



Standard Specification for Steel Springs, Helical, Heat-Treated¹

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ε¹ NOTE—Paragraph 4.4.1 was added and the year date changed in January 1996.

1. Scope

1.1 This specification covers hot-coiled, heat-treated helical compression springs with tapered, closed, squared and ground ends made of hot-wrought round steel bars $\frac{3}{8}$ in. (9.5 mm) and larger in diameter.

1.2 This specification also serves to inform the user of practical manufacturing limits, mechanical tests, and inspection requirements applicable to the type of spring described in 1.1.

1.3 Supplementary Requirements S1 to S8 inclusive of an optional nature are provided. They shall apply only when specified by the purchaser. Details of these supplementary requirements shall be agreed upon by the manufacturer and purchaser.

1.4 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only).

2. Referenced Documents

2.1 ASTM Standards:

A 29/A 29M Specification for Steel Bars, Carbon and Alloy, Hot-Wrought and Cold-Finished, General Requirements for²

A 689 Specification for Carbon and Alloy Steel Bars for Springs²

E 10 Test Method for Brinell Hardness of Metallic Materials³

E 112 Test Methods for Determining Average Grain Size³

E 709 Guide for Magnetic Particle Examination⁴

3. Ordering Information

3.1 Orders for springs under this specification shall include the following information:

3.1.1 Quantity,

3.1.2 Name of material,

3.1.3 A drawing or list showing required dimensions and loads, and part number,

3.1.4 Packaging, marking and loading, and

3.1.5 End use.

NOTE 1—A typical ordering description is: 500 springs Drawing 3303 Rev. A. to ASTM A 125, 1095 steel, for cyclical machine operation. Palletize, maximum weight 4000 lb.

4. Materials and Manufacture

4.1 Material:

4.1.1 Unless otherwise specified, the springs shall be made of carbon steel bars conforming to the requirements of Specification A 689. Due to hardenability limitations of carbon steel, it is suggested that the bar diameter be limited to $1\frac{5}{8}$ in. (41.8 mm) max in order to withstand the maximum test stress requirements of this specification.

4.1.2 If alloy steel is specified, the springs shall be made from alloy steel bars conforming to Specification A 689. Any of the alloy steel grades referred to may be used at the option of the spring manufacturer, providing that a minimum as-quenched hardness of Rockwell HRC-50 will be achieved at the center of the bar section representing the spring when quenched in the same media and manner as the spring.

4.1.3 *Springs Made from Bars Over 2 in. (50.8 mm)*—Note that the bias tolerance (reference A29/A 29M, Table A1.1 on Permissible Variations in Cross Section for Hot-Wrought Round, Square, and Round-Cornered Square Bars of Steel) of the bar diameter shall be taken into consideration when designing and calculating the solid height, spring rate, solid stress, and solid capacity.

4.2 Hardness:

4.2.1 The springs must be quenched and tempered to a sufficiently high hardness (strength) to withstand the stresses developed in testing the finished spring. The maximum hardness shall not exceed 477 Brinell numbers (2.80 mm indentation diameter).

4.2.2 When hardness limits are specified, the total range or spread may not be less than 0.15 mm difference in indentation diameters. The specified or indicated minimum hardness must be sufficient to develop the required strength to withstand the solid stresses of the spring design involved.

4.2.3 Hardness shall be read on a prepared flat surface in an area not detrimental to the life of the spring at a full section

¹ This specification is under the jurisdiction of ASTM Committee A-1 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.15 on Bars.

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² Annual Book of ASTM Standards, Vol 01.05.

³ Annual Book of ASTM Standards, Vol 03.01.

⁴ Annual Book of ASTM Standards, Vol 03.03.