



Designation: **B833—09 B833 – 13**

## Standard Specification for Zinc and Zinc Alloy Wire for Thermal Spraying (Metallizing) for the Corrosion Protection of Steel<sup>1</sup>

This standard is issued under the fixed designation B833; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope\*

1.1 This specification covers zinc and zinc alloy wire used to deposit zinc coatings by thermal spraying (metallizing) for the corrosion protection of steel and iron. Zinc and zinc alloy wire provided under this specification is intended for use in oxy-fuel and electric arc thermal spraying equipment. Additional zinc alloy compositions used in thermal spraying primarily for electronic applications are found in Specification **B943**.

1.2 Zinc alloy wire compositions used in thermal spraying primarily for electronic applications are found in Specification **B943**.

1.3 Zinc alloy wire compositions used as solders are found in Specification **B907**.

1.4 The values stated in SI units are to be regarded as the standard. The values in parentheses are for information only.

1.5 *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 become familiar with all hazards including those identified in the appropriate Material Safety Data Sheet (MSDS) for this product/material as provided by the manufacturer, to establish appropriate safety and health practices, and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

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

2.2 *ASTM Standards*:<sup>2</sup>

**B6** Specification for Zinc

**B899** Terminology Relating to Non-ferrous Metals and Alloys

**B907** Specification for Zinc, Tin and Cadmium Base Alloys Used as Solders

**B943** Specification for Zinc and Tin Alloy Wire Used in Thermal Spraying for Electronic Applications

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

**E527** Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

**E536** Test Methods for Chemical Analysis of Zinc and Zinc Alloys

2.3 *ANSI/AWS Standard*:<sup>3</sup>

**ANSI/AWS A5.33** Specification for Solid and Ceramic Wires and Ceramic Rods for Thermal Spraying

2.4 *ISO Standards*:<sup>4</sup>

**ISO 3815-1** Zinc and zinc alloys — Part 1: Analysis of solid samples by optical emission spectrometry

**ISO 3815-2** Zinc and zinc alloys — Part 2: Analysis by inductively coupled plasma optical emission spectrometry

### 3. Terminology

3.1 Terms shall be defined in accordance with Terminology **B899**.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee **B02** on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee **B02.04** on Zinc and Cadmium.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from American Welding Society (AWS), 550 NW LeJeune Rd., Miami, FL 33126, <http://www.aws.org>.

<sup>4</sup> Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

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

#### 4. Ordering Information

4.1 In order to make the application of this specification complete, the purchaser shall supply the following information to the seller in the purchase order or other governing documents:

- 4.1.1 Name, designation, and date of issue of this specification,
- 4.1.2 Quantity (mass(weight) in kilograms (pounds)),
- 4.1.3 Diameter (see [Table 1](#)),
- 4.1.4 Acceptance tests if other than specified (see [Section 10](#)),
- 4.1.5 Certification (see [Section 11](#)),
- 4.1.6 Packaging and packing materials (see [Section 12](#)), and
- 4.1.7 Supplementary requirements, if applicable.

#### 5. Materials and Manufacture

5.1 The zinc used to manufacture the wire shall conform to the requirements for High Grade Zinc (Z15001) or Special High Grade Zinc (Z13001) as specified in [Specification B6](#).

#### 6. Chemical Composition

6.1 The wire shall conform to the requirements prescribed in [Table 2](#).

#### 7. Physical Properties and Mechanical Properties

7.1 [Appendix X1](#) shows typical physical properties for zinc and zinc alloy wire and does not constitute a part of this specification but is provided for informational purposes only.

7.2 [Appendix X2](#) shows typical mechanical properties for zinc and zinc alloy wire and does not constitute a part of this specification but is provided for informational purposes only.

7.2.1 Mechanical properties are important so the wire can be fed into a thermal spray gun without breaking or jamming.

7.2.2 Mechanical properties of zinc and zinc alloy wire will vary depending upon the wire diameter and processing factors.

#### 8. Dimensions, Weights, and Permissible Variations

8.1 The wire shall conform to the sizes, tolerances, and weights per unit length listed in [Table 1](#).

#### 9. Workmanship, Finish, and Appearance

9.1 The wire shall be clean and free of corrosion, adhering foreign material, scale, seams, nicks, burrs, and other defects which would interfere with the operation of thermal spraying equipment. The wire shall uncoil readily and be free of bends or kinks that would prevent its passage through the thermal spray gun.

9.2 the wire shall be a continuous length per spool, coil, or drum. Splices or welds are permitted, provided that they do not interfere with the thermal spray equipment or coating process.

