Designation: A 856/A 856M – 03

Standard Specification for Zinc-5 % Aluminum-Mischmetal Alloy-Coated Carbon Steel Wire[1]

This standard is issued under the fixed designation A 856/A 856M; 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 soft, medium, and hard temper zinc-5 % aluminum-mischmetal (Zn-5 Al-MM) alloy-coated carbon steel wire in coils for general use. The product is intended for applications requiring corrosion resistance, drawability, and formability.

1.2 This specification is applicable to orders in either inch-pound units (as A 856) or acceptable SI units [as A 856M]. Inch-pound units and SI units are not necessarily equivalent; therefore, each system shall be used independently of the other, without combining values in any way.

1.3 This specification references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of this specification.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

A 90/A 90M Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc-Alloy Coatings

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

A 902 Terminology Relating to Metallic Coated Steel Products

B 117 Test Method of Salt Spray (Fog) Testing

B 750 Specification of Zinc-5 % Aluminum-Mischmetal Alloy (UNS Z38510) in Ingot Form for Hot-Dip Coatings

E 8 Test Methods of Tension Testing of Metallic Materials

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

E 47 Test Methods for Chemical Analysis of Zinc Die-Casting Alloys

E 1277 Test Method for Chemical Analysis of Zinc-5 % Aluminum-Mischmetal Alloy by the ICP Argon Plasma Spectrometric Method

2.2 *Military Standards:*[3]

MIL-STD-129 Marking for Shipment and Storage

MIL-STD-163 Steel Mill Products Preparation

2.3 *Federal Standards:*[3]

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

2.4 *Other Standards:*[4]

GF-1 Standard Practice for Determination of Cerium and Lanthanum Compositions in Galfan Alloy (5–Al-0.04 % La-0.04 % Ce-Ba1 SHG Zn)

3. Terminology

3.1 *Definitions*—See Terminology A 902 for definitions of general terminology relating to metallic coated steel products.

4. Classification

4.1 *Temper*—The wire is classified with regard to mechanical properties by temper, which is related to tensile strength and stiffness. The temper designations are soft, medium, and hard.

4.2 *Coating Classes*—Zn-5AL-MM alloy coating on the wire is classified in a number of classes (1, 3 or A, 60, B, 100, and C) (see Table 1).

5. Ordering Information

5.1 Orders for material under this specification shall include the following information:

5.1.1 Quantity (weight),

5.1.2 Coated wire diameter,

5.1.3 Class of coating (see 4.2)

5.1.4 Temper (soft, medium, or hard) (see Table 2),

5.1.5 Packaging requirements, and

5.1.6 ASTM designation and year of issue, as A 856-____for inch-pound units or A 856M-____ for SI units.

NOTE 1—A typical ordering description is as follows: 50 000 lb, 0.120-in. diameter Zn-5 Al-MM alloy-coated wire, Coating Class 60, Soft Temper in 600-lb coils on tubular carriers to ASTM A 856-____or [50 000 kg, 3.00-mm diameter Zn-5 Al-MM alloy-coated wire, Coating Class 1,

[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

[4] Available from International Lead Zinc Research Organization 2525 Meridian Parkway, P.O. Box 12036, Research Triangle Park, NC 27709-2036.

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

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TABLE 1 Minimum Weight of Zn-5 AL-MM Alloy Coating per Unit Area of Uncoated Wire Surface, oz/ft² [g/m²]

