

INDUSTRIAL FASTENERS INSTITUTE
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1.0 Scope

1.1 This specification describes the physical, mechanical and metallurgical requirements for stainless steel wire and rods in coils intended for cold and warm formed mechanical fasteners, which includes bolts, nuts, rivets, screws, washers and special formed parts.

1.2 Wire size range typically includes 0.040 inches thru 1.375 inches. In special circumstance wire may be provided as small as 0.001 inches.

1.3 Rod size range usually includes 7/32 inches to 1 inch or larger and is generally offered in 1/64th or 0.5 mm increments.

1.4 Sizes for wire and rod outside the ranges of 1.2 and 1.3 may be ordered by agreement between purchaser and supplier.

1.5 Both wire and rod are furnished in two basic variations: the first is referred to as "standard cold heading" and the other as "seam free". Standard cold heading stainless steel may have surface variations which may not exceed 1% of its nominal size. Seam free stainless is free of seams and other surface defects.

1.6 Conformance of all test data shall be determined in accordance with ASTM E29.

1.7 Heat treating terms not defined in this standard are included in SAE J415.

2.0 Referenced Documents

All standards are latest issue unless otherwise agreed between manufacturer and purchaser.

2.1 ASTM specifications are available from American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428, U.S.A.

A262 *Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels*

A370 *Test Methods and Definitions for Mechanical Testing of Steel Products*

A380 *Standard Practice for Cleaning, Descaling and Passivation of Stainless Steel Parts, Equipment and Systems*

A493 *Specification for Stainless and Heat-Resisting Steel for Cold Heading and Cold Forging Bar and Wire*

A555/A555M *Specification for General Requirements for Stainless Steel Wire and Wire Rods*

A580 *Standard Specification for Stainless Steel Wire*

A700 *Practices for Packaging, Marking, and Loading Methods for Steel Products for Domestic Shipment*

A751 *Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products*

A967 *Chemical Passivation for Treatment for Stainless Steel Parts*

E10 *Test Method for Brinell Hardness of Metallic Materials*

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E29 *Practice for Using Significant Digit and Test Data to Determine Conformance with Specifications*

E30 *Methods for Chemical Analysis of Steel, Cast Iron, Open-Hearth Iron, and Wrought Iron*

E112 *Test Methods for Determining Average Grain Size*

E353 *Test Methods for Chemical Analysis of Stainless Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys*

2.2 SAE standards are available from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096-0001, U.S.A.

J412 *General Characteristics and Heat Treatments of Steels*

J415 *Definitions of Heat Treating Terms*

J467b *Special Purpose Alloys ("Superalloys")*

2.3 IFI standards are available from the Industrial Fasteners Institute, 6363 Oak Tree Blvd., Independence, OH 44131-2500.

IFI-140 *Carbon and Alloy Steel Wire, Rods and Bars for Mechanical Fasteners*

3.0 Definitions

3.1 Carbon Steel: see IFI-140

3.2 Alloy Steel: see IFI-140

3.3 Stainless Steel

With almost complete conformance, stainless steels are a family of ferrous alloys which contain at least 11.5 percent chromium.

3.3.1 Austenitic Stainless Steel. Austenitic stainless steel is commercially referred to as "18-8 series" and the "300 series". They are characterized by having a chemical composition of approximately 18% chromium and 8% nickel. They cannot be hardened by heat treatment and may be strengthened by cold working. They are nonmagnetic, but can become slightly magnetic when cold worked.

3.3.2 Ferritic Stainless Steel. These are iron-chromium alloys referred to as 400 series, having no intentionally added nickel. They have low carbon content with no response to heat treatment and only a light response to cold working. They are all ferro magnetic.

3.3.3 Martensitic Stainless Steel. These are iron-chromium alloys also referred to as 400 series with 12-17 percent chromium and sufficient carbon content to provide response to heat treatment. They are all ferro magnetic.

3.4 Annealing

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A process of heating to and holding stainless steel at a given temperature for a given time and then cooling at a given rate. Used to soften and/or produce changes in the microstructure of the steel to enhance formability and reduce tensile strength.

3.5 Sensitization

Caution: When considering thermal treatments, the effect of these heat treatments on corrosion resistance should be taken into account. Sensitization can lead to catastrophic intergranular corrosion.

3.6 Passivation

A chemical treatment of the metal surface to remove surface contaminants and to form a protective film chrome-oxide on finished fasteners.

3.7 Wire

3.7.1 CF Annealed wire annealed in process (AIP) and cold drawn to finished size is intended for direct feeding into a cold forming machine.

3.7.2 CF Annealed wire annealed at finished (AFS) size is intended for in-line drawing prior to feeding into a cold forming machine.

3.8 Rod

Rod in hot rolled coils is annealed, cleaned (descaled), and coated and is intended for in-line drawing prior to feeding into a cold forming machine.

3.9 Warm Forming

Warm forming is forming at elevated temperatures that are typically in the 400°F-800°F range.

3.10 Seam Free

Seam free refers to wire or rod which has experienced surface removal.

4.0 Manufacture

4.1 *Melting Practice:* Stainless steel is typically melted in an electric furnace process and is usually further vessel refined.

4.2 *Casting Practice:* Stainless steel may be ingot cast, or continuous cast with controlled procedures to meet the requirements of this specification.

4.3 Thermal Treatment

4.3.1 Material is furnished with thermal treatment. Material may be ordered as follows:

4.3.1.1 Wire or Rod

4.3.1.1.1 Solution Annealed (Austenitic Alloys)

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