



Designation: F2180 – 24

Standard Specification for Metallic Implantable Strands and Cables¹

This standard is issued under the fixed designation F2180; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope*

1.1 This specification covers the materials, dimensional tolerances, constructions, and mechanical properties for standard metallic implantable strands and cables.

1.2 This specification is intended to assist in the development of specific strand and cable specifications. It is particularly appropriate for high load bearing applications. It is not intended, however, to address all of the possible variations in construction, material, or properties.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

E8/E8M Test Methods for Tension Testing of Metallic Materials

F86 Practice for Surface Preparation and Marking of Metallic Surgical Implants

F2503 Practice for Marking Medical Devices and Other Items for Safety in the Magnetic Resonance Environment

2.2 ISO Standards:³

ISO 9001 Quality Management Systems—Requirements

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 F04.21 on Osteosynthesis.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website. Historical material standards cited in this document included various stainless steel, titanium, and cobalt alloys including ASTM F90, ASTM F136, ASTM F138, ASTM F562, ASTM F1058, ASTM F1295, ASTM F1314, and ASTM F1341.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

2.3 U.S. Department of Defense Specifications:⁴

MIL-DTL-83420J Wire Rope, Flexible, For Aircraft Control
MIL-DTL-83420/1B Wire Rope, Flexible, Type 1, Composition A

MIL-DTL-83420/2B Wire Rope, Flexible, Type 1, Composition B

3. Terminology

3.1 Definitions:

3.1.1 *cable, n*—a group of strands helically twisted together.

3.1.2 *diameter, n*—the distance between opposing points across the circle circumscribing either the strand or cable as illustrated in **Figs. 1 and 2** (see MIL-DTL-83420J, MIL-DTL-83420/1B, and MIL-DTL-83420/2B).

3.1.3 *lay (or twist), n*—the helical form taken by the wires in a strand and by the strands in a cable (see MIL-DTL-83420J).

3.1.3.1 *Discussion*—In a “right lay” situation, the wires of the strand (or the strands in a cable) are oriented in the same direction as the thread on a right-hand screw.

3.1.4 *length of lay (or pitch), n*—the distance parallel to the axis of the strand (or cable) in which a wire (or strand) makes one complete turn about the axis.

3.1.5 *M×N, n*—the construction designation for strands and cables. In this construction, designation *M* represents the number of strands in the cable and *N* represents the number of wires in each strand.

3.1.5.1 *Discussion*—Some examples of strand constructions are 1×7 and 1×3. Similar examples of cable constructions are 7×7 and 7×19.

3.1.6 *strand, n*—a group of wires helically twisted together.

3.1.7 *wire, n*—an individual element (typically a cylindrical rod) making up a strand.

4. General Requirements

4.1 Metallic implantable strands and cables shall be fabricated from a (metallic) material intended for surgical implant applications. In addition, biocompatibility of the material and final, finished device shall be established for the intended application. Materials should be chosen based on the design

⁴ Available from DODSSP, Building 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098.

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



Documents

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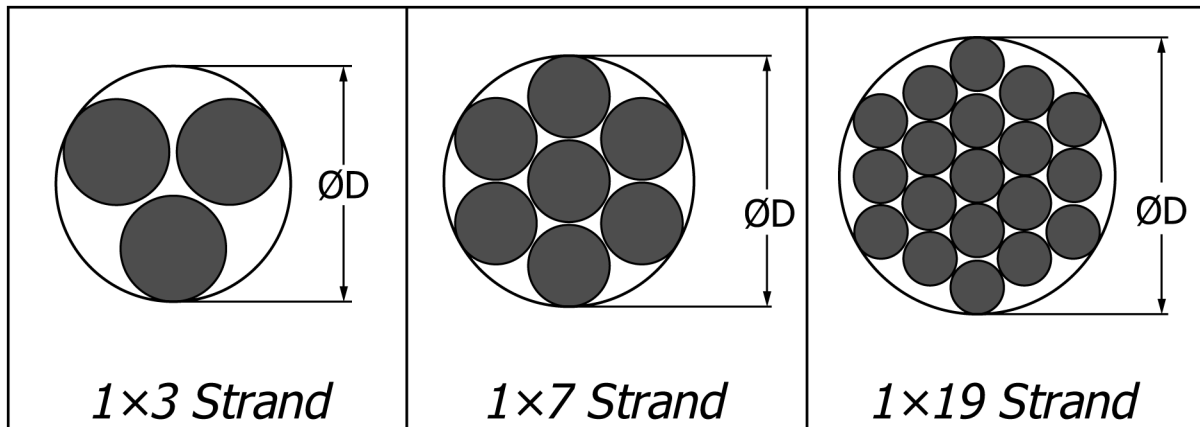