Wire Diameter in. [mm][A]	Class 1 oz/ft²[g/m²]	Class 3 or A Coating, oz/ft²[g/m²]	Class 60 Coating, oz/ft²[g/m²]	Class B Coating, oz/ft²[g/m²]	Class 100 Coating, oz/ft²[g/m²]	Class C Coating, oz/ft²[g/m²]
0.035 [0.89]	0.15 [46]	0.45 [137]	n/a	0.90 [275]	n/a	1.35 [412]
0.041 [1.04]	0.15 [46]	0.50 [153]	n/a	1.00 [305]	n/a	1.50 [458]
0.048 [1.22]	0.15 [46]	0.55 [168]	n/a	1.10 [335]	n/a	1.65 [503]
0.054 [1.37]	0.20 [61]	0.60 [183]	n/a	1.20 [366]	n/a	1.80 [549]
0.062 [1.57]	0.20 [61]	0.65 [198]	n/a	1.20 [366]	n/a	1.80 [549]
0.072 [1.83]	0.20 [61]	0.65 [198]	n/a	1.20 [366]	n/a	1.80 [549]
0.076 [1.93]	0.25 [76]	0.70 [214]	.60 [183]	1.40 [427]	1.00 [305]	2.10 [641]
0.080 [2.03]	0.25 [76]	0.70 [214]	.60 [183]	1.40 [427]	1.00 [305]	2.10 [641]
0.092 [2.34]	0.28 [85]	0.75 [229]	.60 [183]	1.50 [458]	1.00 [305]	2.25 [686]
0.099 [2.51]	0.28 [85]	0.80 [244]	.60 [183]	1.60 [488]	1.00 [305]	2.40 [732]
0.106 [2.69]	0.30 [92]	0.80 [244]	.60 [183]	1.60 [488]	1.00 [305]	2.40 [732]
0.120 [3.05]	0.30 [92]	0.85 [259]	.60 [183]	1.70 [519]	1.00 [305]	2.55 [778]
0.135 [3.43]	0.30 [92]	0.85 [259]	.60 [183]	1.70 [519]	1.00 [305]	2.55 [778]
0.148 [3.76]	0.35 [107]	0.90 [275]	.60 [183]	1.80 [549]	1.00 [305]	2.70 [824]
0.162 [4.11]	0.35 [107]	0.90 [275]	.60 [183]	1.80 [549]	1.00 [305]	2.70 [824]
0.177 [4.50]	0.44 [134]	0.90 [275]	.60 [183]	1.80 [549]	1.00 [305]	2.70 [824]
0.192 [4.88]	0.50 [153]	1.00 [305]	.60 [183]	2.00 [610]	1.00 [305]	3.00 [915]
0.207 [5.26] and larger	0.53 [162]	1.00 [305]	.60 [183]	2.00 [610]	1.00 [305]	3.00 [915]

[A] Coating weights [mass] for diameters other than those shown in Table 1 are the coating weights [mass] for the next smaller diameter.

TABLE 2 Tensile Strength for Temper Designation[A]

Wire Diameter, in. [mm]	Soft, ksi [MPa]	Medium, ksi [MPa]	Hard, ksi [MPa]
0.035 to under 0.080 [0.20 to under 2.00]	75 [515], max	70 to 100 [485 to 690]	90 to 120 [820 to 825]
0.080 to under 0.106 [2.00 to under 2.50]	75 [515], max	70 to 95 [485 to 655]	85 to 115 [585 to 795]
0.106 to 0.176 [2.50 to under 4.70], incl	70 [485], max	65 to 90 [450 to 620]	80 to 110 [550 to 760]
Over 0.176 [4.70]	70 [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.

Soft Temper in 1000-kg coils on tubular carriers to ASTM A 856M-____].

6. Materials and Manufacture

6.1 The steel from which the wire is produced shall be made by any commercially accepted steelmaking process.

6.2 *Coating Bath Analysis*—The bath metal used in continuous hot-dip Zn-5 Al-MM alloy-coated wire shall meet the chemical composition limits specified in Specification B 750.

6.2.1 For a two-step coating operation where the first coating is zinc (hot-dip galvanizing or electrogalvanizing) the final bath shall be permitted to have an aluminum content of up to 7.2 % to prevent depletion of the aluminum content of the bath.

6.2.2 *Method of Analysis*—The determination of chemical composition shall be made in accordance with suitable chemical (see Test Method E 47 for tin), ICP Argon Plasma Spectrometric (see Test Methods E 1277), or other methods. In case of dispute, the results secured by Text Methods E 1277 shall be the basis of acceptance.

6.2.3 A standard practice for X-ray fluorescence spectrometry for determination of cerium and lanthanum in a zinc-5 % aluminum-mischmetal alloy has been established by the International Lead Zinc Research Organization (Standard Practice GF-1). In case of dispute, the results secured by Test Methods E 1277 shall be the basis of acceptance.

7. Mechanical Properties

7.1 The Zn-5 Al-MM alloy coated wire as represented by the test specimens tested in accordance with Test Methods E 8 shall conform to the tensile strength requirements prescribed in Table 2.

7.2 Test specimens found to contain a weld or obvious imperfections shall be discarded and another test specimen obtained to verify conformance to the tensile strength requirements.

8. Coating Tests

8.1 *Weight of Coating*—The Zn-5 Al-MM alloy-coated wire when tested in accordance with Test Method A 90/A 90M shall conform to the requirements of Table 1 for minimum weight of coating for the class required.

NOTE 2—A typical ratio of 0.20 oz/ft² [61 g/m²] equals 200 to 240 h as salt spray test in accordance with Test Method B 117 may be used.

