



Standard Specification for Unalloyed Titanium, for Surgical Implant Applications (UNS R50250, UNS R50400, UNS R50550, UNS R50700)^{1,2}

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1. Scope

1.1 This specification covers the chemical, mechanical, and metallurgical requirements for four grades of unalloyed titanium used for the manufacture of surgical implants.

1.2 The values stated in inch-pound units are to be regarded as the standard.

2. Referenced Documents

2.1 ASTM Standards:

B 265 Specification for Titanium and Titanium Alloy Strip, Sheet, and Plate³

B 348 Specification for Titanium and Titanium Alloy Bars and Billets³

B 381 Specification for Titanium and Titanium Alloy Forgings³

E 8 Test Methods for Tension Testing of Metallic Materials⁴

E 120 Test Methods for Chemical Analysis of Titanium and Titanium Alloys⁵

E 290 Test Method for Semi-Guided Bend Test for Ductility of Metallic Materials⁴

E 527 Practice for Numbering Metals and Alloys⁶

E 1409 Test Method for Determination of Oxygen in Titanium Alloys by the Inert Gas Fusion Technique⁷

E 1447 Test Method for Determination of Hydrogen in Titanium and Titanium Alloys by the Inert Gas Fusion Thermal Conductivity Method⁷

F 981 Practice for Assessment of Compatibility of Biomaterials for Surgical Implants with Respect to Effect of Materials on Muscle and Bone⁸

F 1341 Specification for Unalloyed Titanium Wire for Surgical Implant Applications⁸

2.2 Aerospace Material Specification:

AMS 2249 Chemical Check Analysis Limits, Titanium and Titanium Alloys⁹

2.3 American Society for Quality (ASQ) Standard:

C1 Specifications of General Requirements for a Quality Program¹⁰

2.4 Society of Automotive Engineers Standard:

SAE J1086 Practice for Numbering Metals and Alloys (UNS)⁹

3. Product Classification

3.1 Product classifications are consistent with Standard Specifications B 265, B 348 and B 381.

3.1.1 *Strip*—Any product 0.1875 in. (4.75 mm) and under in thickness and less than 24 in. (610 mm) in width.

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

3.1.3 *Plate*—Any product 0.1875 in. (4.75 mm) in thickness and over 10 in. (254 mm) in width.

3.1.4 *Bar*—A hot rolled, forged, or cold worked semi-finished solid section product whose cross sectional area is equal to or less than 16 in.² (10322 mm²); rectangular bar must be less than or equal to 10 in. (254 mm) in width and greater than 0.1875 in. (4.75 mm) in thickness.

3.1.5 *Billet*—A solid semi-finished section hot rolled or forged from an ingot, with a cross sectional area greater than 16 in.² (10322 mm²) whose width is less than 5 times its thickness.

3.1.6 *Forging*—Any product of work on metal formed to a desired shape by impact or pressure in hammers, forging machines, upset presses or related forming equipment.

3.1.7 *Wire*—Coiled round and non-round product with a diameter or major dimension equal to or greater than 0.3130 in.

NOTE 1—Wire less than or equal to 0.3125 in. in diameter or major dimension is covered in ASTM F 1341.

3.1.8 *Other*—Other forms and shapes, including tubing, may be provided by agreement between purchaser and supplier.

¹ 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.

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² New UNS designation established in accordance with E 527 and SAE J1086.

³ Annual Book of ASTM Standards, Vol 02.04.

⁴ Annual Book of ASTM Standards, Vol 03.01.

⁵ Annual Book of ASTM Standards, Vol 03.05.

⁶ Annual Book of ASTM Standards, Vol 1.01.

⁷ Annual Book of ASTM Standards, Vol 3.06.

⁸ Annual Book of ASTM Standards, Vol 13.01.

⁹ Available from Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.

¹⁰ Available from American Society for Quality Control, 161 W. Wisconsin Ave., Milwaukee, WI 53203.