Designation: ~~A713 – 04 (Reapproved 2017)~~ A713 – 24

Standard Specification for Steel Wire, High-Carbon Spring, for Heat-Treated Components[1]

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~~ 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~~A510/A510M Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon ~~Steel (Metric) A0510_A0510M~~ 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

~~E30 Test Methods for Chemical Analysis of Steel, Cast Iron, Open-Hearth Iron, and Wrought Iron (Withdrawn 1995)[3]~~

~~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:*[3]

J 1086 Numbering Metals and Alloys

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[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.

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

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

2.3 *AIAG Standard:*[4]

~~AIAGB-5~~AIAGB-10 02.00 ~~Primary Metals Identification Tag Application Standard~~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:*~~*Definitions of Terms Specific to This Standard:*

3.2.1 *heat-treated* ~~*components*~~—*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.

~~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),

4.1.3 Diameter ~~(~~(Section~~Table 1~~ 10),

4.1.4 Packaging, marking, and loading (Section ~~12~~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~~30 000 lb, Size 0.250 in. in 500-lb Catch Weight Coils.

TABLE ~~1~~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)

[4] Available from Automotive Industry Action Group (AIAG), ~~26200 Lahser Rd., Suite 200, Southfield, MI 48033,~~4400 Town Center, Southfield, MI, 48075. http://www.aiag.org.

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~~A510/A510M unless otherwise specified herein.

6. Materials and Manufacture

6.1 The steel shall be made by ~~the open-hearth, basic-oxygen, or electric-furnace~~ 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 ~~2~~1 for the grade ordered.

TABLE ~~2~~1 Chemical Composition

NOTE 1— The following ranges of silicon are commonly specified for high-carbon steels: ~~0.10~~0.10 % to 0.20 %; ~~0.15~~0.15 % to 0.30 %; ~~0.20~~0.20 % to 0.40 %; or ~~0.30~~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 ~~2~~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 ~~2~~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 ~~10~~3 in Specification ~~A510~~A510/A510M. For referee purposes, Test Methods ~~E30 or Test~~and Practices A751 ~~Methods E350~~shall be used.