



# Standard Specification for Zinc-Aluminum Alloys in Ingot Form for Hot-Dip Coatings<sup>1</sup>

This standard is issued under the fixed designation B997; 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 certain zinc-aluminum (Zn-Al) alloys in ingot form for re-melting for use in the production of hot-dip coatings on steel. Alloy compositions are specified below and in [Table 1](#).

ASTM	Common	UNS
Type 5	95/5 Zn/Al	to be assigned
Type 10	90/10 Zn/Al	to be assigned
Type 15	85/15 Zn/Al	to be assigned

NOTE 1—The zinc-aluminum alloys in Specification B997 are intended to be used primarily to create a molten zinc-aluminum bath and differ from the master alloys in Specification [B860](#) which are intended primarily to adjust the concentration of certain elements in molten zinc galvanizing baths.

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 *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 order acceptance form a part of this specification to the extent referenced herein:

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

- [B750 Specification for GALFAN \(Zinc-5 % Aluminum-Mischmetal\) Alloy in Ingot Form for Hot-Dip Coatings](#)
- [B860 Specification for Zinc Master Alloys for Use in Hot Dip Galvanizing](#)
- [B899 Terminology Relating to Non-ferrous Metals and Alloys](#)

<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.

- [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](#)
  - [E527 Practice for Numbering Metals and Alloys in the Unified Numbering System \(UNS\)](#)
  - [E536 Test Methods for Chemical Analysis of Zinc and Zinc Alloys](#)
  - [E1277 Test Method for Analysis of Zinc-5 % Aluminum-Mischmetal Alloys by ICP Emission Spectrometry](#)
- 2.3 *ISO Standards:*<sup>3</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 *Terminology:*

- 3.1.1 *Type 5, n*—95 % zinc – 5 % aluminum alloy.
- 3.1.2 *Type 10, n*—90 % zinc – 10 % aluminum alloy.
- 3.1.3 *Type 15, n*—85 % zinc – 15 % aluminum alloy.

3.2 *Abbreviations:*

- 3.2.1 *95/5 Zn/Al*—95 % zinc – 5 % aluminum alloy.
- 3.2.2 *90/10 Zn/Al*—90 % zinc – 10 % aluminum alloy.
- 3.2.3 *85/15 Zn/Al*—85 % zinc – 15 % aluminum alloy.

## 4. Ordering Information

4.1 Orders for ingots under this specification shall include the relevant information as listed in Specification [B949](#), Section 4.

## 5. Chemical Requirements

5.1 *Limits*—The alloys shall conform to the requirements as to chemical composition prescribed in [Table 1](#). Conformance shall be determined by the producer by analyzing samples taken at the time ingots are made. If the producer has determined the chemical composition of the metal during the course of manufacture, he shall not be required to sample and analyze the finished product.

<sup>3</sup> Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

**TABLE 1 Zn-Al Alloy Ingot Chemical Requirements<sup>A,B,C,D,E,F,G</sup>**

Element	Composition, %		
	Type 5 <sup>F</sup> 95/5 Zn/Al UNS (to be assigned)	Type 10 <sup>F</sup> 90/10 Zn/Al UNS (to be assigned)	Type 15 <sup>F</sup> 85/15 Zn/Al UNS (to be assigned)
Aluminum	4.2-6.2	9.5-10.5	14.1-15.9
Iron, max	0.075	0.075	0.075
Silicon, max	0.015	0.015	0.015
Lead, <sup>H</sup> max	0.005	0.005	0.005
Cadmium, <sup>H</sup> max	0.005	0.005	0.005
Tin, <sup>H</sup> max	0.002	0.002	0.002
Others, <sup>I</sup> each, max	0.02	0.02	0.02
Others, <sup>I</sup> total, max	0.04	0.04	0.04
Zinc	Remainder	Remainder	Remainder

<sup>A</sup> 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 in Section 3 of Practice E29.

<sup>B</sup> By agreement between purchaser and supplier, analysis may be required and limits established for elements or compounds not specified in the table of chemical composition.

<sup>C</sup> Zn-Al alloy ingot for hot-dip coatings may contain antimony and copper in amounts of up to 0.002 and 0.1 %, respectively. No harmful effects have ever been noted due to the presence of these elements up to these concentrations and, therefore, analyses are not required for these elements.

<sup>D</sup> Magnesium may be specified by the buyer up to 0.75 % maximum.

<sup>E</sup> For Type 10 and Type 15, the mischmetal (cerium + lanthanum) may be specified by the buyer up to 0.10 % maximum.

<sup>F</sup> For Type 5, if the mischmetal (cerium + lanthanum) is specified by the buyer, both the buyer and producer shall indicate Specification B750 (GALFAN is a registered trademark of the GALFAN Technology Centre, Inc.) as the referenced standard and the composition shall meet all the requirements of that standard.

<sup>G</sup> Zirconium and titanium may each be specified by the buyer up to 0.02 % maximum.

<sup>H</sup> Lead and cadmium, and to a lesser extent tin and antimony, are known to cause intergranular corrosion in zinc-aluminum alloys. For this reason it is important to maintain the levels of these elements below the limits specified.

<sup>I</sup> Except antimony, copper, magnesium, zirconium, titanium, and the mischmetal (cerium + lanthanum).

## 6. Sampling for Determination of Chemical Composition

6.1 See appropriate requirements in Specification B949, in Section 6.

## 7. Methods for Chemical Analysis

7.1 The determination of chemical composition shall be made in accordance with Specification B949, Section 5.2.2.

7.2 In case of dispute, the results secured by an approved method (or combination of approved methods), or by a method agreed upon by both parties, shall be the basis of acceptance.

7.2.1 Approved methods include: Test Methods E536, E1277, ISO 3815-1, or ISO 3815-2.

NOTE 2—Test Method E1277 is directly applicable up to 8 % Al, in an unmodified form. ISO 3815-1 and ISO 3815-2 are generic methods applied to zinc and zinc alloys. Each of the methods may be modified and formatted for the alloy to be assayed. An experienced chemist, using suitable and/or traceable standards along with valid quality assurance techniques, will be able to perform and validate the methods and demonstrate acceptable precision and accuracy.

## 8. Materials and Manufacture

8.1 The alloys may be made by any approved process.

8.2 The material covered by this specification shall be free from dross, slag, or other harmful contamination.

## 9. Physical Properties

9.1 See appropriate requirements in Specification B949, Section 9.

## 10. Mechanical Properties

10.1 See appropriate requirements in Specification B949, Section 10.

## 11. Dimensions, Mass, and Permissible Variation, and Shapes and Sizes

11.1 See appropriate requirements in Specification B949, Section 11.

## 12. Workmanship, Finish, and Appearance

12.1 See appropriate requirements in Specification B949, Section 12.

## 13. Inspection

13.1 See appropriate requirements in Specification B949, Section 13.

## 14. Rejection and Rehearing

14.1 Material that fails to conform to the requirements of this specification may be rejected. Rejection should 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 may make claim for a rehearing. If the rehearing establishes that the material does not conform to the requirements of this specification, as much of the rejected original material as possible shall be returned to the producer or supplier.

14.2 For additional information see Specification B949.

## 15. Certification

15.1 See appropriate requirements in Specification B949, Section 15.

## 16. Product and Package Marking, Packaging and Preparation for Delivery

16.1 See appropriate requirements in Specification B949, Section 16.

## 17. Keywords

17.1 GALFAN; hot-dip coating alloy; zinc-5 % aluminum alloy; zinc-10 % aluminum alloy; zinc-15 % aluminum alloy

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