Designation: A 809 – 08

# Standard Specification for Aluminum-Coated (Aluminized) Carbon Steel Wire[1]

This standard is issued under the fixed designation A 809; 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 Department of Defense.*

## 1. Scope*

1.1 This specification covers soft, medium, and hard temper carbon steel wire coated with aluminum by a hot-dip process, supplied in coils for general use.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

## 2. Referenced Documents

2.1 *ASTM Standards:* [2]

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products

A 428/A 428M Test Method for Weight [Mass] of Coating on Aluminum-Coated Iron or Steel Articles

A 700 Practices for Packaging, Marking, and Loading Methods for Steel Products for Shipment

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

2.2 *U.S. Military Standards:*[3]

MIL-STD-129 Marking for Shipment and Storage

MIL-STD-1188 Commercial Packaging of Supplies and Equipment

2.3 *U.S. Federal Standard:*

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)[3]

## 3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *carbon steel*—steel is considered to be carbon steel (*1*) when no minimum content is specified or required for aluminum, chromium, cobalt, columbium, molybdenum, nickel, titanium, tungsten, vanadium, or zirconium or any other element is added to obtain a desired alloying effect; (*2*) when the specified minimum copper content does not exceed 0.40 %; or (*3*) when the maximum specified content for any of the following elements does not exceed these percentages: manganese 1.65, silicon 0.60, or copper 0.60.

3.1.2 *aluminum-coated (aluminized) wire*—aluminum-coated (aluminized) wire is produced by passing individual wires through a bath of molten aluminum, after first being properly preheated, cleaned, and pickled.

3.1.3 *temper—as applied to aluminum-coated (aluminized) wire*, pertains to stiffness or resistance to bending. It has customarily been expressed by tensile strength as shown in the three ranges given in Table 1. The temper of a given chemical composition can be controlled by the use of a different thermal treatment for each temper. Different properties can also be obtained by varying the chemical composition for a given thermal treatment. A thorough understanding of the end use of the wire, which involves both tensile strength and ductility, should be reached between the user and the manufacturer of the aluminum-coated (aluminized) wire. Requirements for both chemical composition and mechanical properties may be technologically impracticable.

## 4. Ordering Information

4.1 Orders for material under this specification should include the following information:

4.1.1 Quantity (weight in pounds (kilograms)),

4.1.2 Coated wire diameter, expressed to 0.001 in. (0.025 mm),

4.1.3 Name of material (aluminum-coated carbon steel wire),

4.1.4 Temper (soft, medium, or hard) (Table 1),

4.1.5 Packaging requirements, and

4.1.6 ASTM designation and year of issue.

[1] This specification is under the jurisdiction of ASTM Committee A05 on Metallic-Coated Iron and Steel Products and is the direct responsibility of Subcommittee A05.12 on Wire Specifications.

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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 Standardization Documents Order Desk, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

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

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**TABLE 1 Tensile Strength for Temper Designation**

| Wire Diameter, in. (mm) | Tensile Strength, ksi (MPa)[A] | | |
|---|---|---|---|
| | Soft Temper | Medium Temper | Hard Temper |
| 0.080 to under 0.106 (2.03 to 2.69) | 75 max (515 max) | 70 to 95 (485 to 655) | 85 to 115 (585 to 795) |
| 0.106 to 0.176, incl (2.69 to 4.47) | 70 max (485 max) | 65 to 90 (450 to 620) | 80 to 110 (550 to 760) |
| Over 0.176 (over 4.47) | 70 max (485 max) | 60 to 85 (415 to 585) | 75 to 105 (515 to 725) |

[A]For the purpose of determining conformance with this specification, an observed value shall be rounded to the nearest 1 ksi in accordance with the rounding method of Practice E 29.

NOTE 1—A typical ordering description is as follows: 40 000 lb, 0.148-in. aluminum-coated carbon steel wire, medium temper, in 500- to 600-lb catch-weight coils on tubular carriers to ASTM A 809–88.

## 5. Materials and Manufacture

5.1 The steel rod from which the wire is produced shall be manufactured by any commercially accepted steel making practice.

5.2 The ingot or pig aluminum used for coating shall conform to the following impurity limits:

| | max, % |
|---|---|
| Copper | 0.10 |
| Iron | 0.50 |

## 6. Mechanical Properties

6.1 The aluminum-coated wire shall meet the tensile strength in accordance with Table 1 when tested in accordance with Test Methods and Definitions A 370.

6.2 Test specimens containing a weld or an obvious defect shall be discarded and another test specimen obtained to verify conformance to the tensile strength requirements.

## 7. Dimensions and Tolerances

7.1 The permissible variation in diameter of the aluminum-coated wire as represented by the test specimens shall be in accordance with Table 2.

