



**NATIONAL STANDARD OF THE  
PEOPLE'S REPUBLIC OF CHINA**

**GB/T 7216-2023**

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**Metallographic test for grey cast iron**

灰铸铁金相检验

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### Foreword

This document was drafted in accordance with the provisions of GB/T 1.1-2020 "Directives for standardization - Part

1. Rules for the structure and drafting of standardizing documents". This document replaces GB/T 7216-2009 "Metallographic test for gray cast iron". Compared with GB/T 7216-2009, in addition to structural adjustments and editorial changes, the main technical changes are as follows:

- a) CHANGE the scope of application of the standard (see Chapter 1; Chapter 1 of the 2009 edition);
- b) ADD the terms and definitions (see Chapter 3);
- c) CHANGE the graphite distribution chart (see Figure 1; Figure 1 ~ Figure 6 of the 2009 edition);
- d) CHANGE the graphite length measurement method (see 5.2.2; 4.2.1 of the 2009 edition);
- e) CHANGE the graphite length grade reference chart (see Figure 2; Figure 7 ~ Figure 14 of the 2009 edition);
- f) ADD the calculation method of graphite content (see 5.3);
- g) CHANGE the pearlite content chart (see Figure 3; Figure 15 ~ Figure 22 of the 2009 edition);
- h) CHANGE the carbide content chart (see Figure 4; Figure 23 ~ Figure 28 of the 2009 edition);

- i) CHANGE the phosphorus eutectic content chart (see Figure 5; Figure 29 ~ Figure 34 of the 2009 edition);
- j) CHANGE the magnification for detecting the number of eutectic clusters (see 5.7.1; 4.6.1 of the 2009 edition);

## 1 Scope

GB/T 7216-2023 specifies the metallographic examination of grey cast iron. Grey iron's properties are set almost entirely by the shape, size and distribution of its graphite flakes and by the matrix around them: the same chemical analysis can give an engine block that works and one that cracks, and the difference is visible only under a microscope. The examination is therefore comparative, done against rating charts. The standard sets the preparation of the specimen, the inspection items and their rating charts, the representation of results and the test report, with informative annexes comparing the clause numbering and the technical differences against ISO 945-1, illustrating typical flake graphite distributions, describing graphite type identification by image analysis, and covering the phosphorus eutectic types. It took effect on 23 May 2023.

This document specifies the preparation of specimens, inspection items and rating charts, result representation, test reports for metallographic examination of gray cast iron.

## 2 Normative references

The contents of the following documents constitute essential provisions of this document through normative references in the text. Among them, for dated reference documents, only the version corresponding to the date applies to this document; for undated reference documents, the latest version (including all amendments) applies to this document.

GB/T 5611 Foundry terminology

GB/T 13298 Inspection methods of microstructure for metals

## 3 Terms and definitions

The terms and definitions defined in GB/T 5611, as well as the following terms and definitions, apply to this document. The maximum straight-line distance between any two points on the graphite sheet outline.

## 4 Specimen preparation

4.1 Metallographic specimens shall be taken from the test block or casting; the detection surface shall avoid the casting surface.

4.2 Metallographic specimens are prepared in accordance with the provisions of GB/T

13298. During the process of intercepting and preparing metallographic specimens, changes in the structure, graphite peeling, graphite tailing shall be prevented. The surface of the specimen shall be smooth and clean; there shall be no coarse scratches.

## 5.1 Graphite distribution morphology

5.1.1 To examine the graphite distribution morphology in the polished state, first observe the entire inspected surface; compare the graphite morphology in most fields of view with the corresponding rating chart, with a magnification of 100x.

5.1.2 According to the distribution form of graphite, it is divided into 6 types, as shown in Figure 1; detailed description is as shown in Table 1.

## 6 Result representation

6.2 The length of graphite is expressed in terms of grades or length values. If the graphite observed in different fields of view includes two length grades, the two length grades of graphite can be described as. 3/

4. By using an underline at a certain grade number, it is indicated that graphite of that grade accounts for the majority.

6.3 Graphite content, pearlite content, carbide content, phosphorus eutectic content are expressed by corresponding grade names or percentages; if the total content of carbide and phosphorus eutectic does not exceed 5%, the two can be combined for assessment.