



Designation: F1314 – 24

Standard Specification for Wrought Nitrogen Strengthened 22Chromium-13Nickel- 5Manganese-2.5Molybdenum Stainless Steel Alloy Bar and Wire for Surgical Implants (UNS S20910)¹

This standard is issued under the fixed designation F1314; 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 nitrogen strengthened 22chromium-13nickel-5manganese-2.5molybdenum stainless steel alloy bar and wire for surgical implants.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of each other, and values from the two systems shall not be combined.

1.3 Any agreement between purchaser and supplier must meet the minimum requirements of this specification.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *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

[A262 Practices for Detecting Susceptibility to Intergranular](#)

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 For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[Attack in Austenitic Stainless Steels](#)

[A484/A484M Specification for General Requirements for Stainless Steel Bars, Billets, Shapes, and Forgings](#)

[A555/A555M Specification for General Requirements for Stainless Steel Wire and Wire Rods](#)

[A751 Test Methods and Practices for Chemical Analysis of Steel Products](#)

[E8/E8M Test Methods for Tension Testing of Metallic Materials](#)

[E10 Test Method for Brinell Hardness of Metallic Materials](#)

[E18 Test Methods for Rockwell Hardness of Metallic Materials](#)

[E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications](#)

[E45 Test Methods for Determining the Inclusion Content of Steel](#)

[E112 Test Methods for Determining Average Grain Size](#)

[E354 Test Methods for Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys](#)

[E384 Test Method for Microindentation Hardness of Materials](#)

[E407 Practice for Microetching Metals and Alloys](#)

[F138 Specification for Wrought 18Chromium-14Nickel-2.5Molybdenum Stainless Steel Bar and Wire for Surgical Implants \(UNS S31673\)](#)

[F746 Test Method for Pitting or Crevice Corrosion of Metallic Surgical Implant Materials](#)

[IEEE/ASTM SI 10 American National Standard for Metric Practice](#)

2.2 [Aerospace Materials Specification](#):³

[AMS 2248 Chemical Check Analysis Limits, Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys](#)

[AMS 2630 Inspection, Ultrasonic Product Over 0.5 inch \(12.7 mm\) Thick](#)

³ Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, <http://www.sae.org>.

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

AMS 2632 Ultrasonic Inspection of Thin Materials

2.3 ISO Standards:⁴

ISO 6892 Metallic Materials Tensile Testing at Ambient Temperature

ISO 9001 Quality Management Systems—Requirements

ISO 13485 Medical Devices—Quality Management Systems—Requirements for Regulatory Purposes

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *lot, n*—the total number mill products produced under the same melt heat under the same conditions at essentially the same time.

4. Classification

4.1 *Bar*—Round, rectangular, flats, or other complex shaped product delivered straightened and cut to defined lengths.

4.2 *Forging Bar*—As described in 4.1, used for production of forgings, may be furnished in the hot rolled condition.

4.3 *Wire*—Round, rectangular, or other complex shapes typically less than 16 mm [0.625 in.] furnished in coils, or on spools, reels, or other packaging as specified.

5. Ordering Information

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

5.1.1 Quantity;

5.1.2 ASTM designation and date of issue;

5.1.2.1 Unless otherwise specified, the material producer shall work to the revision of this specification in effect on the date of order placement. Unless otherwise specified, material manufactured and certified to the immediately previous revision of this specification may be procured and used until inventory is depleted.

5.1.3 Mechanical properties (if applicable for special conditions);

5.1.4 Classification (see Section 4);

5.1.5 Applicable dimensions including size, thickness, width, and length (exact, random, or multiples) or drawing number;

5.1.6 *Tolerances*—Unless otherwise specified by purchaser, tolerances shall meet the requirements of Specification A484/A484M, A555/A555M, or both, as applicable;

5.1.7 Condition (see 6.1);

5.1.8 Finish (see 6.2);

5.1.9 Special tests (if any); and

5.1.10 Other requirements.

6. Materials and Manufacture

6.1 *Condition*—Bar and wire shall be furnished in the hot-worked, annealed, or cold-worked condition, as specified.

6.2 *Finish*—Bar and wire shall be furnished bright annealed, cold-drawn, pickled, ground, or ground and polished, as specified by the purchaser.

7. Chemical Requirements

7.1 The supplier's heat analysis shall conform to the chemical requirements prescribed in Table 1. The supplier shall not ship material with chemistry outside the requirements specified in Table 1.

7.1.1 Requirements for the major and minor elemental constituents are listed in Table 1. Also listed are important residual elements.

7.1.2 All commercial metals may contain small amounts of elements other than those which are specified in Table 1. It is neither practical nor necessary to specify limits for unspecified elements that can be present. By agreement between purchaser and supplier, analysis may be required and limits established for elements or compounds not specified in the table of chemical composition.

7.1.3 Intentional elemental additions other than those specified in Table 1 are not permitted.

7.1.4 Methods and practices relating to chemical analysis required by this specification shall be in accordance with Test Methods A751 and E354.

7.2 *Tolerance Limits*—The product (check) analysis tolerance limits shall conform to Table 2 per AMS 2248. Product (check) analysis tolerances do not broaden the specified heat (ladle or ingot) analysis requirements but cover variations between laboratories in the measurement of chemical content.

7.2.1 A product (check) analysis may be performed by the purchaser of the metal after it has been worked into semi-finished or finished forms or fabricated into parts. It is either for the purpose of verifying the composition of a heat or manufacturing lot or to determine variations in the composition within the heat. In the analysis of semi-finished, finished, or fabricated parts, based on the potential impact of fabricating techniques and sample size on the product (check) analysis, the applicability of the results shall be agreed upon between the manufacturer and the purchaser prior to testing. Acceptance or rejection of a heat or lot of material may be made by the purchaser on the basis of this product (check) analysis. Product (check) analysis outside the tolerance limits allowed in Table 2 may be cause for rejection of the product. A referee analysis may be used if agreed upon by supplier and purchaser.

TABLE 1 Chemical Composition

Element	Composition, % (Mass/Mass)
Carbon	0.030 max
Manganese	4.00 to 6.00
Phosphorus	0.025 max
Sulfur	0.010 max
Silicon	0.75 max
Chromium	20.50 to 23.50
Nickel	11.50 to 13.50
Molybdenum	2.00 to 3.00
Nitrogen	0.20 to 0.40
Niobium	0.10 to 0.30
Vanadium	0.10 to 0.30
Copper	0.50 max
Cobalt ^A	...
Iron	balance ^B

^A If no maximum is stated, cobalt content shall be reported for information only.

^B The percentage of iron content is determined by difference and need not be determined or certified.

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