



Designation: B 240 – 07

# Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloys in Ingot Form for Foundry and Die Castings<sup>1</sup>

This standard is issued under the fixed designation B 240; 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 commercial zinc and zinc-aluminum (ZA) alloys in ingot form for remelting for the manufacture of pressure die castings, foundry castings and continuous cast bar stock as designated and specified in **Table 1**. Seven alloy compositions are specified, designated as follows:

| Common  | Traditional | ASTM <sup>A</sup> | UNS <sup>A</sup> |
|---------|-------------|-------------------|------------------|
| Alloy 3 | Zamak 3     | AG 40A            | Z33521           |
| Alloy 7 | Zamak 7     | AG 40B            | Z33522           |
| Alloy 5 | Zamak 5     | AC 41A            | Z35530           |
| Alloy 2 | Zamak 2     | AC 43A            | Z35540           |
| ZA-8    | ZA-8        | ...               | Z35635           |
| ZA-12   | ZA-12       | ...               | Z35630           |
| ZA-27   | ZA-27       | ...               | Z35840           |

<sup>A</sup> See **Table 1**, footnote B.

1.2 Zinc alloys Z33521, Z33522, Z35530, and Z35540 are used primarily for remelting in the manufacture of pressure die castings. Zinc-aluminum alloys Z35635, Z35630, and Z35840 are used for remelting in the manufacture of both foundry and pressure die castings. Castings made from these ingots are specified in **Specification B 86**, Standard Specification for Zinc and Zinc-Aluminum Alloys for Foundry and Die Castings.

1.3 The values stated in inch-pound units are to be regarded as standard.

1.4 Systems of nomenclature used to designate zinc and zinc-aluminum (ZA) alloys used for casting are described in **Appendix X1**.

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.*

<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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## 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>

**B 86** Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings

**B 275** Practice for Codification of Certain Nonferrous Metals and Alloys, Cast and Wrought

**B 897** Specification for the Configuration of Zinc and Zinc Alloy Jumbo and Block Ingot

**B 899** Terminology Relating to Non-ferrous Metals and Alloys

**B 908** Practice for the Use of Color Codes for Zinc Casting Alloy Ingot

**E 29** Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

**E 47** Test Methods for Chemical Analysis of Zinc Die-Casting Alloys<sup>3</sup>

**E 88** Practice for Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition

**E 527** Practice for Numbering Metals and Alloys (UNS)

**E 536** Test Methods for Chemical Analysis of Zinc and Zinc Alloys

**E 634** Practice for Sampling of Zinc and Zinc Alloys for Optical Emission Spectrometric Analysis

2.3 *Other ASTM Document*:

Methods for Emission Spectrochemical Analysis<sup>4</sup>

2.4 *ISO Standard*<sup>5</sup>

**ISO 301** Zinc Alloy Ingots Intended for Casting

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

<sup>2</sup> 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.

<sup>3</sup> Withdrawn.

<sup>4</sup> *Methods for Emission Spectrochemical Analysis: General Practices, Nomenclature, Standard Methods, Proposed Methods, Suggested Methods*, ASTM International, 1982.

<sup>5</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.

**TABLE 1 Chemical and North American Color Code Requirements**

|                         | Alloy 3 <sup>A,B,C,D</sup> | Alloy 7 <sup>A,B,C,D</sup> | Alloy 5 <sup>A,B,C,D</sup> | Alloy 2 <sup>A,B,C,D</sup> | ZA-8 <sup>B,C,E</sup> | ZA-12 <sup>B,C,E</sup> | ZA-27 <sup>B,C,E</sup> |
|-------------------------|----------------------------|----------------------------|----------------------------|----------------------------|-----------------------|------------------------|------------------------|
|                         | Zamak 3<br>(AG40A)         | Zamak 7<br>(AG40B)         | Zamak 5<br>(AC41A)         | Zamak 2<br>(AC43A)         | ZA-8                  | ZA-12                  | ZA-27                  |
|                         | Z33521                     | Z33522                     | Z35530                     | Z35540                     | Z35635                | Z35630                 | Z35840                 |
| Color Code <sup>F</sup> | None                       | Brown                      | Black                      | Green                      | Blue                  | Orange                 | Purple                 |
| Element                 |                            |                            |                            |                            |                       |                        |                        |
| Aluminum                | 3.9-4.3                    | 3.9-4.3                    | 3.9-4.3                    | 3.9-4.3                    | 8.2-8.8               | 10.8-11.5              | 25.5-28.0              |
| Magnesium               | 0.03-0.06                  | 0.010-0.020                | 0.03-0.06                  | 0.025-0.05                 | 0.02-0.03             | 0.02-0.03              | 0.012-0.020            |
| Copper                  | 0.10 max                   | 0.10 max                   | 0.7-1.1                    | 2.7-3.3                    | 0.9-1.3               | 0.5-1.2                | 2.0-2.5                |
| Iron, Max               | 0.035                      | 0.075                      | 0.035                      | 0.035                      | 0.035                 | 0.05                   | 0.07                   |
| Lead, Max               | 0.0040                     | 0.0030                     | 0.0040                     | 0.0040                     | 0.005                 | 0.005                  | 0.005                  |
| Cadmium, Max            | 0.0030                     | 0.0020                     | 0.0030                     | 0.0030                     | 0.005                 | 0.005                  | 0.005                  |
| Tin, Max                | 0.0015                     | 0.0010                     | 0.0015                     | 0.0015                     | 0.002                 | 0.002                  | 0.002                  |
| Nickel                  | ---                        | 0.005-0.020                | ---                        | ---                        | ---                   | ---                    | ---                    |
| Zinc <sup>G</sup>       | Remainder                  | Remainder                  | Remainder                  | Remainder                  | Remainder             | Remainder              | Remainder              |

