



**Designation: F 136 – 02**

## **Standard Specification for Wrought Titanium-6Aluminum-4Vanadium ELI (Extra Low Interstitial) Alloy for Surgical Implant Applications (UNS R56401)<sup>1</sup>**

This standard is issued under the fixed designation F 136; 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 ( $\epsilon$ ) 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 annealed titanium-6aluminum-4vanadium ELI (extra low interstitial) alloy (R56401) to be used in the manufacture of surgical implants.

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

### **2. Referenced Documents**

#### **2.1 ASTM Standards:**

E 8 Test Methods of Tension Testing of Metallic Materials<sup>2</sup>

E 120 Test Methods for Chemical Analysis of Titanium and Titanium Alloys<sup>3</sup>

E 290 Test Method for Bend Testing of Materials for Ductility<sup>3</sup>

E 527 Practice for Numbering Metals and Alloys (UNS)<sup>4</sup>

E 1409 Test Methods for Determination of Oxygen in Titanium and Titanium Alloys by the Inert Gas Fusion Technique<sup>3</sup>

E 1447 Test Method for Determination of Hydrogen in Titanium and Titanium Alloys by the Inert Gas Fusion Thermal Conductivity Method<sup>3</sup>

F 981 Practice for Assessment of Compatibility of Biomaterials for Surgical Implants with Respect to Effect of Materials on Muscle and Bone<sup>5</sup>

#### **2.2 ASQ Standard:**

ASQ C1 Specifications of General Requirements for a Quality Control Program<sup>6</sup>

#### **2.3 Aerospace Material Specifications:<sup>7</sup>**

AMS 2249 Chemical Check Analysis Limits, Titanium and Titanium Alloys

AMS 4930 Titanium Alloy Bars, Forgings, and Rings  
6AL-4V Extra Low Interstitial Annealed

#### **2.4 Society of Automotive Engineers Standard:**

SAE J1086 Practice for Numbering Metals and Alloys (UNS)<sup>8</sup>

### **3. Product Classification**

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

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

3.3 *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 4.00 in. (101.60 mm), thick inclusive is covered by this specification.

3.4 *Bar*—Round bars and flats from 0.1875 in. (4.75 mm) to 4.00 in. (101.60 mm) in diameter or thickness (other sizes and shapes by special order).

3.5 *Forging Bar*—Bar as described in 3.4, used for production of forgings, may be furnished in the hot rolled condition.

3.6 *Wire*—Rounds less than 0.1875 in. (4.75 mm) in diameter.

### **4. Ordering Information**

4.1 Include with inquiries and orders for material under this specification the following information:

4.1.1 Quantity,

4.1.2 ASTM designation and date of issue,

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

4.1.4 Condition (See 5.3),

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

4.1.6 Finish (See 5.2),

4.1.7 Applicable dimensions including size, thickness, width, or drawing number,

4.1.8 Special tests, if any, and

4.1.9 Other requirements.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee F04 on Medical and Surgical Materials and Devices and is the direct responsibility of Subcommittee F04.12 on Metallurgical Materials.

Current edition approved Apr. 10, 2002. Published June 2002. Originally published as F 136 – 84. Last previous edition F 136 – 98<sup>ε1</sup>.

<sup>2</sup> *Annual Book of ASTM Standards*, Vol 03.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 03.05.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 01.01.

<sup>5</sup> *Annual Book of ASTM Standards*, Vol 13.01.

<sup>6</sup> Available from American Society for Quality, 600 N. Plankinton Ave., Milwaukee, WI 53203.

<sup>7</sup> Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.

<sup>8</sup> New designation established in accordance with E 527 and SAE J1086.

**\*A Summary of Changes section appears at the end of this standard.**