



Designation: B 736 – 00

Standard Specification for Aluminum, Aluminum Alloy and Aluminum-Clad Steel Cable Shielding Stock¹

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1. Scope

1.1 This specification covers selected aluminum, aluminum-alloy and aluminum clad steel cable shielding stock, both uncoated and coated, for applications such as electrostatic or electromagnetic shielding for insulated power, control, instrumentation and communication cables (including coaxial cable).

NOTE 1—See B 694, Specification for Copper, Copper Alloy, and Copper-Clad Stainless Steel Sheet and Strip for Electrical Cable Shielding² for related standards for copper-based shielding materials.

1.2 The materials covered are the following:

Type of Material ^A	Coating
Aluminum 1060	none
Aluminum 1100	none
Aluminum 1145	none
Aluminum 1235	none
Alloy 3003	none
Aluminum 1060	polyolefin
Aluminum 1100	polyolefin
Aluminum 1145	polyolefin
Aluminum 1235	polyolefin
Alloy 3003	polyolefin
Aluminum 1060	vinyl resin
Aluminum 1100	vinyl resin
Aluminum 1145	vinyl resin
Aluminum 1235	vinyl resin
Alloy 3003	vinyl resin
Aluminum Clad Steel ^B	none
Aluminum Clad Steel ^B	polyolefin

^A Aluminum designations are in accordance with ANSI H35.1. The equivalent Unified Numbering System alloy designations are those shown preceded by A9, for example, A91100 for aluminum 1100 in accordance with Practice E 527.

^B Cladding ratio must be specified (see 5.4).

1.3 For acceptance criteria for inclusion of new aluminum and aluminum alloys in this specification, see Annex A2.

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.

1.5 The following precautionary caveat pertains only to the test method portion, Section 12, of this specification. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein:

2.2 *ASTM Standards:*

- A 568/A 568M Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for³
- B 193 Test Method for Resistivity of Electrical Conductor Materials⁴
- B 557 Test Methods of Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products⁵
- D 903 Test Method for Peel or Stripping Strength of Adhesive Bonds⁶
- E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications⁷
- E 34 Test Methods for Chemical Analysis of Aluminum and Aluminum Base Alloys⁸
- E 55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition⁸
- E 227 Test Method for Optical Emission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Point-to-Plane Technique⁸
- E 527 Practice for Numbering Metals and Alloys (UNS)⁹
- E 607 Test Method for Optical Emission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Point-to-Plane Technique, Nitrogen Atmosphere¹⁰

³ *Annual Book of ASTM Standards*, Vol 01.03.

⁴ *Annual Book of ASTM Standards*, Vol 02.03.

⁵ *Annual Book of ASTM Standards*, Vol 02.02.

⁶ *Annual Book of ASTM Standards*, Vol 15.06.

⁷ *Annual Book of ASTM Standards*, Vol 14.02.

⁸ *Annual Book of ASTM Standards*, Vol 03.05.

⁹ *Annual Book of ASTM Standards*, Vol 01.01.

¹⁰ *Annual Book of ASTM Standards*, Vol 03.06.

¹ This specification is under the jurisdiction of ASTM Committee B07 on Light Metals and Alloys and is the direct responsibility of Subcommittee B07.03 on Aluminum Alloy Wrought Products.

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² *Annual Book of ASTM Standards*, Vol 02.01.

E 716 Practices for Sampling Aluminum and Aluminum Alloys For Spectrochemical Analysis¹⁰

E 1251 Test Method for Optical Emission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Argon Atmosphere, Point-to Plane, Unipolar Self-Initiating Capacitor Discharge¹⁰

2.3 *American National Standards:*

H35.1 Alloy and Temper Designation Systems for Wrought Aluminum⁵

H35.2 Dimensional Tolerances for Aluminum Mill Products⁵

B46.1 Surface Texture¹¹

3. Terminology

3.1 *Definitions:*

3.1.1 *cable shielding stock*—a rolled product, rectangular in cross section and form, of nominal thickness 0.004 in. (0.10 mm) through 0.019 in. (0.48 mm) in coils (rolls) or traverse wound on reels or spools, with sheared or slit edges for electrical cable shielding applications.

3.1.2 *cladding ratio*—ratio by percent thickness of the aluminum/steel/aluminum component layers; for example, 20/60/20.

3.1.3 *producer*—the primary manufacturer of the material.

3.1.4 *supplier*—includes only the category of jobbers and distributors as distinct from producers.