FIG. 1 Standard Stranding Constructions

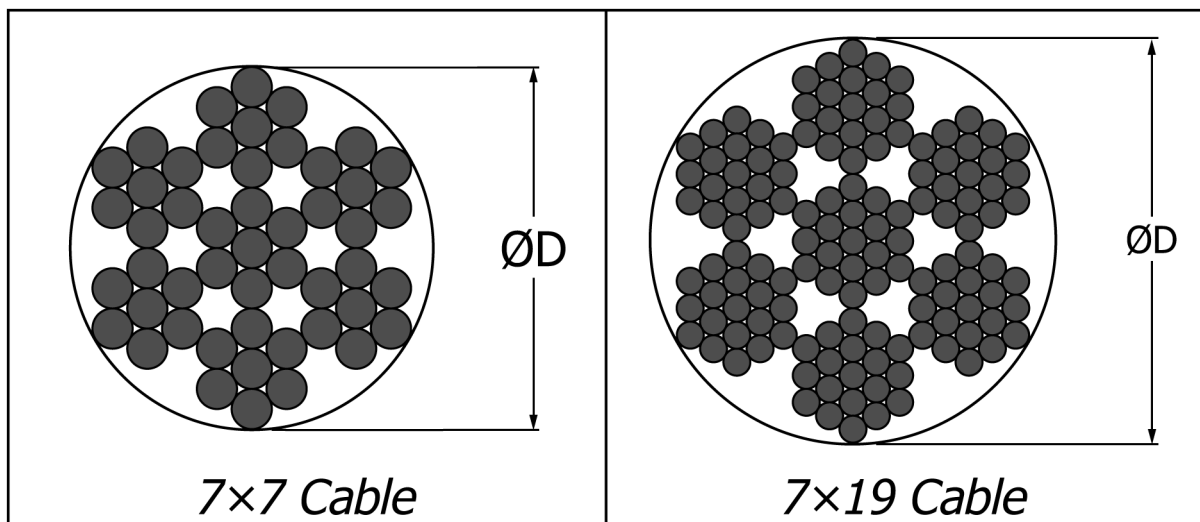


FIG. 2 Standard Cabling Constructions

requirements of the particular device. ASTM Committee F04 on Medical and Surgical Materials and Devices maintains a number of specifications for metallic materials that may be considered for surgical implant and instrument applications.

5. Ordering Information

5.1 Inquiries and orders under this specification shall include the following information:

- 5.1.1 Quantity (weight, length, or number of pieces),
- 5.1.2 ASTM designation,
- 5.1.3 Material (ASTM designation),
- 5.1.4 Condition,
- 5.1.5 Construction,
- 5.1.6 Applicable dimensions (including diameter, length(s) of lay, and length),
- 5.1.7 Mechanical properties (including breaking force),
- 5.1.8 Special requirements, and
- 5.1.9 Special tests.

6. Materials and Manufacture

6.1 *Wires*—Implantable strands and cables shall be manufactured using equivalent size wires.

6.2 *Condition*—Implantable strands and cables shall be supplied in the cold-worked, cold-worked and stress-relieved, or annealed condition.

6.3 *Finish*—Types of finish available in strands and cables are cold-drawn, pickled, swaged, or as specified by the customer.

7. Stranding

7.1 The standard strand constructions are illustrated in Fig. 1. These constructions are described in the following manner:

7.1.1 *1x3 Strand*—This construction is characterized by a left-hand lay with a uniform pitch of 4 to 10 times the nominal strand diameter.

7.1.2 *1x7 Strand*—This construction is characterized by a left-hand lay with a uniform pitch of 8 to 16 times the nominal strand diameter.

7.1.3 *1x19 Strand*—This construction is characterized by an inner 1x7 strand with a right-hand lay and a uniform pitch of 8 to 12 times the nominal strand diameter. The outer 12 wires have a left-hand lay with a uniform pitch of 9 to 11 times the nominal strand diameter.