



Designation: B1022 – 22

Standard Specification for Zinc-Aluminum-Magnesium Alloys in Ingot Form for Coating Steel Sheet by the Hot-Dip Process¹

This standard is issued under the fixed designation B1022; 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 commercial zinc-aluminum-magnesium alloys in ingot form for remelting for the coating of steel sheet as specified in [Table 1](#), and referenced in Specifications [A875/A875M](#) and [A1046/A1046M](#).

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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

[A875/A875M](#) Specification for Steel Sheet, Zinc-5 % Aluminum Alloy-Coated by the Hot-Dip Process

[A902](#) Terminology Relating to Metallic Coated Steel Products

[A1046/A1046M](#) Specification for Steel Sheet, Zinc-Aluminum-Magnesium Alloy-Coated by the Hot-Dip Process

[B897](#) Specification for Configuration of Zinc and Zinc Alloy Jumbo, Block, Half Block, and Slab Ingot

[B899](#) Terminology Relating to Non-ferrous Metals and Alloys

[B914](#) Practice for Color Codes on Zinc and Zinc Alloy Ingot for Use in Hot-Dip Galvanizing of Steel

[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

2.2 ISO Standards:³

[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

2.3 SAE Standards:⁴

[SAE 1086](#) Numbering Metals and Alloys

3. Terminology

3.1 Terms shall be defined in accordance with Terminology [B899](#).

3.2 See Terminology [A902](#) for definitions of general terminology relating to metallic-coated hot-dip products.

4. Ordering Information (see Specification [B949](#))

4.1 Customers may order an alloy type and specify a target level for aluminum or magnesium within the minimum and maximum for the type listed in [Table 1](#). The acceptable composition range that may be specified is listed as the tolerance in [Table 1](#).

5. Materials and Manufacture

5.1 See Specification [B949](#).

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.

Current edition approved April 1, 2022. Published April 2022. DOI: 10.1520/B1022-22.

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

⁴ Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, <http://www.sae.org>.

TABLE 1 Chemical Composition of Zinc-Aluminum-Magnesium Alloys

| Common Name | UNS | Composition, % | | | | | | | | | |
|----------------------------|-----|-----------------|-----------------|------------------------|-------------------------------|----------|----------|----------|----------|----------|-----------------|
| | | Al ^E | Mg ^E | Tolerance ^E | Additional (max) ^B | Cu (max) | Fe (max) | Pb (max) | Cd (max) | Sn (max) | Zn ^D |
| Type 1 ^{A, B, C} | ... | 5.0 – 13.0 | 2.0 – 4.0 | 0.5 | 1.0 | 0.10 | 0.08 | 0.01 | 0.007 | 0.007 | Bal |
| Type 2 ^{A, B, C} | ... | 3.0 – 4.9 | 2.0 – 4.0 | 0.3 | 1.0 | 0.10 | 0.08 | 0.01 | 0.007 | 0.007 | Bal |
| Type 3 ^{A, B, C} | ... | 3.0 – 6.0 | 0.40 – 1.9 | 0.3 | 1.0 | 0.10 | 0.08 | 0.01 | 0.007 | 0.007 | Bal |
| Type 4 ^{A, B, C} | ... | 0.50 – 2.9 | 0.40 – 2.5 | 0.2 | 1.0 | 0.10 | 0.08 | 0.01 | 0.007 | 0.007 | Bal |
| Type 5 ^{A, B, C} | ... | 0.50 – 2.9 | 2.6 – 4.0 | 0.2 | 1.0 | 0.10 | 0.08 | 0.01 | 0.007 | 0.007 | Bal |
| Type II ^{A, B, C} | ... | 4.5 – 6.2 | 0.06 – 0.15 | 0.3 Al, 0.05 Mg | | 0.10 | 0.08 | 0.01 | 0.007 | 0.007 | Bal |

^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 in Section 3 of Practice E29.

^B By agreement between the supplier and the user, one or more additional alloying elements (except iron) may be specified up to a combined total of 1 %.

^C Zn-Al-Mg alloy ingot for hot-dip coatings may contain antimony in amounts of up to 0.002 %. No detrimental effects on alloy performance have ever been noted due to the presence of this element up to this concentration and, therefore, analyses are not required for this element.

^D For information only. Quantitative determination of this element is not required. Zinc is assumed to be the difference between 100 % and the sum of those elements listed above (or additional as specified and agreed upon between the supplier and user).

^E The customer may request specific target levels for Al or Mg, or both. The listed tolerance will represent the acceptable range around the target that may be specified. For example, a customer may specify Type 1 alloy with a target Al level of 9 %, then the acceptable range would be 8.5 % to 9.5 %.

6. Chemical Requirements

6.1 The ingots shall conform to the requirements of chemical composition as prescribed in Table 1.

6.2 Conformance shall be determined in accordance with Specification B949.

7. Methods for Chemical Analysis

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

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, ISO 3815–1, or ISO 3815–2.

7.2.1.1 Test Methods E536 are generally applicable but must be modified to cover the higher Al and magnesium ranges. 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 or traceable standards, or both, along with valid quality assurance techniques, will be able to perform and validate the methods and demonstrate acceptable precision and accuracy.

7.3 For purposes of determining compliance with specified composition limits as given in Table 1, an observed or calculated value shall be rounded to the nearest unit in the last right-hand place of figures shown in Table 1, in accordance with the rounding method of Practice E29.

8. Dimensions, Mass, and Permissible Variations

8.1 Zinc casting alloy ingots are typically supplied in ingot bundles weighing 1700 to 2400 lb (770 to 1090 kg).

8.2 Ingots and bundles vary in size and weight depending on the alloy and supplier.

8.2.1 Standard ingots have a nominal weight in the range of 17 to 24 lb (8 to 11 kg) and are generally 24 to 26 in. (61 to 66 mm) long.

8.3 Zinc casting alloy ingot may be ordered in jumbos or blocks, as specified in Specification B897.

8.4 Zinc casting alloy ingot may also be ordered in other shapes.

9. Inspection

9.1 See Specification B949.

10. Rejection and Reheating

10.1 See Specification B949.

11. Certification

11.1 See Specification B949.

12. Product Marking, Packaging, and Package Marking

12.1 See Table 2 for Color Code marking and Specification B949 for general requirements.

13. Keywords

13.1 coatings; galvanizing; hot-dip; metallic; metallic coated; zinc alloy; zinc-aluminum-magnesium alloy

**TABLE 2 Color Codes for Zinc-Aluminum-Magnesium Alloys
Application of Colors as per Practice B914**

| Alloy | Reference Source | North American | International |
|---------|------------------|----------------|-------------------------|
| Type 1 | A1046/A1046M | Black / Red | Yellow / Black / Red |
| Type 2 | A1046/A1046M | Black / Orange | Yellow / Black / Orange |
| Type 3 | A1046/A1046M | Black / Yellow | Yellow / Black / Yellow |
| Type 4 | A1046/A1046M | Black / Green | Yellow / Black / Green |
| Type 5 | A1046/A1046M | Black / Blue | Yellow / Black / Blue |
| Type II | A875/A875M | Black / Violet | Yellow / Black / Violet |