4. Ordering Information

4.1 Orders for material to this specification shall include the following information:

4.1.1 This specification designation (which includes the number, the year, and the revision letter, if applicable),

4.1.2 Quantity for each item, in pounds (kilograms),

4.1.3 Name of material (cable shielding),

4.1.4 Type of material (bare aluminum, coated aluminum, aluminum clad steel, or coated aluminum clad steel) (see 1.2),

4.1.5 Aluminum designation, when appropriate (see 1.2 and 5.3),

4.1.6 Cladding ratio, when appropriate (see 5.4),

4.1.7 Type of coating, class of coating and number of sides to be coated (see 1.2, 11.1 and Table 1),

4.1.8 Color of coated aluminum (see 11.3),

4.1.9 Temper when non-standard is required (see Section 9),

4.1.10 Dimensions (thickness and width),

4.1.11 How furnished: coils (rolls), traverse wound on reels or spools, etc.,

4.2 Additionally, orders for material to this specification shall include the following information when required by the purchaser:

4.2.1 Whether the resistivity test is required for any item (Section 13),

4.2.2 Core requirements (core material, inner core diameter, if required; see 17.2),

4.2.3 Coil dimension (outer coil diameter limitation, if required; see 17.2),

4.2.4 Weight of coils and packages (coil weights and package size limitations, if required; see 17.3),

4.2.5 Certification, if required (see Section 18),

4.2.6 Special tests or exceptions, if any.

5. General Requirements, Materials and Manufacture

5.1 The material and manufacturing methods used shall be such that the resulting products will conform to the properties and characteristics prescribed in this specification.

5.2 Cladding may be bonded to the base metal by any method that will produce a clad material that will conform to this specification.

5.3 For bare or coated aluminum, Aluminum 1100, 1145 and 1235 shall be understood to be interchangeable, unless otherwise agreed upon between the producer and purchaser.

5.4 Unless otherwise stated (4.1.6), the cladding ratio shall be the standard ratio listed in Table 2 and shall be expressed as xx/xx/xx, aluminum/steel/aluminum.

6. Responsibility for Quality Assurance

6.1 *Responsibility for Inspection and Tests*—Unless otherwise specified in the contract or purchase order, the producer is responsible for the performance of all inspection and test requirements specified herein. The producer may use his own or any other suitable facilities for the performance of the inspection and test requirements specified herein, unless disapproved by the purchaser in the order or at the time of contract signing. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification where such inspections are deemed necessary to assure that material conforms to prescribed requirements.

6.2 *Lot Definition*—An inspection lot shall consist of an identifiable quantity of the same material, temper, and nominal dimensions subjected to inspection at one time.

7. General Quality

7.1 All cable shielding stock shall be commercially flat and free of buckles; they shall be free of injurious surface defects and shall have an 80 $\mu\text{in.}$ (2.0 μm) maximum roughness measurement (AA) per ANSI B46.1, unless otherwise agreed upon by the producer and purchaser. Unless otherwise specified, discoloration due to proper annealing shall not be a cause for rejection.

7.2 Each ordered item shall be examined to determine conformance to this specification with respect to general quality and package marking. On approval of the purchaser, however, the producer may use a system of statistical quality control for such examinations.

8. Chemical Composition

8.1 *Limits*—The aluminum for cable shielding shall conform to the chemical composition limits specified in Table 3. Conformance shall be determined by the producer by analyzing samples taken at the time the aluminum ingots are poured, or samples taken from the finished or semifinished product. If the producer has determined the chemical composition of the material during the course of manufacture, the producer shall not be required to sample and analyze the finished product.

¹¹ Available from American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036.

TABLE 1 Property Requirements for Coated Metals

Coating			Performance Requirements, lbf/in. (N/m), min				
Type No.	Description	Class	Sides Coated	Bonding to Metal (12.2)	Heat Sealability (12.3)	Lap-Shear (12.4)	Moisture Resistance (12.5)
I	Polyolefin	1	1 2	1.5 (260)	5.0 (875)	The coated metal tape fails in tension before the bond between coatings fails in shear.	1.5 (260)
		2	1 2	3.5 (610)	10.0 (1750)		3.5 (610)
II	Vinyl Resin	1	1 2	N/A	5.0 (875)		N/A

