



Designation: A805/A805M – 09 (Reapproved 2021)

Standard Specification for Steel, Flat Wire, Carbon, Cold-Rolled¹

This standard is issued under the fixed designation A805/A805M; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers carbon steel flat wire in coils or cut lengths. Flat wire is classified as a cold-rolled section, rectangular in shape, 0.500 in. [12.7 mm] or less in width and under 0.250 in. [6.35 mm] in thickness.

1.2 Low-carbon steel flat wire is produced from steel compositions with a maximum carbon content of 0.25 % by cast or heat analysis.

1.3 Carbon spring steel flat wire is produced to a carbon range in which the specified or required maximum is over 0.25 % by cast or heat analysis.

1.3.1 Two types of carbon spring steel flat wire are produced:

1.3.1.1 Untempered cold-rolled carbon spring steel flat wire, produced to several desirable combinations of properties and

1.3.1.2 Hardened and tempered carbon spring steel wire.

1.4 Definite application flat wire is a product developed for a specific application and may be specified only by size and descriptive name.

1.5 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 the other, and values from the two systems shall not be combined.

1.6 *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 A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.19 on Steel Sheet and Strip.

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2. Referenced Documents

2.1 ASTM Standards:²

A370 Test Methods and Definitions for Mechanical Testing of Steel Products

A510 Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel (Metric) A0510_A0510M

A510M Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel (Metric) (Withdrawn 2011)³

A751 Test Methods and Practices for Chemical Analysis of Steel Products

E45 Test Methods for Determining the Inclusion Content of Steel

E112 Test Methods for Determining Average Grain Size

E140 Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness

2.2 Military Standard:⁴

MIL-STD-129 Marking for Shipment and Storage

2.3 Federal Standard:⁴

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)

2.4 SAE Standard:⁵

Recommended Practice SAE J 419 Methods of Measuring Decarburization

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *annealing*—the process of heating to and holding at a suitable temperature and then cooling at a suitable rate, for such purposes as reducing hardness, facilitating cold working,

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 The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, <http://quicksearch.dla.mil>.

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

producing a desired microstructure, or obtaining desired mechanical, physical, or other properties.

3.1.2 *batch annealing*—annealing that is generally performed in large cylindrical bell type or large rectangular box or car-type furnaces; the product is protected from scaling and decarburization by the use of a controlled atmosphere that envelops the charge in an inner chamber sealed to prevent the influx of air or products of combustion; the coils or bundles are heated to a temperature in the vicinity of the lower critical temperature for the grade of steel, and held at that temperature for a definite length of time; after which the steel is allowed to cool slowly to room temperature; the time of holding at the annealing temperature varies with the grade of the steel and the desired degree of softness.

3.1.3 *continuous or strand annealing*—annealing that consists of passing a number of individual strands of flat wire continuously through either a muffle furnace or a bath of molten lead or salt, thus heating the flat wire to the desired temperature for a definite time; the hardness obtained by this type of annealing, as measured by Rockwell hardness number, is normally somewhat higher than is secured by batch-type annealing; other characteristics peculiar to strand-annealed steel require this type of annealing for some flat wire products.

3.1.4 *salt annealing*—annealing that is accomplished by immersing bundles or coils of flat wire in a molten salt bath at a desired temperature for a definite time; following the annealing, the coils are permitted to cool slowly, after which they are immersed in hot water to remove any adhering salts.

3.1.5 *spheroidize annealing*—an operation consisting of prolonged heating and prolonged cooling cycles to produce a globular or spheroidal condition of the carbide for maximum softness.

3.1.6 *cold reduction*—the process of reducing the thickness of the strip at room temperature. The amount of reduction is greater than that used in skin-rolling.

3.1.7 *finish*—the degree of smoothness or lustre of the flat wire. The production of specific finishes requires special preparation and control of the roll surfaces employed.

3.1.8 *hardening and tempering*—a heat treatment for steel over 0.25 % carbon by cast or heat analysis involving continuous strand heating at finish size to an appropriate temperature above the critical temperature range, followed by quenching in oil and finally passing the strands through a tempering bath; this heat treatment is used in the production of such commodities as oil-tempered spring wire for use in certain types of mechanical springs that are not subjected to a final heat treatment after forming; oil-tempered wire is intended primarily for the manufacture of products that are required to withstand high stresses; the mechanical properties and resiliency of oil-tempered wire provide resistance to permanent set under repeated and continuous stress applications.

3.1.9 *patenting*—a thermal treatment usually confined to steel over 0.25 % carbon; in this process individual strands of rods or wire are heated well above the upper critical temperature followed by comparatively rapid cooling in air, molten salt, or molten lead; this treatment is generally employed to prepare the material for subsequent processing.

3.1.10 *skin-rolled*—a term denoting a relatively light cold-rolling operation following annealing; it serves to reduce the tendency of the steel to flute or stretcher strain during fabrication; it is also used to impart surface finish, or affect hardness or other mechanical properties.

3.1.11 *temper*—a designation by number to indicate the hardness as a minimum, as a maximum, or as a range; the tempers are obtained by the selection and control of chemical composition, by amounts of cold reduction, and by thermal treatment.

4. Ordering Information

4.1 Orders for material to this specification shall include the following information, as necessary, to describe adequately the desired product:

- 4.1.1 Quantity,
- 4.1.2 Name of material (flat wire identified by type),
- 4.1.3 Analysis or grade, if required (Section 6),
- 4.1.4 Temper of low carbon or type of spring steel (Sections 9, 10, and 11),
- 4.1.5 Edge (Section 7),
- 4.1.6 Finish or coating (Sections 14 and 12),
- 4.1.7 Dimensions,
- 4.1.8 Coil type and size requirements (Section 17),
- 4.1.9 Packaging (17.1),
- 4.1.10 Condition (oiled or not oiled) (14.4),
- 4.1.11 ASTM designation and date of issue,
- 4.1.12 Copper-bearing steel, if required,
- 4.1.13 Application (part identification or description),
- 4.1.14 Case or heat analysis (request, if desired), and
- 4.1.15 Exceptions to the specification, if required.

NOTE 1—A typical ordering description is as follows: 18 000 lb [8000 kg] Low-Carbon Cold-Rolled Carbon Steel Flat Wire, Temper 4, Edge 4, Finish 2, 0.125 by 0.450-in. [3.18 by 11.4 mm] vibrated coils, 2000 lb [900 kg] max, coil weight, 16 to 20 in. [410 to 510 mm] ID, 36 in. [915 mm] max OD, Face dimension 6 to 10 in. [150 to 250 mm], ASTM A805/A805M – 09, for Stove Frames.

5. Materials and Manufacture

5.1 Low-carbon steel flat wire is normally produced from rimmed, capped, or semi-killed steel. When required, killed steel may be specified, with silicon or aluminum as the deoxidizer.

5.2 Untempered-carbon spring steel flat wire is commonly produced from killed steel, although semi-killed steel is sometimes used.

5.3 Hardened and tempered carbon spring steel flat wire customarily has a carbon content over 0.60 %.

5.4 Flat wire is generally produced from hot-rolled rods or round wire, by one or more cold-rolling operations, primarily for the purpose of obtaining the size and section desired and for improving surface finish, dimensional accuracy, and varying mechanical properties. Flat wire can also be produced from slitting hot- or cold-rolled flat steel to the desired width. The hot-rolled slit flat steel is subsequently cold reduced. The width to thickness ratio and the specified type of edge generally determine the process that is necessary to produce a specific flat-wire item.