



## Designation: **A713 – 04 (Reapproved 2010) A713 – 04 (Reapproved 2017)**

# Standard Specification for Steel Wire, High-Carbon Spring, for Heat-Treated Components<sup>1</sup>

This standard is issued under the fixed designation A713; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification covers round carbon spring steel wire in coils intended for the manufacture of mechanical springs and wire forms that are heat treated (austenitized, quenched, and tempered) after fabrication.

1.2 The values stated in inch-pound units are to be regarded as the standard.

## 2. Referenced Documents

2.1 *ASTM Standards*:<sup>2</sup>

[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](#)

[A700 Guide for Packaging, Marking, and Loading Methods for Steel Products for Shipment](#)

[A941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys](#)

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

[E30 Test Methods for Chemical Analysis of Steel, Cast Iron, Open-Hearth Iron, and Wrought Iron \(Withdrawn 1995\)](#)<sup>3</sup>

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

[E350 Test Methods for Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron](#)

[E527 Practice for Numbering Metals and Alloys in the Unified Numbering System \(UNS\)](#)

2.2 *Society of Automotive Engineers Standard*:<sup>4</sup>

[J 1086 Numbering Metals and Alloys](#)

2.3 *AIAG Standard*:<sup>5</sup>

[AIAGB-5 02.00 Primary Metals Identification Tag Application Standard](#)

## 3. Terminology

3.1 *Definitions*:

3.1.1 *heat-treated components*—mechanical springs or wire forms that are austenitized, quenched, and tempered after fabrication.

3.2 Refer to Terminology [A941](#) for a more detailed description of heat-treating terms.

## 4. Ordering Information

4.1 It shall be the responsibility of the purchaser to specify all requirements that are necessary for material under this specification. Such requirements include, but are not limited to, the following:

4.1.1 Quantity (weight),

4.1.2 Name of material (Sections 1 and 7),

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.03 on Steel Rod and Wire.

Current edition approved April 1, 2010/March 15, 2017. Published April 2010/March 2017. Originally approved in 1975. Last previous edition approved in 2004/2010 as A713 – 04/A713 – 04 (2010). DOI: 10.1520/A0713-04R10.10.1520/A0713-04R17.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

<sup>4</sup> Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

<sup>5</sup> Available from Automotive Industry Action Group (AIAG), 26200 Lahser Rd., Suite 200, Southfield, MI 48033, <http://www.aiag.org>.

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

- 4.1.3 Diameter (Table 1),
- 4.1.4 Packaging, marking, and loading (Section 12),
- 4.1.5 ASTM designation and date of issue,
- 4.1.6 Special requirements (Sections 8 and 9), and
- 4.1.7 End use.

NOTE 1—A typical ordering description is as follows: Steel Wire, High Carbon Spring, for Heat-Treated Components, Grade 1070, to ASTM A713 dated \_\_\_\_\_, for Door Closer Springs, 30 000 lb, Size 0.250 in. in 500-lb Catch Weight Coils.

## 5. General Requirements for Delivery

5.1 Material furnished under this specification shall conform to the applicable requirements of the latest edition of Specification **A510** unless otherwise specified herein.

## 6. Materials and Manufacture

- 6.1 The steel shall be made by the open-hearth, basic-oxygen, or electric-furnace process.
- 6.2 The wire, prior to fabrication, shall be thermally treated or thermally treated and drawn.
- 6.3 The condition or wire (metallurgical and mechanical properties) to be used is at the discretion of the purchaser and is generally dependent on the severity of the component part to be formed.

## 7. Chemical Composition

- 7.1 The steel shall conform to the requirements for chemical composition prescribed in Table 2 for the grade ordered.
- 7.2 A chemical composition other than those shown in Table 2 may be supplied when agreed upon by the manufacturer and purchaser.
- 7.3 An analysis of each cast or heat shall be made by the manufacturer to determine the percentage of elements specified in Table 2. The chemical composition thus determined shall be reported to the purchaser or his representative upon request.
- 7.4 A product analysis may be made by the purchaser. The chemical composition thus determined, as to elements required or restricted, shall conform to permissible variations for product analysis as specified in Table 10 in Specification **A510**. For referee purposes, Test Methods **E30** or Test Methods **E350** shall be used.

## 8. Metallurgical Structure

8.1 Austenitic grain size, when specified, shall be determined in accordance with the requirements of Test Methods **E112** or some other mutually agreeable method.

## 9. Mechanical Properties

9.1 Tensile strength is not normally a requirement. Minimum or maximum values for tensile strength may be agreed upon between the purchaser and manufacturer and are dependent on the chemical composition, thermal treatment, and diameter of wire specified.

### 9.2 Wrap Test:

9.2.1 *Requirements*—Wire shall wind without fracture on a cylindrical mandrel of a diameter specified in Table 3. The wrap test is not applicable to wires over 0.312 in. (8 mm). Since the conventional methods will not accommodate wire sizes over 0.312 in., an alternative test procedure may be agreed upon between the purchaser and manufacturer.

9.2.2 *Number of Tests*—At least one test specimen shall be taken for each ten coils or fraction thereof in a lot.

9.2.3 *Location of Test*—The test specimen shall be taken from either end of the coil.

9.2.4 *Test Method*—The wrap test shall be made in accordance with Supplement IV of Test Methods and Definitions **A370**.

**TABLE 1 Permissible Variations in Wire Diameter**

NOTE 1—For purposes of determining conformance with this specification, all specified limits are considered absolute as defined in Practice **E29**.

| Diameter, in. (mm)                        | Permissible Variations, Plus and Minus, in. (mm) | Permissible Out-of-Round, in. (mm) |
|-------------------------------------------|--------------------------------------------------|------------------------------------|
| 0.035 to 0.075 (0.89 to 1.90), incl       | 0.001 (0.03)                                     | 0.001 (0.03)                       |
| Over 0.075 to 0.375 (1.90 to 9.52), incl  | 0.002 (0.05)                                     | 0.002 (0.05)                       |
| Over 0.375 to 0.625 (9.52 to 15.88), incl | 0.003 (0.08)                                     | 0.003 (0.08)                       |