



Designation: F2282 – 23

Standard Specification for Quality Assurance Requirements for Carbon and Alloy Steel Wire, Rods, and Bars for Mechanical Fasteners¹

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1. Scope*

1.1 This specification establishes quality assurance requirements for the physical, mechanical, and metallurgical requirements for carbon and alloy steel wire, rods, and bars in coils intended for the manufacture of mechanical fasteners which includes: bolts, nuts, rivets, screws, washers, and special parts manufactured cold.

NOTE 1—The Steel Industry uses the term “quality” to designate characteristics of a material which make it particularly well suited to a specific fabrication and/or application and does not imply “quality” in the usual sense.

1.2 Wire size range includes 0.062 to 1.375 in.

1.3 Rod size range usually includes $\frac{7}{32}$ in. (0.219) to $\frac{47}{64}$ in. (0.734) and generally offered in $\frac{1}{64}$ increments (0.0156).

1.4 Bar size range includes $\frac{3}{8}$ in. (0.375) to 1½ in. (1.500).

1.5 Sizes for wire, rod and bar outside the ranges of paragraphs 1.2 – 1.4 may be ordered by agreement between purchaser and supplier.

1.6 Material is furnished in many application variations. The purchaser should advise the supplier regarding the manufacturing process and finished product application as appropriate. Five application variations are:

- Cold Heading
- Recessed Head
- Socket Head
- Scrapless Nut
- Tubular Rivet

1.6.1 Wire is furnished for all five application variations.

1.6.2 Rod and bar are furnished to the single application variation; Cold Heading.

1.7 *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.*

¹ This specification is under the jurisdiction of ASTM Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.93 on Quality Assurance Provisions for Fasteners.

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2. Referenced Documents

2.1 ASTM Standards:²

A29/A29M Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought

A370 Test Methods and Definitions for Mechanical Testing of Steel Products

A700 Guide for Packaging, Marking, and Loading Methods for Steel Products for Shipment

A751 Test Methods and Practices for Chemical Analysis of Steel Products

E4 Practices for Force Calibration and Verification of Testing Machines

E10 Test Method for Brinell Hardness of Metallic Materials

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E112 Test Methods for Determining Average Grain Size

E381 Method of Macroetch Testing Steel Bars, Billets, Blooms, and Forgings

E407 Practice for Microetching Metals and Alloys

E1077 Test Methods for Estimating the Depth of Decarburization of Steel Specimens

F1470 Practice for Fastener Sampling for Specified Mechanical Properties and Performance Inspection

F1789 Terminology for F16 Mechanical Fasteners

2.2 AIAG Standard:

B-5 Primary Metals Tag Application Standard³

2.3 IFI Standard:

IFI-140 Carbon and Alloy Steel Wire, Rods, and Bars for Mechanical Fasteners⁴

2.4 SAE Standards:

J403 Chemical Compositions of SAE Carbon Steels⁵

J404 Chemical Compositions of SAE Alloy Steels⁵

J406 Methods of Determining Hardenability of Steels⁵

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.

³ Available from Automotive Industry Action Group (AIAG), 26200 Lahser Rd., Suite 200, Southfield, MI 48033, <http://www.aiag.org>.

⁴ Available from Industrial Fasteners Institute (IFI), 6363 Oak Tree Blvd, Independence, OH 44131, <http://www.indfast.org>.

⁵ Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, <http://www.sae.org>.

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

J415 Definitions of Heat Treating Terms⁵

3. Terminology

3.1 Definitions:

3.1.1 *annealing*—a process of heating to and holding steel at a given temperature for a given time and then cooling at a given rate, used to soften or produce changes, or both, in the microstructure of the steel to enhance formability and reduce tensile strength.

3.1.2 *bars*—produced from hot rolled or cast billets or blooms rolled single strand into coils. Bars have a greater precision in cross section than rods. Size tolerances are in Table 1. Bars are finished as-rolled, annealed or spheroidize annealed, and in sizes included in 1.4.

3.1.3 *exogenous inclusions*—particles contained in steel resulting from incidental reoxidation, slag entrainment, refractory erosion, or other sources, that can occur during the processes of steel making, refining, and casting.

3.1.4 *lap*—a longitudinal surface discontinuity extending into rod, bar, or wire caused by doubling over of metal during hot rolling.

3.1.5 *lot*—a quantity of raw material of one size and heat number submitted for testing at one time.

