



Designation: B 652/B 652M – 96 (Reapproved 1999)

Standard Specification for Niobium-Hafnium Alloy Ingots¹

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1. Scope

1.1 This specification covers hafnium alloyed niobium ingots prepared by vacuum-arc melting or electron-beam furnace melting, or both, to produce consolidated metal for processing to various mill shapes.

1.2 The material covered by this specification is Grade R04295, niobium-base alloy containing approximately 10 % hafnium and 1 % titanium.

1.3 The values stated in either inch-pound or SI units are to be regarded separately as standard. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. SI values cannot be mixed with inch-pound values.

2. Referenced Documents

2.1 *ASTM Standards:*

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications²

3. Ordering Information

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

3.1.1 General alloy description (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 Chemistry (Section 5),

3.1.6 Quality and finish (Section 7),

3.1.7 Marking (Section 14),

3.1.8 Packaging (Section 15),

3.1.9 Required reports (Section 13), and

3.1.10 Disposition of rejected material (Section 11).

4. Materials and Manufacture

4.1 The ingot metal for this material may be vacuum- or plasma-arc melted, electron-beam melted, or a combination of these methods.

5. Chemical Composition

5.1 The material shall conform to the requirements as to chemical composition prescribed in Table 1. Analysis for elements, not listed in Table 1 and not normally expected in niobium hafnium alloy, 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 Variations in Quantity

6.1 For orders requiring up to 100 lb [45 kg] of ingots, the manufacturer may overship up to a maximum of 20 %. For orders up to 1000 lb [450 kg], the manufacturer may overship up to a maximum of 10 %. The permissible overshipment shall be negotiated for orders larger than 1000 lb [450 kg].

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 purchaser and the manufacturer.

7.3 In the conditioned ingot, no abrupt changes 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 5 % of the maximum radius. Lands, grooves, and local depressions shall be blended to a maximum angle of 30° to the axis of the ingot.

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

7.5 Defects in 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 such removal, the requirements of conditioning are met (7.3).

7.6 The ingots shall be free of imperfections that would be deemed injurious by the standards of acceptability agreed upon between the purchaser and the manufacturer.

¹ This specification is under the jurisdiction of ASTM Committee B-10 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 *Annual Book of ASTM Standards*, Vol 14.02.