Designation: B907 – 16 (Reapproved 2021)

Standard Specification for Zinc, Tin and Cadmium Base Alloys Used as Solders[1]

This standard is issued under the fixed designation B907; 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 solder metal alloys (commonly known as soft solders), including zinc-aluminum, zinc-aluminum-copper, zinc-tin, zinc-tin-copper, zinc-cadmium-tin, zinc-cadmium, tin-zinc, cadmium-zinc, cadmium-zinc-silver, and cadmium-silver, used as solders for the purpose of joining together two or more metals at temperatures below their melting points.

1.1.1 Certain alloys specified in this standard are also used as Thermal Spray Wire in the electronics industry and are covered for this purpose in Specification B943. Specification B833 covers Zinc and Zinc Alloy Wire for Thermal Spraying (Metallizing) used primarily for the corrosion protection of steel (as noted in Annex A1 of this specification).

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

1.1.3 These solders include alloys having a nominal liquidus temperature not exceeding 850°F (455°C).

1.1.4 This specification includes solder in the form of solid bars, ingots, wire, powder and special forms, and in the form of solder paste.

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.

1.3 *Toxicity*—**Warning—**Soluble and respirable forms of cadmium may be harmful to human health and the environment in certain forms and concentrations. Therefore, ingestion and inhalation of cadmium should be controlled under the appropriate regulations of the U.S. Occupational Safety and Health Administration (OSHA). Cadmium-containing alloys and coatings should not be used on articles that will contact food or beverages, or for dental and other equipment that is normally inserted in the mouth. Similarly, if articles using cadmium-containing alloys or coatings are welded, soldered, brazed, ground, flame-cut, or otherwise heated during fabrication, adequate ventilation must be provided to maintain occupational cadmium exposure below the OSHA Permissible Exposure Level (PEL).

1.4 *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 Safety Data Sheet (SDS) for this product/material as provided by the manufacturer, to establish appropriate safety, health, and environmental practices, and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

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

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

B949 Specification for General Requirements for Zinc and Zinc Alloy Products

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 (Withdrawn 1994)[3]

E51 Method for Spectrographic Analysis of Tin Alloys by the Powder Technique (Withdrawn 1983)[3]

[1] This specification is under the jurisdiction of ASTM Committee B02 on Nonferrous Metals and Alloys 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] The last approved version of this historical standard is referenced on www.astm.org.

TABLE 1 Solder Compositions

Table 1a: Zinc Base Alloys

	UNS[D]	Composition %[A,B,C] Cd	Zn	Sn	Pb	Sb	Ag	Cu	Al	Bi	As	Fe	Ni	Mg	Temperature Solidus F	Solidus C	Liquidus F	Liquidus C
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 97	Z30505	0.005	REM	0.003	0.005	0.10	0.015	0.005	2.5–3.5	0.02	0.002	0.02	0.005	0.02	720	382	743	395
Zn 96	Z30506	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	Z34530	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 90	Z34550	0.004	88.0–92.0	0.003	0.005	0.10	0.015	3.0–6.0	3.0–6.0	0.02	0.002	0.100	0.005	0.05	720	382	797	425
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 80	Z30800	0.005	REM	0.003	0.005	0.10	0.015	0.005	19.5–20.5	0.02	0.002	0.08	0.005	0.02	720	382	896	480
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
Zn/Sn 27[E]	Z13371	33.0	26.0–28.0	REM	0.05	0.10	0.015	0.05	0.050	0.02	0.020	0.02	0.005	0.05	351	177	500	260
Zn/Cd 90[E]	Z50940	REM	89.0–91.0	0.003	0.05	0.10	0.015	0.05	0.100	0.02	0.002	0.02	0.005	0.05	509	265	738	392
Zn/Cd 60[E]	Z50980	REM	59.0–61.0	0.003	0.05	0.10	0.015	0.05	0.100	0.02	0.002	0.02	0.005	0.05	509	265	648	342

Table 1b: Tin Base Alloys

	UNS	Composition %[A,B,C] Cd	Zn	Sn	Pb	Sb	Ag	Cu	Al	Bi	As	Fe	Ni	Mg	Temperature Solidus F	Solidus C	Liquidus F	Liquidus C
Sn/Zn 60	L13281	0.005	REM	59.0–61.0	0.05	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	L13271	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	L13261	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	L13251	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
Sn/Zn 91	L13241	0.005	REM	90.0–92.0	0.05	0.10	0.015	0.01	0.100	0.005	0.002	0.02	0.005	0.05	390	199	390	199

Table 1c: Cadmium Base Alloys

	UNS	Composition %[A,B,C] Cd	Zn	Sn	Pb	Sb	Ag	Cu	Al	Bi	As	Fe	Ni	Mg	Temperature Solidus F	Solidus C	Liquidus F	Liquidus C
Cd 60	L01181	REM	39.0–41.0	0.003	0.05	0.10	0.015	0.05	0.100	0.02	0.002	0.02	0.005	0.05	509	265	601	316
Cd 70	L01171	REM	29.0–31.0	0.003	0.05	0.10	0.015	0.05	0.100	0.02	0.002	0.02	0.005	0.05	509	265	572	300
Cd 78	L01255	REM	11.0–13.0	0.003	0.05	0.10	4.5–5.5	0.05	0.100	0.02	0.002	0.02	0.005	0.05	480	249	601	316
Cd 83	L01161	REM	16.0–18.0	0.003	0.05	0.10	0.015	0.05	0.100	0.02	0.002	0.02	0.005	0.05	509	265	509	265
Cd 95	L01331	REM	0.007	0.003	0.05	0.10	4.5–5.5	0.05	0.100	0.02	0.002	0.02	0.005	0.05	640	338	739	393

[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] These alloys are listed with the zinc base alloys even though they contain significant amounts of cadmium because their use is similar to those of the other alloys in Table 1A.

E55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition
E87 Methods for Chemical Analysis of Lead, Tin, Antimony and Their Alloys (Photometric Method) (Withdrawn 1983)[3]
E88 Practice for Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition
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:*[4]
Fed. Std. No. 123 Marking for Shipment (Civil Agencies)

2.3 *ISO Standards:*[5]
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

2.4 *Military Standard:*[4]
Mil-Std-129 Marking for Shipment and Storage

3. Terminology

3.1 Terms shall be defined in accordance with Terminology B899.

4. Classification

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

[4] Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, http://quicksearch.dla.mil.

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