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Abrasion-resistant white iron castings

耐磨白口铸铁件

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Abrasion-resistant white iron castings

1 Scope

This document specifies the designation, manufacturing, technical requirements, inspection rules as well as marking, certification, packaging, transportation and storage of abrasion-resistant white iron castings (hereinafter referred to as "castings"), and describes the corresponding test methods.

This document is applicable to the production, testing, application, procurement and delivery acceptance of abrasion-resistant white iron castings subject to abrasive wear in the mining, metallurgy, building materials, electric power, construction, shipbuilding, chemical and machinery industries. It serves as a reference for the implementation of abrasion-resistant white iron castings for other working conditions.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 223.3, Methods for chemical analysis of iron, steel and alloy - The diantipyrylmethane phosphomolybdate gravimetric method for the determination of phosphorus content

GB/T 223.4, Alloyed steel - Determination of manganese content - Potentiometric or visual titration method

GB/T 223.11, Iron, steel and alloy - Determination of chromium content - Visual titration or potentiometric titration method

GB/T 223.18, Methods for chemical analysis of iron steel and alloy - The sodium thiosulfate separation iodimetric method for the determination of cupper content

GB/T 223.23, Iron, steel and alloy - Determination of nickel content - The dimethylglyoxime spectrophotometric method

GB/T 223.25, Methods for chemical analysis of iron, steel and alloy - The dimethylglyoxime gravimetric method for the determination of nickel content

GB/T 223.26, Iron, steel and alloy - Determination of molybdenum content - The thiocyanate spectrophotometric method

GB/T 11351-2017, Mass tolerances of casting

GB/T 13298, Inspection methods of microstructure for metals

GB/T 15056, Casting surface roughness - Appraising method

GB/T 20066, Steel and iron - Sampling and preparation of samples for the determination of chemical composition

GB/T 24234, Cast iron - Determination of multi-element contents - Spark discharge atomic emission spectrometric method (Routine method)

GB/T 39428-2020, Steel castings by sand casting - Visual examination method of surface quality

GB/T 39638, X-ray digital radiographic testing for casting

3 Terms and definitions

For the purposes of this document, the following terms and definitions, as well as those given in GB/T 5611, apply.

3.1

abrasion-resistant white cast iron

White cast iron with good abrasion resistance, whose microstructure consists of a metal matrix and carbides.

Note: Abrasion-resistant white cast iron is also called wear-resistant white cast iron.

3.2

nickel-chromium abrasion-resistant white cast iron

Abrasion-resistant white cast iron with nickel and chromium as the main alloying elements.

Note: Nickel-chromium abrasion-resistant white cast iron is also called nickel-hard cast iron.

3.3

chromium abrasion-resistant white cast iron

Abrasion-resistant white cast iron with chromium as the main alloying element.

3.4

chromium-manganese-tungsten abrasion-resistant white cast iron

Abrasion-resistant white cast iron with chromium, manganese and tungsten as the main alloying elements.

4 Designation

The designation method of abrasion-resistant white cast iron and its castings shall comply with the provisions of GB/T 5612. Abrasion-resistant white cast iron and its castings shall be divided into 3 categories and 17 designations according to the types and contents of the main alloying elements, as shown in Table 1.

5 Manufacturing

5.1 Casting

Unless otherwise agreed upon by the supplier and the buyer, the smelting method and casting process shall be determined by the supplier.

5.2 Heat treatment

5.2.1 Castings can be supplied in the following conditions:

a) As-cast;

b) As-cast destressing;

c) Hardened state;

d) Tempering treatment in hardened state;

e) Softened annealed state.

5.2.2 The heat treatment process of castings is shown in Appendix A.

5.2.3 Unless otherwise agreed between the supplier and the buyer, the delivery status shall be determined by the supplier.

5.3 Casting cleaning

When cleaning castings and treating casting defects, flame cutting, arc gouging cutting, electric welding cutting and welding repair shall not be used.

6 Technical requirements

6.1 Chemical composition

The chemical composition of abrasion-resistant white cast iron and its castings shall comply with the requirements of Table 1.

6.2 Microstructure

Unless otherwise agreed upon by the supplier and the buyer, microstructure shall not be used as the basis for product acceptance. The microstructure of the casting is shown in Appendix B.

6.3 Hardness

The hardness of abrasion-resistant white cast iron and its castings at room temperature shall comply with the requirements of Table 2. If the buyer has special requirements for hardness, it shall be determined by negotiation between the supplier and the buyer.

6.5.3 The casting surface grinding (mechanical) treatment level, surface non-metallic inclusion level, and surface porosity level may be agreed upon by the supplier and the buyer in accordance with the provisions of GB/T 39428-2020.

