards of acceptability agreed upon between the manufacturer and the purchaser.

9.2 Material may be finished as forged, rolled, swaged, drawn in the as-cleaned, as-machined, or as-ground conditions. The manufacturer shall be permitted to remove minor surface imperfections provided such removal does not reduce the dimensions below the minimum permitted by the tolerances established in Section 8 of this specification.

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

Element	Content, max, % weight Grades				
	Electron-Beam Case (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