8.2 *Adherence of Coating*—The Zn-5 Al-MM alloy-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 as prescribed in Table 3 without cracking or delaminating the coating to such an extent that any coating is removed when rubbed with the bare fingers. Loosening or detachment during

TABLE 3 Mandrel Diameters for Test for Adherence of Zn-5 Al-MM Alloy-Coating

Wire Diameter, in. [mm]	Mandrel Diameters for Coating Classes	
	Class 1	All Other Classes
0.035 to under 0.076 [0.20 to under 1.90]	1*d* [A]	2*d* [A]
0.076 to under 0.148 [1.90 to under 3.70]	1*d*	3*d*
0.148 to 0.500, incl [over 3.70]	2*d*	4*d*

[A] *d* = nominal wire diameter being tested.

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the adhesion test of superficial, small particles of Zn-5 Al-MM alloy formed by mechanical polishing of the surface of the coated wire shall not be considered cause for rejection.

9. Permissible Variations

9.1 The permissible variation in diameter of the Zn-5 A1-MM alloy-coated wire as represented by the test specimens shall meet the requirements shown in Table 4.

10. Workmanship, Finish, and Appearance

10.1 The Zn-5 Al-MM alloy-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 are permitted in the finished wire.

11. Number of Tests and Retests

11.1 The number of test specimens taken from the ends of coils during production to ensure compliance with Sections 7, 9, and 8 vary 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.

11.2 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 7, 9, and 8.

11.3 If 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 10 % tested for the property in which the original sample failed to comply. The number of samples thus selected shall be at least twice the number of the original sampling. Any lot that exhibits a failure shall be rejected.

TABLE 4 Diameter Tolerance for Zn-5 Al-MM Alloy-Coated Wire in Coils[A,B]

Wire Diameter, in. [mm]	Tolerance, Plus and Minus, in. [mm]	
	Class 1	All Other Classes
0.035 to under 0.076 [0.20 to under 1.90]	0.002 [0.05]	0.002 [0.05]
0.076 to 0.500, inclusive [1.90 to 12.7], inclusive	0.003 [0.08]	0.004 [0.10)

[A]For the purpose of determining conformance with this specification, an observed value shall be rounded to the nearest 0.001 in. [0.01 mm] in accordance with the rounding method of Practice E 29.

[B]It is recognized that the surface of heavy alloy coatings, particularly those produced by the hot-dip method, are not perfectly smooth and devoid of irregularities. The tolerances shown in Table 4 shall not be rigidly applied to such irregularities that are inherent to the product so that unjustified rejections of wire that are actually satisfactory for use do not occur. Therefore, it is intended that these tolerances be used in gaging the uniform areas of the Zn-5 Al-MM alloy-coated wire.

11.3.1 The manufacturer has the option of testing each coil in the failed lot for the property in which the failure occurred, rejecting the nonconforming coils. The coils which conform for the property tested shall be accepted.

12. Inspection

12.1 Unless otherwise specified in the purchase order or contract, the manufacturer is responsible for the performance of all inspection and test requirements specified in this specification. Except as otherwise specified in the purchase order or contract, the manufacturer shall use his own or any other suitable facilities for the performance of the inspection and test requirements, at his option, 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 ensure that the material conforms to prescribed requirements.

13. Rejection and Rehearing

13.1 Material that fails to conform to the requirements of this specification is subject to rejection. Rejection shall 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 shall make claim for a rehearing.

14. Certification

14.1 When specified in the purchase order or contract, a producer's or supplier's certification shall be furnished to the purchaser that the material was manufactured, sampled, tested, and inspected in accordance with this specification and has been found to meet the requirements. When specified in the purchase order or contract, a report of the test results shall be furnished.

15. Packaging and Marking

15.1 Unless otherwise specified, packaging, marking, and loading for shipment shall be in accordance with Practices A 700.

15.2 When specified in the contract or order, and for direct procurement by or direct shipment to the U.S. Government, when Level A is specified, preservation, packaging, and packing shall be in accordance with the Level A requirement of MIL-STD-163.

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

16. Keywords

16.1 steel wire; wire; zinc-5 % aluminum-mischmetal alloy-coated carbon steel wire; zinc-5 % aluminum-mischmetal alloy coated steel wire

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SUMMARY OF CHANGES

Committee A05 has identified the location of selected changes to this standard since the last issue (A 856/A 856M - 98) that may impact the use of this standard.

A 856/A 856M - 03:

(*1*) Renumbered sections to meet Form and Style requirements.

(*2*) Changed coating classes from “20, 40, 60, 80, 100, 120” to “Class 1, 3 or A, 60, B, 100, and C” in 4.2 and Tables 1, 3, 4.

(*3*) Editorial changes in 7.2 and 8.2

(*4*) Added Summary of Changes section.

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