Designation: B943 – 05

Standard Specification for Zinc and Tin Alloy Wire Used in Thermal Spraying for Electronic Applications[1]

This standard is issued under the fixed designation B943; 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 zinc and tin alloy wire, including zinc-aluminum, zinc-aluminum-copper, zinc-tin, zinc-tin-copper and tin-zinc, used as thermal spray wire in the electronics industry.

1.1.1 Certain alloys specified in this standard are also used as solders for the purpose of joining together two or more metals at temperatures below their melting points, and for other purposes (as noted in Annex A1). Specification B907 covers Zinc, Tin and Cadmium Base Alloys Used as Solders which are used primarily for the purpose of joining together two or more metals at temperatures below their melting points and for other purposes (as noted in the Annex part of Specification B907). Specification B833 covers Zinc and Zinc Alloy Wire for Thermal Spraying (Metallizing) used primarily for the corrosion protection of steel (as noted in the Annex part of Specification B833).

1.1.2 Tin base alloys are included in this specification because their use in the electronics industry is similar to the use of certain zinc alloys but different than the major use of the tin and lead solder compositions specified in Specification B32.

1.1.3 These wire alloys have a nominal liquidus temperature not exceeding 850°F (455°C).

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 *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 *ASTM Standards:*[2]

B32 Specification for Solder Metal

B833 Specification for Zinc and Zinc Alloy Wire for Thermal Spraying (Metallizing) for the Corrosion Protection of Steel

B899 Terminology Relating to Non-ferrous Metals and Alloys

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

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

E46 Test Methods for Chemical Analysis of Lead and Tin-Base Solder[3]

E47 Test Methods for Chemical Analysis of Zinc Die-Casting Alloys[3]

E51 Method for Spectrographic Analysis of Tin Alloys by the Powder Technique[3]

E87 Methods for Chemical Analysis of Lead, Tin, Antimony, and Their Alloys (Photometry Method)[3]

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

E536 Test Methods for Chemical Analysis of Zinc and Zinc Alloys

2.2 *Federal Standard:*

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)[4]

2.3 *Military Standard:*

MIL-STD-129 Marking for Shipment and Storage[4]

3. Terminology

3.1 Terms shall be defined in accordance with Terminology B899.

[1] 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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[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] Withdrawn.

[4] Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098.

4. Classification

4.1 *Type Designation*—The type designation uses the following symbols to properly identify the material:

4.1.1 *Alloy Composition*—The composition is identified by a two or four-letter symbol and a number. The letters typically indicate the chemical symbol for the critical element(s) in the wire and the number indicates the nominal percentage, by weight, of the primary element in the wire (see Table 1).

5. Ordering Information

5.1 Orders for material under this specification indicate the following information, as required, to adequately describe the desired material.

5.1.1 Type designation (see 4.1),

5.1.2 Detailed requirements for special forms,

5.1.3 Dimensions of wire (see 9.2),

5.1.4 Unit weight,

5.1.5 Packaging (see Section 17),

5.1.6 Marking (see Section 16),

5.1.7 ASTM Specification number and issue, marked on *(a)* purchase order and *(b)* package or spool, and

5.1.8 Special requirements, as agreed upon between supplier and purchaser.

6. Materials and Manufacture

6.1 The producer shall have each lot of wire as uniform in quality as practicable and of satisfactory appearance in accordance with best industrial practices.

7. Chemical Composition

7.1 The wire shall conform to the requirements prescribed in Table 1.

7.2 The manufacturer shall perform chemical analyses as directed in Test Methods E536 or by other methods of at least equal accuracy to confirm that the wire conforms to the requirements of composition. In case of dispute, analysis by Test Methods E536 shall be accepted. Analysis of alloy wires not covered by Test Methods E536 shall be agreed upon between the manufacturer and the purchaser.

NOTE 1—By mutual agreement between supplier and purchaser, analysis may be required and limits established for elements or compounds not specified in Table 1.

