



Designation: F 2180 – 02

Standard Specification for Metallic Implantable Strands and Cables¹

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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. The inch-pound equivalents may be approximate.

2. Referenced Documents

2.1 ASTM Standards:

E 8 Test Methods for Tension Testing of Metallic Materials²

F 86 Practice for Surface Preparation and Marking of Surgical Implants³

F 90 Specification for Wrought Cobalt-Chromium-Tungsten-Nickel Alloy for Surgical Implant Applications³

F 136 Specification for Wrought Titanium 6Al-4V ELI Alloy for Surgical Implant Applications³

F 138 Specification for Wrought 18Chromium-14Nickel 2.5Molybdenum Stainless Steel Bar and Wire for Surgical Implants³

F 562 Specification for Wrought Cobalt-35Nickel-20Chromium-10Molybdenum Alloy for Surgical Implant Applications³

F 1058 Specification for Wrought Cobalt-Chromium-Nickel-Molybdenum-Iron Alloy for Surgical Implant Applications (UNS R30003 and R30008)³

F 1295 Specification for Wrought Titanium-6Aluminum-7Niobium Alloy for Surgical Implant Applications³

F 1314 Specification for Wrought Nitrogen Strengthened-22Chromium-12.5Nickel-5Manganese-2.5Molybdenum Stainless Steel Bar and Wire for Surgical Implants (UNS S20910)³

F 1341 Specification for Unalloyed Titanium Wire (UNS R50250)³

2.2 American Society for Quality (ASQ) Standard:⁴

C1 Specification of General Requirements for a Quality Program

2.3 Department of Defense Specifications:⁵

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*—a group of strands helically twisted together.

3.1.2 *diameter*—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)*—the helical form taken by the wires in a strand and by the strands in a cable (see MIL-DTL-83420J). 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)*—the distance parallel to the axis of the strand (or cable) in which the wire (or strand) makes one complete turn about the axis.

3.1.5 $M \times N$ —the construction designation for strands and cables. In this construction designation M represents the

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² Annual Book of ASTM Standards, Vol 03.01.

³ Annual Book of ASTM Standards, Vol 13.01.

⁴ Available from the American Society for Quality (ASQ), 600 N. Plankinton Ave., Milwaukee, WI 53203.

⁵ Available from DODSSP, Building 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098.

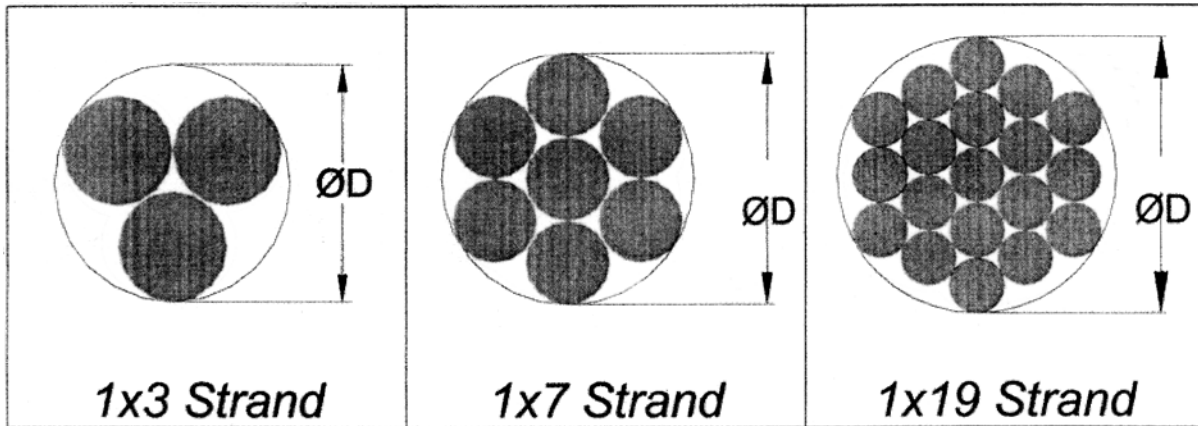


FIG. 1 Standard Stranding Constructions

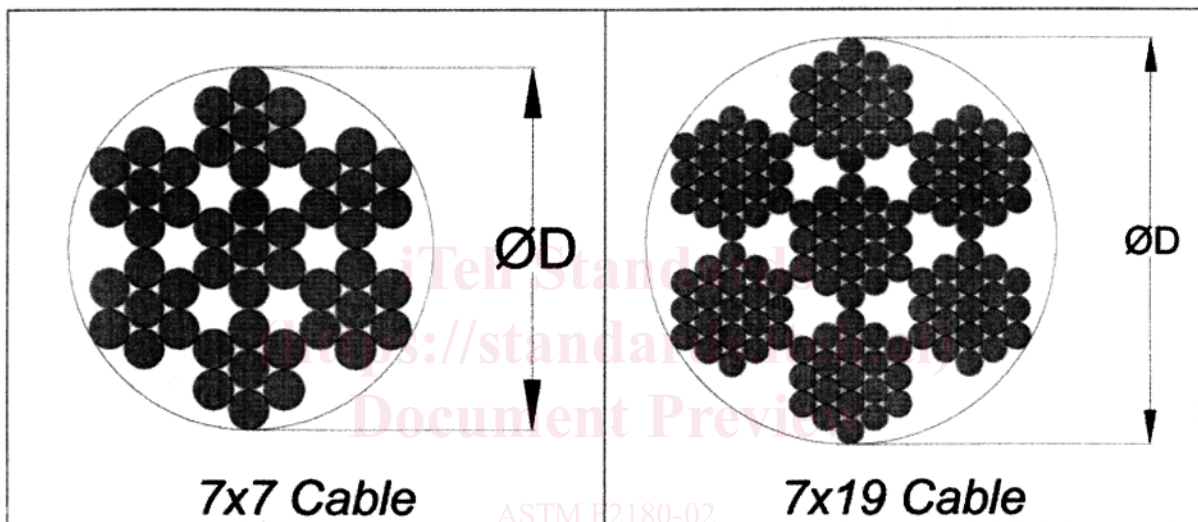


FIG. 2 Standard Cabling Constructions

number of strands in the cable and N represents the number of wires in each strand. 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*—a group of wires helically twisted together.

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

4. General Requirements

4.1 In addition to the requirements of this specification, all requirements of the current editions of Specifications F 90, F 136, F 138, F 562, F 1058, F 1295, F 1314, and F 1341 shall apply.

4.2 In cases of conflict between this specification and those listed in 2.1, this specification shall take precedence.

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 customer.

7. Stranding

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