



Designation: B 894 – 99^{ε1}

Standard Specification for Zinc-Copper-Aluminum Alloy Die Castings¹

This standard is issued under the fixed designation B 894; 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.

^{ε1} NOTE—The caveat in section 1.3 and section 3. Terminology were added editorially in December 2000.

1. Scope

1.1 This specification covers zinc-copper-aluminum alloy die castings. (UNS Z46541).²

1.2 The values stated in inch-pound units are standard. The SI values 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 Data Sheet 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 The following documents of the issue in effect on date of order acceptable form a part of this specification to the extent referenced herein:

2.2 ASTM Standards:

B 892 Specification for Zinc-Copper-Aluminum Alloys in Ingot Form for Die Castings³

B 899 Terminology Relating to Non-ferrous Metals and Alloys⁴

E 10 Test Method for Brinell Hardness of Metallic Materials⁵

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications⁶

E 47 Test Methods for Chemical Analysis of Zinc Die Casting Alloys⁷

E 88 Practice for Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition⁷

E 527 Practice for Numbering Metals and Alloys⁸

E 536 Test Method for Chemical Analysis of Zinc and Zinc Alloys⁹

E 634 Practice for Sampling of Zinc and Zinc Alloys for Optical Emission Spectrochemical Analysis⁹

2.3 Federal Standards:

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)¹⁰

2.4 Military Standard:

MIL-P-116 Methods of Preservation¹¹

MIL-STD-129 Marking for Shipment and Storage¹¹

2.5 NADCA Standard:

NADCA Product Specification Standards for Die Castings¹²

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 *die casting*—a metal object produced by the introductions of molten metal under pressure into a metal die.

4. Ordering Information

4.1 Orders for die castings shall include the following basic information:

4.1.1 This specification number and date,

4.1.2 Quantity and delivery schedule, as required,

4.1.3 Part name and number,

4.1.4 Alloy (Table 1), and

4.1.5 Drawing of die casting, when required, giving all necessary dimensions and showing latest revisions and allowances for machining, if any. Location of ejector pin marks or parting lines shall be at the option of the producer, unless specifically designated on the drawing.

4.2 Additional tests, options and special inspection requirements as provided below should be justified only on the basis of need. These shall be specified in the contract or purchase

¹ This specification is under the jurisdiction of ASTM Committee B-2 on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee B02.04 on Zinc and Cadmium.

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² See Footnote B in Table 1.

³ *Annual Book of ASTM Standards*, Vol 02.02.

⁴ *Annual Book of ASTM Standards*, Vol 02.04.

⁵ *Annual Book of ASTM Standards*, Vol 03.01.

⁶ *Annual Book of ASTM Standards*, Vol 14.02.

⁷ *Annual Book of ASTM Standards*, Vol 03.05.

⁸ *Annual Book of ASTM Standards*, Vol 01.01.

⁹ *Annual Book of ASTM Standards*, Vol 03.06.

¹⁰ Available from Superintendent of Documents, US Government Printing Office, Washington, DC 20402.

¹¹ Available from Standardized Documents Order Desk, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5004, Attn: NPODS.

¹² Available from North American Die Casting Association, 9701 West Higgins Road, Suite 880, Rosemont, IL 60018-4721, USA.

order, as additional procedures and extended delivery time may be involved.

- 4.2.1 Chemical analysis (7.1.1),
- 4.2.2 Quality assurance (Section 6),
- 4.2.3 Special proof tests or mechanical properties (Section 8),
- 4.2.4 General quality options for internal soundness or for finish (Section 10),
- 4.2.5 Source inspection (Section 11),
- 4.2.6 Certification (Section 13),
- 4.2.7 Marking for identification (Section 14), and
- 4.2.8 Special packaging (Section 15).

5. Materials and Manufacture

5.1 The metal used in the manufacture of die castings shall be zinc alloy of a specified chemical composition conforming to the requirements of Specification B 892.

