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Designation: A231/A231M - 10 A231/A231M - 15

Standard Specification for Chromium-Vanadium Alloy Steel Spring Wire¹

This standard is issued under the fixed designation A231/A231M; 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 round and shaped chromium-vanadium alloy steel spring wire having properties and quality intended for the manufacture of springs used at moderately elevated temperatures. This wire shall be either in the annealed and cold-drawn or oil-tempered condition as specified by the purchaser.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.2.1 Within the text, the inch-pound units are shown in brackets.

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, Practices, and Terminology for Chemical Analysis of Steel Products

A752 Specification for General Requirements for Wire Rods and Coarse Round Wire, Alloy Steel (Withdrawn 2011)³

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

3. Ordering Information

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

- 3.1.1 Quantity (mass),
- 3.1.2 Name of material (chromium-vanadium alloy steel wire), 60b-4f4b-8291-8672cfB7fB0/astm-a231-a231m-15
- 3.1.3 Wire diameter (Table 1 and Section 8),
- 3.1.4 Packaging (Section 14),
- 3.1.5 Heat analysis report (if requested) (5.2),
- 3.1.6 Certification or test report, or both, if specified (Section 13), and
- 3.1.7 ASTM designation and date of issue.

NOTE 1—A typical ordering description is as follows: 20 000 kg oil-tempered chromium-vanadium alloy steel wire, size 6.00 mm in 150-kg coils to ASTM A231/A231M dated______, or for inch-pound units, 40 000 lb oil-tempered chromium-vanadium alloy steel spring wire, size 0.250 in. in 350-lb coils to ASTM A231/A231M dated______.

4. Materials and Manufacture

4.1 The steel may be made by any commercially accepted steel-making process. The steel may be either ingot cast or strand cast.

4.2 The finished wire shall be free from detrimental pipe and undue segregation.

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.

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TABLE 1 Tensile Requirements^A

| Diameter, ^e mm MPa, min MPa, max min, % 0.50 2060 2280 0 0.60 2030 2220 0 0.65 2010 2200 0 0.65 2010 2200 0 0.65 2010 2200 0 0.60 1980 2140 0 0.80 1980 2140 0 0.90 1960 2120 0 1.00 1940 2100 0 1.10 1920 2080 0 1.20 1900 2060 0 1.40 1860 1980 0 2.20 1750 1930 0 2.50 1720 1860 45 3.00 1660 1830 45 3.00 1660 1830 40 5.50 1440 1580 40 5.50 1440 1580 40 1.00 | | SI Units | | Reduction of Areas, |
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^A Tensile strength values for intermediate diameters may be interpolated.

^B Preferred sizes. For a complete list, refer to ANSI B 32.4M.

⁶ The reduction of area test is not applicable to wire diameters under 2.34 mm [0.092 in.] in diameter.

5. Chemical Composition

5.1 The steel shall conform to the requirements of Grade 6150 for chemical composition specified in Table 2.

| TABLE 2 Chemical Requirements | | | | | |
|-------------------------------|-------------|--|--|--|--|
| Element | Analysis, % | | | | |
| Carbon | 0.48–0.53 | | | | |
| Manganese | 0.70-0.90 | | | | |
| Phosphorus | 0.035 max | | | | |
| Sulfur | 0.040 max | | | | |
| Silicon | 0.15-0.35 | | | | |
| Chromium | 0.80-1.10 | | | | |
| Vanadium | 0.15 min | | | | |