TABLE 2 Mechanical Property Limits^{A,B}

Aluminum Designation	Temper	Specified Thickness in. (mm)	Tensile Strength, ksi (MPa)		Yield Strength (0.2 % offset)		Elongation in 2 in. (51 mm) min, %
			min	max	ksi (MPa)		
					min	max	
1060	0	0.004–0.019 (0.10–0.50)	8.0 (55)	14.0 (95)	2.5 (15)	...	15
1100	0	0.004–0.019 (0.10–0.50)	11.0 (75)	15.5 (105)	3.5 (25)	...	15
1145	0	0.004–0.019 (0.10–0.50)	8.0 (55)	14.0 (95)	3.0 (20)	...	15
1235	0	0.004–0.019 (0.10–0.50)	8.0 (55)	14.0 (95)	3.0 (20)	...	15
3003	0	0.004–0.019 (0.10–0.50)	14.0 (95)	19.0 (130)	5.0 (35)	...	14
Aluminum Clad Steel							
Cladding ^C Ratio	Total Thickness in. (mm)						
33/33/33	Annealed ^D	0.009 (0.225)	20.0 (140)	34.0 (235)	18 (125)	...	15

^A To determine conformance to this specification, each value for tensile strength shall be rounded to the nearest 0.1 ksi and each value for elongation to the nearest 0.5 %, both in accordance with the round method of Practice E 29.

^B For aluminum and aluminum alloys, the basis for establishment of mechanical property limits is shown in Annex A1. The listed mechanical property limits are statistically valid only for material thicknesses of 0.006 in. and over (over 15 mm).

^C Other cladding ratios may be supplied when agreed upon between the producer and purchaser.

^D Specification A 568.

TABLE 3 Chemical Requirements^{A,B,C}

Aluminum Designation	Silicon	Iron	Copper	Manganese	Magnesium	Zinc	Vanadium	Titanium	Other Elements ^D		Aluminum ^E
									Each	Total ^F	
1060	0.25	0.35	0.05	0.03	0.03	0.05	...	0.03	0.03	...	99.60 min
1100	0.95 Si + Fe		0.05–0.20	0.05	...	0.10	0.05	0.15	99.00 min
1145	0.55 Si + Fe		0.05	0.05	0.05	0.05	0.05	0.03	0.03	...	99.45 min
1235	0.65 Si + Fe		0.05	0.05	0.05	0.10	0.05	0.06	0.03	...	99.35 min
3003	0.6	0.7	0.05–0.20	1.0–1.5	...	0.10	0.05	0.15	remainder

^A Limits are in weight (mass) percent maximum unless stated otherwise.

^B Analysis shall be made for the elements for which limits are shown in this table.

^C For purposes of determining conformance to these limits, an observed value or a calculated value attained from analysis shall be rounded-off to the nearest unit in the last righthand place of figures used in expressing the specified limit, in accordance with the rounding method of Practice E 29.

^D *Others* includes listed elements for which no specific limit is shown as well as unlisted metallic elements. The producer may analyze samples for trace elements not specified in the specification. However, such analysis is not required and may not cover all metallic *Others* elements. Should any analysis by the producer or the purchaser establish that an *Others* element exceeds the limit of *Each* or that the aggregate of several *Others* elements exceeds the limit of *Total* the material shall be considered nonconforming.

^E By difference.

^F *Other Elements—Total* shall be the sum of unspecified metallic elements 0.010 % or more, rounded to the second decimal before determining the sum.

NOTE 2—It is standard practice in the United States aluminum industry to determine conformance to the chemical composition limits prior to further processing of ingots into wrought products. Due to the continuous nature of the process, it is not practical to keep a specific ingot analysis identified with a specific quantity of finished material.

8.2 Aluminum cladding shall be, unless otherwise specified, an aluminum conforming in chemical composition to Aluminum 1100, 1145 or 1235 (Table 3). These aluminums shall be

understood to be interchangeable for cladding purposes, unless otherwise agreed upon between the producer and purchaser.

8.3 *Number of Samples*—The number of samples taken for determination of chemical composition shall be as follows:

8.3.1 When samples are taken at the time the aluminum ingots are poured, at least one sample shall be taken for each group of ingots poured simultaneously from the same source of molten metal.

8.3.2 When samples are taken from the finished or semifinished product, a sample shall be taken to represent each 4000 lb (1816 kg), or fraction thereof, of material in the lot, except that not more than one sample shall be required per piece.