9.3 The starting end of each coil shall be tagged to indicate winding direction and to be readily identifiable with ASTM designation.

#### 10. Acceptance Tests

10.1 The seller shall provide, at the buyer's option, either a certification or a manufacturer's declaration that the raw material used to manufacture the wire met the requirements of composition specified in [5.1](#).

10.2 Selection of samples of wire shall be agreed upon between the purchaser and the supplier. Agreement may also include requirements of the number of tests and retests.

**TABLE 1 Dimensions, Weights, and Permissible Variations**

Nominal Wire Diameter		Permissible Variation		Nominal Weight Per Unit Length	
mm	(in.)	mm	(in.)	g/m	(lb/ft)
4.763	(0.1875)	+0.0000 -0.0762	(+0.0000) (-0.0030)	123.517-126.493	(0.083-0.085)
3.175	(0.125)	+0.0000 -0.0508	(+0.0000) (-0.0020)	55.062-56.550	(0.037-0.038)
2.311	(0.091)	+0.0000 -0.0381	(+0.0000) (-0.0015)	28.275-29.673	(0.019-0.020)
2.000	(0.079)	+0.0000 -0.0381	(+0.0000) (-0.0015)	20.834-22.322	(0.014-0.015)
1.626	(0.064)	+0.0000 -0.0381	(+0.0000) (-0.0015)	13.393-14.882	(0.009-0.010)
1.448	(0.057)	+0.0000 -0.0381	(+0.0000) (-0.0015)	10.417-11.905	(0.007-0.008)

**TABLE 2 Chemical Composition Requirements for Zinc and Zinc Alloy Wires**

NOTE 1—The following applies to all specified limits in this table. For the purposes of determining conformance with this specification, an observed value obtained from analysis shall be rounded off to the nearest unit in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding method of Practice E29.

Common Name (UNS) <sup>A</sup>	Al, max unless noted	Composition, % (Weight percent)												Zn, min	Total Non-Zn+Al, max	Other, Total max
		Cd, max	Cu, max	Fe, max	Pb, max	Sn, max	Sb, max	Ag, max	Bi, max	As, max	Ni, max	Mg, max	Mo, Ti, maxmax			
99.99 Zinc <sup>B</sup> (Z13005)	0.002	0.003	0.005	0.003	0.003	0.001	...	...	...	...	...	...	...	99.99	...	...
99.9 Zinc <sup>B</sup> (Z15005)	0.01	0.02	0.02	0.02	0.03	...	...	...	...	...	...	...	...	99.9	...	0.10
85 Zn/15 Al <sup>B</sup> (Z30700)	14.0-16.0	0.005	0.005	0.06	0.005	0.003	0.01	0.015	0.02	0.002	0.005	0.02	...	remainder <sup>C</sup>	...	0.05
99.995 Zinc (---)	0.001	0.003	0.001	0.002	0.003	0.001	...	...	...	...	...	...	...	99.995	...	0.005
99.995 Zinc (Z12004)	0.001	0.003	0.001	0.002	0.003	0.001	...	...	...	...	...	...	...	99.995	...	0.005
99.95 Zinc (---)	0.01	0.02	0.001	0.02	0.03	0.001	...	...	...	...	...	...	...	99.95	...	0.050
99.95 Zinc (Z14004)	0.01	0.02	0.001	0.02	0.03	0.001	...	...	...	...	...	...	...	99.95	...	0.050
99 Zinc (---)	0.01	0.005	0.7	0.01	0.005	0.001	...	...	...	...	0.01	0.010-18	...	99	...	1.0
99 Zinc (Z17000)	0.01	0.005	0.7	0.01	0.005	0.001	...	...	...	...	0.01	0.010-18	...	99	...	1.0
98Zn/2Al (Z30402)	1.5-2.5	0.005	0.005	0.02	0.005	0.003	0.10	0.015	0.02	0.002	0.005	0.02	...	remainder	...	...
87Zn/13Al (---)	12.0-14.0	0.005	0.005	0.06	0.005	0.003	0.01	0.015	0.02	0.002	0.005	0.02	...	remainder	0.05	...
87Zn/13Al (Z30701)	12.0-14.0	0.005	0.005	0.06	0.005	0.003	0.01	0.015	0.02	0.002	0.005	0.02	...	remainder	0.05	...

<sup>A</sup> UNS designations were established in accordance with Recommended Practice E527.

<sup>B</sup> In accordance with ANSI/AWS A5.33.

<sup>C</sup> Remainder determined arithmetically by difference.