ICS 77.120.60
CCS J 31

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 46786-2025

Metallographic examination of zinc alloy die castings

锌合金压铸件金相检验

Issued on: December 2, 2025 **Implemented on: July 1, 2026**

Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC

Table of Contents

1 Scope

GB/T 46786-2025 is the Chinese national standard covering reading the microstructure of a zinc die casting - the grain and phases, the porosity and cold shuts, and the intergranular corrosion that lead and cadmium impurities cause in zinc alloys years after the part was made. First edition, with the magnesium die casting alloy standard GB/T 25748-2025. It was issued on 2 December 2025 and has been in force since 1 July 2026, as a first edition. The document is under the responsibility of the Standardization Administration of China. This page is published from the official record of the 2025 edition; the clause text of a standard this recent is not yet in circulation, and the figures, limits and tables it contains are those of the document itself, delivered in full with the English translation.

This document describes the selection and preparation of metallographic test specimens for zinc alloy die castings, as well as the inspection methods, inspection items, and inspection report. This document is applicable to the inspection of microstructure types, volume percentages of primary phases, and primary phase sizes in metallographic test specimens for zinc alloy die castings.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 5611 Foundry terminology

3 Terms and Definitions

The terms and definitions defined in GB/T 5611 and the following ones are applicable to this document.

3.1 Primary Phase The solid phase that precipitates preferentially from the liquid phase during the solidification of a zinc alloy.

3.2 Primary eta Phase The solid phase that precipitates preferentially during the solidification of a zinc alloy, consisting of a small amount of aluminum dissolved within the zinc matrix.

3.3 Primary alpha Phase The solid phase that precipitates preferentially during the solidification of a zinc alloy, consisting of zinc dissolved within the aluminum matrix.

3.4 Eutectic Structure A two-phase or multi-phase microstructure formed through a eutectic transformation.

3.5 Eutectoid Structure A two-phase or multi-phase microstructure formed through a eutectoid transformation.

4 Specimen Selection and Preparation

4.1 Metallographic specimens shall be sectioned directly from the body of the die casting; the sampling location shall be determined in accordance with the technical specifications of the product or upon agreement between the supply and demand sides.

4.2 During the sectioning and preparation of metallographic specimens, care must be taken to prevent external factors-such as specimen deformation or heat generation-from altering the microstructure.

4.3 If metallographic specimens require mounting, cold mounting using epoxy resin or dental acrylic powder is recommended. The mounting procedure may reference the cold mounting method specified in GB/T 13298-2015.

4.4 During the grinding and polishing of metallographic specimens, care must be taken to prevent external factors-such as specimen deformation or heat generation-from affecting the microstructure. After polishing, the inspection surface shall be smooth and free of defects, such as scratches.

4.5 Etching of metallographic specimens is preferably performed using a 2% to 6% (by volume) solution of nitric acid in alcohol.

5 Inspection Methods

5.1 After the inspection surface of the specimen has undergone grinding, polishing, and etching, the overall morphology of the specimen shall first be observed under low

magnification. Subsequently, depending on the specific inspection items, fields of view shall be randomly selected and examined under the appropriate magnification; the number of selected fields of view shall be no fewer than three.

5.2 A magnification of 200x is recommended for observing the microstructure type; a magnification of 1 000x may also be used to assist in the observation.

5.3 A magnification of 500x is recommended for observing the volume fraction and size of the primary phase.

6 Inspection Items

6.1 Basic Requirements The metallographic test for zinc alloy die castings encompasses the microstructure type, the volume fraction of the primary phase, and the size of the primary phase.

6.2 Microstructure Types

6.2.1 The microstructure types of zinc alloy die castings primarily consist of the primary phase, eutectic structure, and eutectoid structure.

6.2.2 The microstructure types and characteristics of die castings made from common zinc alloy grades, as defined in GB/T 13821, are presented in Table 1; the metallographic atlases for these typical grades can be found in Appendix A. Table 1 -- Types and Characteristics of Metallographic Structures in Zinc Alloy Die Castings

6.3.1 General

6.3.1.1 The inspection of the volume fraction of the primary phase may be performed using the grid point-counting method, the grid intercept method, or the determination method using an image analyzer.

6.3.1.2 Illustrative examples of the volume fraction of primary phases in zinc alloy die castings are provided in Appendix B.

6.3.2 Grid point-counting method When measuring the primary phase using the grid point-counting method, the grid is superimposed onto the image under examination (see Figure 1), and the total number of grid points falling upon the primary phase is calculated. Grid points situated on the boundary of the primary phase are counted as 1/2 point each. The volume fraction of the primary phase (VV) is defined as the percentage of the total number of grid points falling upon the primary phase relative to the total number of grid points in the grid.

6.3.3 Grid intercept method When verifying the volume fraction of the primary phase using the grid intercept method, the grid spacing should ideally be selected to approximate the distance between the primary phases. The grid is superimposed onto the image under

examination (see Figure 1), and the total length of the line segments falling upon the primary phase is measured. When a measurement line segment coincides with the boundary of a primary phase, it is counted as 1/2 of the length of the coinciding line segment. The volume fraction of the primary phase (VV) is defined as the percentage of the total length of line segments falling upon all primary phases relative to the total length of the grid line segments. Figure 1 -- Schematic Diagram of a Grid Superimposed on An Image of the Primary Phase

6.3.4 Determination method using an image analyzer When measuring and verifying the volume fraction of the primary phase using an automated image analyzer, the etched specimen must exhibit distinct contrast in the primary phase and clear phase boundaries. The automatically measured area percentage of the primary phase is taken as the volume fraction of the primary phase (VV). The measurement steps are as follows:

a) Open the image of the microstructure to be analyzed within the image analysis software;

b) Load the scale bar;

c) If the image is a grayscale image, proceed directly to threshold segmentation to extract the primary phase; if the image is a true-color image, you may either proceed directly to threshold segmentation to extract the primary phase, or convert the image to grayscale before performing threshold segmentation to extract the primary phase.