<sup>A</sup> Zinc alloy ingot for die casting may contain nickel, chromium, silicon, and manganese in amounts of up to 0.02, 0.02, 0.035 and 0.05 %, respectively. No harmful effects have ever been noted due to the presence of these elements in up to these concentrations and, therefore, analyses are not required for these elements, except that nickel analysis is required for Z33522.

<sup>B</sup> ASTM alloy designations were established in accordance with Practice B 275. UNS assignments were established in accordance with Practice E 527. The last digit of a UNS number differentiates between alloys of similar composition. UNS designations for ingot and casting versions of an alloy were not assigned in the same sequence for all alloys.

<sup>C</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 prescribed in Practice E 29.

<sup>D</sup> When this material is required to conform to ISO Standard 301, the chemical limits for thallium and indium each shall not exceed 0.001 %.

<sup>E</sup> Zinc-aluminum ingot for foundry and pressure die casting may contain nickel, chromium, and manganese in amounts of up to 0.01 % each or 0.03 % total. No harmful effects have ever been noted due to the presence of these elements in up to these concentrations and, therefore, analyses are not required for these elements.

<sup>F</sup> Refer to Practice B 908. (Note: Colors indicated are for North American applications.)

<sup>G</sup> Determined arithmetically by difference.

## 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 B 899.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *continuous casting, n*—a casting technique in which a cast is continuously withdrawn through the bottom of the mold as it solidifies, so that its length is not determined by mold dimensions; used chiefly to produce semifinished mill products such as billets, blooms, ingots, slabs and tubes; also known as concast.

3.2.2 *die casting, n*—a casting process in which molten metal is injected under high velocity and pressure into a metal die and solidified, also a product produced by such a process. Alternately known as pressure die casting.

### 4. Ordering Information

4.1 Orders for ingot under this specification shall include the following information:

- 4.1.1 Quantity in pounds,
- 4.1.2 Alloy (Table 1),
- 4.1.3 Size, if not manufacturer's standard (see Section 7),
- 4.1.4 Specification number and date,
- 4.1.5 Source inspection (Section 10),
- 4.1.6 Marking (Section 12), and
- 4.1.7 Whether certification is required (Section 13).

### 5. Materials and Manufacturer

5.1 The material covered by this specification shall be of uniform quality and reasonably free from dross, adhering foreign matter, and surface oxide.

### 6. Chemical Requirements

6.1 The ingots shall conform to the requirements as to chemical composition prescribed in Table 1. Conformance shall be determined by the manufacturer by analyzing samples taken at the time the ingots are poured or samples taken from the ingots. Unless otherwise agreed in the contract or purchase order, sampling procedure will be the manufacturer's choice.

### 7. Ingot Sizes and Shapes

7.1 Zinc casting alloy ingots are typically supplied in ingot bundles weighing 1700 to 2400 lb.

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

7.2.1 Standard ingots have a nominal weight in the range of 17 to 24 lb. and are generally 24 to 26 in. long.

7.2.2 Margash bars or ingots come in two sizes with a nominal weight in the range of either 12 to 14 lb. or 20 to 24 lb.

7.3 Zinc casting alloy ingot may be ordered in jumbos or blocks, as specified in Specification B 897.

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

### 8. Sampling for Determination of Chemical Composition

8.1 In the event of a dispute, if the ingots are shipped in carload lots of the same alloy, not less than five ingots shall be taken at random from the carload for sampling. If the shipment is less than a carload lot, one sample ingot shall be taken for each 10,000 lb. (4500 kg) or fraction thereof. Either party may request that a sample be taken from each melt of 1000 lb. (450 kg) or more.

8.2 The samples for chemical analysis shall be taken by sawing, milling, or drilling in such a manner as to be