8. Dimensions and Unit Weight

8.1 The dimensions and unit weight of wire are specified in 5.1.3 and 5.1.4. The tolerance on specified outside diameter shall be ±5 % or ±0.002 in. (0.05 mm), whichever is greater.

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. Sampling

10.1 Sampling methodology should ensure that the sample selected for testing is representative of the material. The method for sampling consists of one of the following methods:

10.1.1 Analysis may be performed on finished wire, on material selected when the wire is cast, or on samples taken from semi-finished wire.

10.1.1.1 If the analysis is performed on finished wire, the frequency of sampling for determination of chemical composition shall be in accordance with Table 2. For spools and coils, the sample is obtained by cutting back 6 ft (1.8 m) of wire from the free end and then taking the next 6 ft for test. In other forms, an equivalent sample is selected at random from the container.

10.1.1.2 If the analysis is performed on material selected while the wire is being cast, at least one sample shall be selected for each source of molten metal.

TABLE 1 Zinc and Zinc Alloy Wire Compositions

		Composition %[A,B,C]													Temperature	
F C F C	UNS[D]	Cd	Zn	Sn	Pb	Sb	Ag	Cu	Al	Bi	As	Fe	Ni	Mg	Solidus	Liquidus
Zn 98	Z30402	0.005	REM	0.003	0.005	0.10	0.015	0.005	1.5–2.5	0.02	0.002	0.02	0.005	0.02	720 382	770 410
Zn 96	XXXX[E]	0.005	REM	0.003	0.005	0.10	0.015	0.005	3.5–4.5	0.02	0.002	0.02	0.005	0.02	720 382	720 382
Zn 95	Z30502	0.005	REM	0.003	0.005	0.10	0.015	0.005	4.5–5.5	0.02	0.002	0.02	0.005	0.02	720 382	720 382
Zn 94	XXXX[E]	0.005	REM	0.003	0.005	0.10	0.015	1.3–1.5	3.5–4.5	0.02	0.002	0.02	0.005	0.02	730 388	734 390
Zn 87	Z30705	0.005	REM	0.003	0.005	0.10	0.015	0.005	12.5–13.5	0.02	0.002	0.05	0.005	0.02	720 382	815 435
Zn 85	Z30702	0.005	REM	0.003	0.005	0.10	0.015	0.005	14.0–16.0	0.02	0.002	0.06	0.005	0.02	720 382	842 450
Zn/Sn 50	Z56900	0.005	REM	49.0–51.0	0.05	0.10	0.015	0.005	0.100	0.02	0.002	0.02	0.005	0.02	388 198	680 360
Zn/Sn 49	Z56930	0.005	REM	47.5–50.5	0.05	0.10	0.015	0.8–1.3	0.100	0.02	0.002	0.02	0.005	0.05	392 200	592 311
Sn/Zn 60	XXXX[E]	0.005	REM	59.0–61.0	0.005	0.10	0.015	0.01	0.100	0.005	0.002	0.02	0.005	0.05	390 199	666 352
Sn/Zn 70	XXXX[E]	0.005	REM	69.0–71.0	0.005	0.10	0.015	0.01	0.100	0.005	0.002	0.02	0.005	0.05	390 199	601 316
Sn/Zn 75	XXXX[E]	0.004	REM	74.0–76.0	0.20	0.10	0.015	0.05	0.050	0.020	0.020	0.02	0.005	0.05	390 199	572 300
Sn/Zn 80	XXXX[E]	0.005	REM	79.0–81.0	0.05	0.10	0.015	0.01	0.100	0.005	0.002	0.02	0.005	0.05	390 199	536 280

[A] For purposes of acceptance and rejection, the observed value or calculated value obtained from analysis should be rounded to the nearest unit in the last right-hand place of figures, used in expressing the specified limit, in accordance with the rounding procedure prescribed in Practice E29.

[B] All values not given as a range are maximum values unless stated otherwise.

[C] Remainder (REM) determined arithmetically by difference.

[D] The USN designations were established in accordance with Practice E527. The last digit of a UNS number differentiates between alloys of similar composition.

[E] UNS numbers to be added when assigned.