



Designation: A713 – 24

Standard Specification for Steel Wire, High-Carbon Spring, for Heat-Treated Components¹

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 (ϵ) 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.

1.3 *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

[A370 Test Methods and Definitions for Mechanical Testing of Steel Products](#)

[A510/A510M Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel](#)

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

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

[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](#)

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

2.2 *Society of Automotive Engineers Standard:*³

[J 1086 Numbering Metals and Alloys](#)

2.3 *AIAG Standard:*⁴

[AIAGB-10 02.00 Trading Partner Labels Implementation Guideline](#)

3. Terminology

3.1 *Definitions:*

3.1.1 Refer to Terminology [A941](#) for definitions of terms not in [3.2](#).

3.2 *Definitions of Terms Specific to This Standard:*

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

3.2.2 *out-of-round, n*—the difference between the maximum diameter and the minimum diameter on the same cross section.

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](#)),
- 4.1.3 Diameter (Section [10](#)),
- 4.1.4 Packaging, marking, and loading (Section [15](#)),
- 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/A510M](#) unless otherwise specified herein.

³ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

⁴ Available from Automotive Industry Action Group (AIAG), 4400 Town Center, Southfield, MI, 48075. <http://www.aiag.org>.

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 [A01.03](#) on Steel Rod and Wire.

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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.

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

6. Materials and Manufacture

6.1 The steel shall be made by any commercially accepted steelmaking 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 1** for the grade ordered.

TABLE 1 Chemical Composition

NOTE 1— The following ranges of silicon are commonly specified for high-carbon steels: 0.10 % to 0.20 %; 0.15 % to 0.30 %; 0.20 % to 0.40 %; or 0.30 % to 0.60 %.

UNS Designation ^A	Grade	Composition, %			
		Carbon	Manganese	Phosphorus, max	Sulfur, max
G 10550	1055	0.50–0.60	0.60–0.90	0.040	0.050
G 10590	1059	0.55–0.65	0.50–0.80	0.040	0.050
G 10600	1060	0.55–0.65	0.60–0.90	0.040	0.050
G 10640	1064	0.60–0.70	0.50–0.80	0.040	0.050
G 10650	1065	0.60–0.70	0.60–0.90	0.040	0.050
G 10690	1069	0.65–0.75	0.40–0.70	0.040	0.050
G 10700	1070	0.65–0.75	0.60–0.90	0.040	0.050
G 10740	1074	0.70–0.80	0.50–0.80	0.040	0.050
G 10750	1075	0.70–0.80	0.40–0.70	0.040	0.050
G 10780	1078	0.72–0.85	0.30–0.60	0.040	0.050
G 10800	1080	0.75–0.88	0.60–0.90	0.040	0.050
G 10840	1084	0.80–0.93	0.60–0.90	0.040	0.050
G 10860	1086	0.80–0.93	0.30–0.50	0.040	0.050
G 10900	1090	0.85–0.98	0.60–0.90	0.040	0.050
G 10950	1095	0.90–1.03	0.30–0.50	0.040	0.050
G 15610	1561	0.55–0.65	0.75–1.05	0.040	0.050
G 15660	1566	0.60–0.71	0.85–1.15	0.040	0.050
G 15720	1572	0.65–0.76	1.00–1.30	0.040	0.050

^A Designation established in accordance with Practice **E527** and SAE J 1086.

7.2 A chemical composition other than those shown in **Table 1** 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 1**. 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 3** in Specification **A510/A510M**. For referee purposes, Test Methods and Practices **A751** shall be used.

8. Metallurgical Structure

8.1 Austenitic grain size, when specified, shall be determined in accordance with the requirements of Specification **A510/A510M** or some 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 2**. The

TABLE 2 Wrap Test Requirements

Wire Diameter, in. (mm)	Mandrel Sizes	
	Grades to 1090	Grades 1090 and Over
Up to 0.162 (4)	1× ^A	2×
Over 0.162 to 0.312 (4 to 8), incl	2×	3×

^A The symbol × represents the diameter of the wire tested. For 1× mandrel, wire may be wrapped around itself.

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 Annex A4 of Test Methods and Definitions **A370**.

10. Dimensions and Tolerances

10.1 The diameter of the wire shall not vary from the specified size by more than the tolerance shown in **Table 3**.

TABLE 3 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)

11. Workmanship

11.1 The surface of the wire as received shall be substantially free of rust and such other surface imperfections of a nature or degree, for the grade ordered, that will be detrimental to the fabrication of the parts.

11.2 Wire drawn as a final operation shall not be kinked or improperly cast. To test for a cast, a single convolution, or ring, of wire shall be cut from the bundle and placed on a flat