



Designation: F 1713 – 96

Standard Specification for Wrought Titanium-13Niobium-13Zirconium Alloy for Surgical Implant Applications¹

This standard is issued under the fixed designation F 1713; 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 the chemical, mechanical, and metallurgical requirements for wrought titanium-13niobium-13zirconium alloy to be used in the manufacture of surgical implants (1).²

1.2 The values stated in inch pound units are to be regarded as the standard. The metric equivalents in parentheses are provided for information only.

2. Referenced Documents

2.1 ASTM Standards:

E 8 Methods of Tension Testing of Metallic Materials³

E 120 Test Methods for Chemical Analysis of Titanium and Titanium Alloys⁴

E 1409 Test Method for the Determination of Oxygen in Titanium and Titanium Alloys by the Inert Gas Fusion Technique⁴

E 1447 Test Method for the Determination of Hydrogen in Titanium and Titanium Alloys by the Inert Gas Fusion Thermal Conductivity Method⁴

F 748 Practice for Selecting Generic Biological Test Methods for Materials and Devices⁵

F 981 Practice for Assessment of Compatibility of Biomaterials for Surgical Implants with Respect to Effect of Materials on Muscle and Bone⁵

F 1472 Specification for Wrought Ti-6Al-4V Alloy for Surgical Implant Applications⁵

2.2 Other Standards:

ASOC C1 Specification of General Requirements for a Quality Control Program⁶

AMS 2249 Chemical Check Analysis Limits, Titanium and Titanium Alloys⁷

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *capability aged, n*—the condition of the material that is obtained if, following solution treatment, a sample of the mill product is subjected to an aging treatment such as given below, for certification testing.

3.1.1.1 Ramp up from room temperature to $923 \pm 25^\circ\text{F}$ ($495 \pm 14^\circ\text{C}$) over 2.5 ± 1 h.

3.1.1.2 Age for 6 ± 0.25 h at $923 \pm 25^\circ\text{F}$ ($495 \pm 14^\circ\text{C}$).

3.1.1.3 Remove from furnace and air cool to room temperature.

3.1.2 *solution treated, n*—the condition of the material that is obtained if, following the final hot-working or cold-working operation, the mill product is rapidly quenched, for example, by water quenching, from a temperature above 1112°F (600°C).

3.1.3 *unannealed, n*—the condition of the material that is obtained after the normal hot-working or cold-working operation used for fabrication of the mill product. There are no subsequent heat treatment requirements.

4. Product Classification

4.1 *Strip*—Any product under 0.1875 in. (4.75 mm) in thickness and under 24 in. (610 mm) wide.

4.2 *Sheet*—Any product under 0.1875 in. (4.75 mm) in thickness and 24 in. (610 mm) or more in width.

4.3 *Plate*—Any product 0.1875 in. (4.75 mm) thick and over and 10 in. (254 mm) wide and over, with widths greater than five times thickness. Plate up to 4 in. (101.60 mm), thick inclusive is covered by this specification.

4.4 *Bar*—Rounds or flats from $\frac{3}{16}$ in. (4.75 mm) to 4 in. (101.60 mm) in diameter or thickness. (Other sizes and shapes by special order.)

4.5 *Wire*—Rounds less than $\frac{3}{16}$ in. (75 mm) in diameter.

5. Ordering Information

5.1 Include with inquiries and orders for material under this specification the following information.

5.1.1 Quantity (weight or number of pieces),

5.1.2 Applicable ASTM designation,

5.1.3 Form (sheet, strip, plate, wire, or bar),

5.1.4 Condition (see Section 3 and 6.1),

5.1.5 Mechanical properties (if applicable, for special conditions),

¹ This specification is under the jurisdiction of ASTM Committee F-4 on Medical and Surgical Materials and Devices and is the direct responsibility of Subcommittee F04.12 on Metallurgical Materials.

Current edition approved July 10, 1996. Published August 1996.

² The boldface numbers in parentheses refer to the list of references at the end of the text.

³ *Annual Book of ASTM Standards*, Vol 03.01.

⁴ *Annual Book of ASTM Standards*, Vol 03.05.

⁵ *Annual Book of ASTM Standards*, Vol 13.01.

⁶ Available from the American Society for Quality Control, 161 W. Wisconsin Ave., Milwaukee, WI 53203.

⁷ Available from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.