



## Standard Specification for Tantalum and Tantalum Alloy Ingots<sup>1</sup>

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### 1. Scope

1.1 This specification covers unalloyed and alloyed tantalum ingots prepared by vacuum-arc melting, electron-beam melting, or powder-metallurgy consolidation to produce consolidated metal for processing to various mill shapes.

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.

### 2. Referenced Documents

2.1 *ASTM Standards:*

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications<sup>2</sup>

### 3. Ordering Information

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

3.1.1 Type (see 1.2),

3.1.2 Quantity in weight or pieces,

3.1.3 Size, diameter, and length,

3.1.4 Method of manufacture (Section 4),

3.1.5 ASTM designation, and

3.1.6 Additions to the specification and supplementary requirements if required.

### 4. Materials and Manufacture

4.1 The ingot metal for Type R05200 (unalloyed tantalum),

for Type R05255 (90 % tantalum 10 % tungsten alloy), Type R05252 (97.5 % tantalum 2.5 % tungsten), and Type R05240 (60 % tantalum 40 % columbium) may be vacuum-arc melted, electron-beam furnace melted, or a combination of these two methods. The metal for Type R05400 is defined as powder-metallurgy consolidation unalloyed tantalum.

### 5. Chemical Composition

5.1 The material shall conform to the requirements for chemical composition in accordance with Table 1.

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

5.2 In the event of dispute over conformity of the material to this specification, upon agreement between the purchaser and the seller as to procedure, representative samples of the material may be submitted to a referee for analysis.

### 6. Permissible Variation

6.1 *Quantity*—The permissible overshipment shall be negotiated between the purchaser and the manufacturer.

### 7. Workmanship, Finish, and Appearance

7.1 The manufacturer shall use care to have each lot of ingot material as uniform in quality as possible.

7.2 When specified, the ingots shall be conditioned on the surface to standards agreed upon between the manufacturer and the purchaser.

7.3 In the conditioned ingot, no abrupt change in diameter or local depressions that will impair subsequent fabrication will be permitted. The difference between maximum and minimum radius of the conditioned ingot shall not exceed 20 % of the maximum radius.

7.4 Each ingot shall be tested for soundness by nondestructive test methods, such as dye penetrant and ultrasonic tests. Methods and acceptance standards shall be as mutually agreed upon between the purchaser and the manufacturer.

7.5 Defects in the ingots that exceed the acceptance standards shall be removed by cropping or surface conditioning, whichever is appropriate. The manufacturer shall be permitted to remove surface imperfections provided that after each removal the requirements of conditioning are met (see 7.3).

7.6 The ingots shall be free of imperfections that would be deemed injurious by the standards of acceptability agreed upon

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 14.02.

**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	34.0–40.0
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	0.50
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

between the purchaser and the manufacturer.

## 8. Significance of Numerical Limits

8.1 For the purpose of determining compliance with the specified limit for requirements of the properties listed in the tables, an observed value or a calculated value shall be rounded as indicated in accordance with the rounding method of Practice E 29.

## 9. Sampling

9.1 Care shall be exercised to ensure that the sample selected for testing is representative of the material and that it is not contaminated by the sampling procedure. If there is any question relating to the sampling techniques or to the analysis thereof, the methods for sampling and analysis shall be as agreed upon between the purchaser and the manufacturer.

## 10. Rejection and Rehearing

10.1 Material that fails to conform to the requirements of this specification may be rejected. Rejection should be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the test, the producer or supplier may make claim for a rehearing.

## 11. Referee

11.1 In the event of disagreement between the manufacturer and the purchaser on the conformance of the material to the requirements of this specification or any special test specified

by the purchaser, a mutually acceptable referee shall perform the tests in question. The results of the referee's testing shall be used in determining the conformance of the material to this specification.

## 12. Certification

12.1 When specified in the purchase order or contract, a producer's or supplier's certificate shall be furnished to the purchaser that the material was manufactured, sampled, tested, and inspected in accordance with the specification and has been found to meet the requirements. When specified in the purchase order or contract, a report of the test results shall be furnished.

## 13. Packaging and Package Marking

13.1 Each ingot shall be marked for identification by metal die stamping the manufacturer's ingot number on the top of the ingot. Each box or skid shall be marked or tabbed legibly and conspicuously with the number, type of material, ingot number(s), manufacturer's identification, nominal size, and the gross, net, and tare weights.

13.2 Unless otherwise specified, material purchased under this specification must be boxed or banded on skids in such a manner as to secure safe delivery to its destination when properly transported by any common carrier.

## 14. Keywords

14.1 chemistry; mechanical properties; tantalum; tantalum alloy

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