8.4 *Methods of Sampling*—Samples for determination of chemical composition shall be taken in accordance with one of the following methods:

8.4.1 Samples for chemical analysis shall be taken from bare sheet by drilling, sawing, milling, turning, or clipping a representative piece or pieces to obtain a prepared sample of not less than 75 g. Sampling shall be in accordance with Practice E 55.

8.4.2 Samples for spectrochemical analysis shall be in accordance with Practice E 716. Samples for other methods of analysis shall be taken by methods suitable for the form of material being analyzed and the type of analytical method used.

8.5 *Methods of Analysis*—The determination of chemical composition shall be made in accordance with suitable chemical (Test Methods E 34), or spectrochemical (Test Methods E 227, E 607, and E 1251), methods. Other methods may be used only when no published ASTM method is available. In case of dispute, the methods of analysis shall be agreed upon between the producer and the purchaser.

8.6 Steel cores of aluminum clad steel shall be a steel conforming in chemical composition to UNS designation G10060, per Specification A 568, grade 1006.

9. Tempers

9.1 Both coated and uncoated aluminum materials furnished to this specification shall be Temper 0. Both coated and uncoated aluminum clad steel materials furnished to this specification shall be annealed temper. Special or nonstandard tempers are subject to negotiation between the producer and purchaser.

10. Tensile Properties of Material as Supplied

10.1 *Limits*—The cable shielding stock shall conform to the requirements for tensile properties as specified in Table 2. The yield strength need not be determined unless specifically indicated in the contract or order.

10.2 *Number of Specimens*—One sample shall be taken from either end of each coil or strip, but no more than one sample per 4000 lb (1816 kg) or portion thereof in a lot shall be required. Other procedures for selecting samples may be employed if agreed upon by the producer and the purchaser.

10.3 *Test Specimens*—Geometry of test specimens and the location in the product from which they are taken shall be as specified in Test Methods B 557.

10.4 *Test Methods*—The tension test shall be made in accordance with Test Methods B 557.

11. Coated Metals

11.1 When ordered, the cable shielding stock may be coated on one or both sides with a protective plastic coating of the specified type and class, as agreed upon by the producer and the purchaser.

11.1.1 *Type I: Polyolefin Coating*—The cable shielding stock shall be coated with material meeting the requirements of this specification for the specified class of coating. The coatings are classified based upon requirements of the wire and cable industry as specified in Table 1, when tested in accordance with Section 12 of this specification.

11.1.1.1 The thickness of the coating on each coated side shall be 0.0015 in. (0.038 mm) min.

11.1.2 *Type II: Vinyl Resin Coating*—The cable shielding stock shall be coated with material meeting the requirements of Table 1 of this specification, when tested in accordance with Section 12 of this specification.

11.1.2.1 The thickness of the coating on each coated side shall be 0.0003 in. (0.008 mm) min.

11.2 The surface coating shall be such that the completed product shall have a smooth uniform appearance without inclusions, irregularities, skips, or agglomerates.

11.3 The color of the coated product shall be as agreed upon between the purchaser and supplier.

12. Test Methods for Coated Metal

12.1 *Test Specimens*—Unless otherwise specified, prepare all test specimens in accordance with the following instructions:

12.1.1 All test specimens shall be lengths of coated metal measuring 6 in. (150 mm) in length by 1 in. (25 mm) in width. It is recommended that specimens be prepared using a sample cutter.¹²

12.1.2 For wide material, prepare a minimum of two specimens for each 6 in. (150 mm) of parent material width.

12.1.3 For metal coated on two sides, twice as many specimens will normally be used as for one-side-coated metal.

12.1.4 If necessary, flatten any burr caused by cutting the coated metal by firmly smoothing the surfaces near the cut edges.

12.1.5 In all sample preparation, avoid touching any surface intended to be heat-sealed (12.3 or 12.4).

12.1.6 When necessary or appropriate, label one side of the test specimens near the specimen end.

12.2 *Bonding to Metal*—Test the finished coated metal for bonding between the metal and its coating in accordance with the requirements of Test Method D 903, with the following exceptions and additional provisions.

12.2.1 Prepare specimens in accordance with 12.1. Repeat the additional procedure for preparing specimens as described in 12.2.2-12.2.4 until sufficient specimens are available for test. Test results shall be an average based on a minimum of three tests per coated side.

¹² JDC-SO Precision Sample Cutter, 1 in. (25 mm) wide, has been found suitable for this purpose. Available from Thwing-Albert Instrument Co., 10960 Dutton Rd., Phila., PA 19154.