**TABLE 2 Dimensions, Tolerances, and Minimum Weight of Aluminum Coating per Unit Area of Uncoated Wire Surface**

| Specified Wire Diameter, in. (mm)[A] | Tolerance, ±in. (mm)[B] | Minimum Weight of Aluminum Coating, oz/ft$^2$(g/m$^2$) |
|---|---|---|
| 0.080 to under 0.092 (2.03 to under 2.34) | 0.004 (0.10) | 0.30 (92) |
| 0.092 to under 0.106 (2.34 to under 2.69) | 0.004 (0.10) | 0.32 (98) |
| 0.106 to under 0.148 (2.69 to under 3.76) | 0.004 (0.10) | 0.35 (107) |
| 0.148 to under 0.244 (3.76 to under 6.20) | 0.004 (0.10) | 0.40 (122) |
| 0.244 (6.20) | 0.005 (0.13) | 0.40 (122) |

[A]For the purpose of determining conformance with this specification, an observed value shall be rounded to the nearest 0.001 in., in accordance with the rounding method of Practice E 29.

[B]It is recognized that the surfaces of heavy aluminum coatings, particularly those produced by the hot dip process, are not perfectly smooth. If the tolerances shown in this table are rigidly applied to such irregularities that are inherent to the product, unjustified rejections of wire that would actually be satisfactory for use could occur. Therefore, it is intended that these tolerances be used in gaging the uniform areas of the aluminized wire.

## 8. Weight of Coating

8.1 The aluminum-coated wire as represented by the test specimens tested in accordance with Test Method A 428, shall have a minimum weight of aluminum coating in accordance with Table 2.

## 9. Adherence of Coating

9.1 The aluminum-coated wire as represented by the test specimens shall be capable of being wrapped in a close helix at a rate not exceeding 15 turns/min around a cylindrical steel mandrel having a diameter equal to three times the nominal diameter of the coated wire under test, without cracking or flaking the aluminum coating to such an extent that any aluminum can be removed by rubbing with the bare fingers.

9.2 Loosening or detachment during the adhesion test of superficial, small particles of aluminum formed by mechanical polishing of the surface of the aluminum-coated wire shall not be considered cause for rejection.

## 10. Workmanship

10.1 The aluminum-coated wire shall be free of slivers, scale, and other imperfections not consistent with good commercial practice. The coating shall be continuous and reasonably uniform. To ensure large continuous length coils, welds may be present in the finished wire.

## 11. Number of Tests and Retests

11.1 A lot shall consist of all of the coils of wire of the same size, type and class, and shall be offered for inspection at one time. A wire sample of sufficient length, approximately 4 ft. (1.2 m), shall be cut from either end of each coil selected for tests described in Sections 6, 8, and 9.

11.2 The number of test specimens taken from the ends of coils during production to assure compliance with Sections 6 and 7 varies with the quality control procedures and the manufacturing facilities of each manufacturer, but is generally not less than 10 % of the coils produced. For the purpose of final product testing, one specimen from every ten coils or fraction thereof in a lot shall be selected at random, or a total of seven specimens, whichever is less.

11.3 Should one or more of the wire specimens fail any requirement, the lot shall be subjected to retest. For retest purposes the original lot shall be regrouped into 50 coil lots or fractions thereof. Each lot shall be tested for the property in which the original sample failed to comply at a frequency of 10 % or more so that the total number of tests is at least double the original. Any lot that exhibits a failure shall be rejected. If during retesting an additional quality parameter is observed to be defective, the lot of 50 is subject to rejection for that cause. The manufacturer may test each coil in the failed lot for the property in which failure occurred and reject only the nonconforming coils.

## 12. Inspection

12.1 Unless otherwise specified in the contract or purchase order, the manufacturer is responsible for the performance of all inspection and test requirements specified in this specification. Except as otherwise specified in the contract or purchase



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order, the manufacturer may use his own or any other suitable facilities for the performance of the inspection and test requirements, unless disapproved by the purchaser at the time the order is placed. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification when such inspections and tests are deemed necessary to assure that the material conforms to prescribed requirements.

## 13. Rejection and Rehearing

13.1 Material that fails to conform to the requirements of this specification may be rejected. Rejections should be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the test, the producer or supplier may make claim for a rehearing.

13.2 The material must be adequately protected and correctly identified in order that the producer or supplier may make a proper investigation.

## 14. Packaging, Marking, and Loading

14.1 Marking shall be by a tag securely attached to each coil of wire and shall show the identity of the producer, name of product, temper, and ASTM designation.

14.2 Packaging of the coils of wire shall be by agreement between the producer and the purchaser. This agreement shall include coil dimensions and mass.

14.3 Unless otherwise specified, the packaging, marking, and loading shall be in accordance with Practices A 700.

14.4 For procurement by or direct shipment to the U.S. Government, marking for shipment, in addition to the requirements specified in the contract or order, shall be in accordance with MIL-STD-129 for military agencies and with Fed. Std. No. 123 for civil agencies.

14.5 When specified in the contract or order, and for direct procurement by or direct shipment to the U.S. Government, commercial packaging shall be in accordance with MIL-STD-1188.

## 15. Keywords

15.1 aluminized wire; aluminum-coated carbon steel wire; steel wire; wire

## SUMMARY OF CHANGES

Committee A05 has identified the location of selected changes to this standard since the last issue (A 809 - 03) that may impact the use of this standard. (May 1, 2008)

(*1*) Deleted reference to Mil Std 163 in 2.2 and 14.5.

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