3.1.6 *rods*—produced from hot rolled or cast billets, usually rolled in a multiple strand mill to a round cross section then coiled into one continuous length to size tolerances shown in Table 2. Rods are furnished as-rolled, annealed, or spheroidize annealed in sizes found in 1.3.

3.1.7 *seam*—a longitudinal discontinuity extending radially into wire, rod, or bar. Seams in raw material used for the manufacture of fasteners or formed parts may lead to the formation of bursts.

3.1.8 *spheroidizing*—a form of annealing, involves prolonged heating at temperatures near the lower critical temperature, followed by slow cooling, with the object of forming spheroidal metallic carbides that allow a higher degree of formability.

3.1.9 *void*—a shallow pocket or hollow on the surface of the material.

3.1.10 *wire*—produced from hot rolled or annealed rods or bars by cold drawing for the purpose of obtaining desired size, dimensional accuracy, surface finish, and mechanical properties. Wire is furnished in the following conditions: direct drawn (DD); drawn from annealed rod or bar (DFAR or DFAB); drawn from spheroidized annealed rod or bar (DFSR or DFSB); drawn to size and spheroidized (SAFS); drawn,

Diameter, in.	Diameter ± Tolerance, in.	Out of Round max, in.
$\frac{7}{32}$ to $\frac{47}{64}$ (0.219 to 0.734)	0.012	0.018

annealed in process, and finally lightly drawn to size (AIP); and drawn, spheroidize annealed in process, and finally lightly drawn to size (SAIP). Wire size tolerances are shown in Table 3. Sizes include those specified in 1.2.

3.1.10.1 *Discussion*—Spheroidize annealed-at-finish size wire (SAFS) is wire that has been spheroidize annealed after final cold reduction. One or more annealing treatments may precede the final cold reduction.

3.1.10.2 *Discussion*—Annealed-in-Process (AIP) or Spheroidize Annealed-in-Process (SAIP) wire is produced as drawn carbon or alloy steel wire. In producing AIP and SAIP wire, rods or bars are drawn to wire and thermal treatment (followed by a separate cleaning and coating operation) is done prior to final drawing to produce a softer and more ductile wire for applications in which direct drawn wire would be too hard. Thermal treatment may also be employed when controlled mechanical properties are required for a specific application.

3.2 Heat treating terms not defined in this standard are included in Terminology F1789 or SAE J415.

4. Ordering Information

4.1 Wire orders shall state the following:

4.1.1 Quantity,

4.1.2 Specification number and issue date,

4.1.3 Diameter,

4.1.4 Steel grade,

4.1.5 Deoxidation practice and grain size or refinement practice (coarse or fine); see 5.3.1 – 5.3.5,

4.1.6 Application variation per 1.6,

4.1.7 Thermal treatment; see 5.5,

4.1.8 Surface coating,

4.1.9 Coil weight and dimensions as required,

4.1.10 Packaging,

4.1.11 Tagging,

4.1.12 Mill certification as required,

4.1.13 Special requirements, for example, steel making method and practice, specific hardenability, special shipping instructions, single heat, etc., and

4.1.14 *Example*—40 000 lb, ASTM F2282, 0.250 in., carbon steel wire, IFI-1022A, silicon killed coarse grain, Recessed Head, spheroidize annealed-in-process, phosphate and lube, 1500 lb coils, 28 in. coil i.d., on 18 in. tubular carriers, three bands per carrier, one metal tag per coil, mill certification, do not ship Fridays.

Fractional Diameter, in.	Diameter ± Tolerance, in.	Out of Round max, in.
$\frac{7}{16}$ to $\frac{5}{8}$	0.006	0.009
$>\frac{5}{8}$ to $\frac{7}{8}$	0.007	0.011
$>\frac{7}{8}$ to 1	0.008	0.012
>1 to $1\frac{1}{8}$	0.009	0.014
$>1\frac{1}{8}$ to $1\frac{1}{4}$	0.010	0.015
$>1\frac{1}{4}$ to $1\frac{3}{8}$	0.011	0.017
$>1\frac{3}{8}$ to $1\frac{1}{2}$	0.013	0.020

Diameter, in.	Diameter ± Tolerance, in.	Out of Round max, in.
< 0.076	0.0010	0.0010
0.076 < 0.500	0.0015	0.0015
≥ 0.500	0.0020	0.0020