5.2 The material covered by this specification shall be of uniform quality and shall be free of harmful contamination.

TABLE 1 Chemical Requirements, Composition, Zinc-Copper-Aluminum Die Castings^A

| Elements | Composition, % |
|-----------|------------------------|
| | (Z46541) ^B |
| Copper | 5.0 to 6.0 |
| Aluminum | 2.5 to 3.3 |
| Magnesium | 0.025 - 0.05 |
| Iron | 0.075 max |
| Lead | 0.005 max |
| Cadmium | 0.004 max |
| Tin | 0.003 max |
| Zinc | Remainder ^C |

^A The following applies to all specified limits in this table: For purposes of determining conformance with this specification, the observed value or calculated value obtained from analysis shall be rounded off to the nearest unit in the last right-hand place of figures used in expressing the specified limit, in accordance with the rounding method of Practice E 29.

^B UNS designations were established in accordance with Practice E 527.

^C Determined arithmetically by difference.

6. Quality Assurance

6.1 *Responsibility for Inspection*—When specified in the contract or purchase order, the producer or supplier is responsible for the performance of all inspection and test requirements specified herein. Except as otherwise specified in the contract or order, the producer or supplier may use his own or any other suitable facilities for the performance of the inspection and test requirements specified herein, unless disapproved by the purchaser. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification. Quality assurance standards shall be agreed upon between the producer or supplier and purchaser at the time a contract or order is placed.

6.2 For normal inspection purposes, an inspection lot shall consist of the production from each die during a single production run, as defined and recorded by the producer, and shipped, or available for shipment, at one time.

6.2.1 The producer or supplier shall examine each die casting of a randomly or statistically selected sample to determine conformance to the requirements of the contract, purchase order, or part drawing. The results of this inspection shall be recorded.

6.2.1.1 Unless otherwise specified in the contract, purchase order, or part drawing, detailed dimensional conformance shall normally be determined on one or more production samples.

6.2.2 When specified in the contact, purchase order, or part drawing, special inspection lot definitions may be established, for a specific part.

7. Chemical Requirements

7.1 *Limits*—The die casting shall conform to the requirements as to chemical composition in Table 1. Conformance shall be determined by the producer by analyzing samples taken at the time castings 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.

7.1.1 When a detailed chemical analysis is required with a shipment, it shall be called for in the contract or purchase order.

7.1.2 If the producer's or supplier's method of composition control is acceptable, sampling for chemical analysis may be waived at the discretion of the purchaser.

7.2 *Number of Samples*—When required, samples for determination of chemical composition shall be taken to represent the following:

7.2.1 A sample shall be taken from each of two representative castings selected from each lot defined in 6.2.

7.3 *Methods of Sampling*—Samples from die castings for determination of chemical composition shall be taken in accordance with one of the following methods:

7.3.1 Samples for chemical analysis shall be taken from the material by drilling, sawing, milling, turning or clipping a representative piece or pieces to obtain a weight of prepared sample not less than 100 g. Sampling shall be in accordance with Practice E 88.

7.3.2 By agreement, an appropriate spectrographic sample may be prepared at time of manufacture in accordance with Practice E 634.

7.3.3 The method of sampling cast products for spectrochemical and other methods of analysis shall be suitable for the form of material being analyzed and the type of analytical method used.

7.4 *Method of Analysis*—The determination of chemical composition shall be made in accordance with suitable chemical (Test Methods E 47 for tin or Test Method E 536), or other methods. In case of dispute, the results secured by Test Method E 536 and Test Method E 47 for tin only, shall be the basis of acceptance.

8. Mechanical Properties and Tests

8.1 Unless specified in the contract or purchase order, or specified on the detail drawing, acceptance of die castings under this specification shall not depend on mechanical properties determined by tension or impact tests.

8.1.1 Tensile strength, yield strength and elongation values shown in Table 1. Are weibull analysis values to be used for design guidance. They are B₅₀ and B₁ values with 50 % confidence and were obtained from tests on 5.3 mm diameter separately cast test bars which had a 25.4 mm gage length. The bars were tested in the as-cast condition.