6.5.4 The surface roughness grade of castings shall comply with the requirements of the drawings or order contracts. If not specified in the drawings or order contract, the supplier shall select the surface roughness. The surface roughness parameters of castings weighing less than 1 000 kg shall comply with the requirements of Ra ≤ 25 μm in GB/T 1031-2009, or meet the requirements of BM2 in GB/T 39428-2020. The surface roughness parameters of castings weighing 1 000 kg or more shall comply with the requirements of Ra ≤ 100 μm in GB/T 1031-2009, or meet the requirements of BM3 in GB/T 39428-2020.

6.6 Geometric shape and dimensions

6.6.1 The geometric shape and dimensional deviation of the casting shall comply with the requirements of the drawing or order contract.

6.6.2 Unless otherwise specified in the drawing and order contract, the dimensional deviation of the casting shall meet the requirements of grade DCTG12 in GB/T 6414-2017, and the geometric deviation shall comply with the requirements of grade GCTG7 in GB/T 6414-2017.

6.7 Weight

The weight deviation grade of castings shall comply with the requirements of the drawing or order contract. If there is no stipulation in the drawing and order contract, the casting weight deviation grade selection shall comply with the requirements for grade MT11 in GB/T 11351-2017.

7 Test methods

7.1 Chemical composition

7.1.1 The sampling and preparation of samples for the determination of chemical composition shall be carried out in accordance with the provisions of GB/T 20066. When multiple packages of molten iron are used to cast a casting, each package of molten iron shall be chemically analyzed and shall meet the corresponding technical requirements.

7.1.2 The analytical method of chemical composition shall be carried out in accordance with the provisions of GB/T 223.3, GB/T 223.4, GB/T 223.11, GB/T 223.18, GB/T 223.23, GB/T 223.25, GB/T 223.26, GB/T 223.28, GB/T 223.43, GB/T 223.59, GB/T 223.60, GB/T 223.64, GB/T 223.71, GB/T 223.72 and GB/T 4699.2. Analytical methods such as spark discharge atomic emission spectrometric method and X-ray fluorescence spectrometric method can be used. Testing by the spark discharge atomic

emission spectrometric method shall be carried out in accordance with the provisions of GB/T 24234. When there is a dispute over the analysis results, the results of the chemical analysis method shall prevail.

7.1.3 When it is necessary to specify residual elements, the type, content and total amount of the residual elements shall be determined by the supplier and the buyer through consultation.

7.2 Microstructure

Microstructure inspection shall be carried out in accordance with the provisions of GB/T 13298.

7.3 Hardness

The Rockwell hardness test shall be carried out in accordance with the provisions of GB/T 230.1; the Brinell hardness test shall be carried out in accordance with the provisions of GB/T 231.1.

7.4 Internal quality

7.4.1 Ultrasonic testing of castings shall be carried out in accordance with the provisions of GB/T 7233.1.

7.4.2 X-ray or gamma-ray radiographic testing of castings shall be carried out in accordance with the provisions of GB/T 5677. Alternatively, X-ray digital radioscopic examination of castings may be used in accordance with the provisions of GB/T 39638.

7.5 Surface quality

7.5.1 The surface quality inspection of castings shall be carried out in accordance with the provisions of GB/T 39428-2020.

7.5.2 Penetrant testing of castings shall be carried out in accordance with the provisions of GB/T 9443.

7.5.3 Magnetic particle testing of castings shall be carried out in accordance with the provisions of GB/T 9444.

7.5.4 The casting surface roughness of castings shall comply with the provisions of GB/T 15056. Alternatively, visual comparison inspection shall be conducted using comparison photos, which shall comply with the surface roughness comparison photos in Appendix C of GB/T 39428-2020.

7.6 Geometric shape and dimensions

The geometric shape and size inspection of castings shall be carried out using inspection tools, gauge blocks, templates or markings of corresponding accuracy.

7.7 Weight

The casting weight deviation inspection shall be carried out in accordance with the provisions of GB/T 11351-2017.

8 Inspection rules

8.1 Inspection and acceptance

8.1.1 The supplier shall inspect the castings to ensure that the product quality complies with the provisions of this document and the order contract.

8.1.2 The buyer shall inspect the received casting in accordance with the provisions of this document. If the inspection results are inconsistent with the provisions of this document and the order contract, the matter shall be raised to the supplier within one month from the date of receipt of the casting and resolved through negotiation between the supplier and the buyer. If arbitration is required, it can be entrusted to an organization that is recognized by both parties to conduct a joint sampling on the buyer's side.

8.2 Division of inspection batches

8.2.1 The division of inspection batches for chemical composition shall be selected from one of the following two ways. If the buyer has special requirements for the inspection batches, it shall be agreed upon by the supplier and the buyer.

a) When smelting in an electric furnace, each furnace is considered as a batch.

b) When smelting in a cupola, every 2 hours is considered as a batch.

8.2.2 The division of inspection batches for other items shall be selected from one of the following three methods. If the buyer has special requirements for the inspection batches, it shall be agreed upon by the supplier and the buyer.

a) Batching by heat: For castings of the same type, those cast from the same smelting furnace and heat-treated in the same heat treatment furnace shall be one batch.

b) Batching by quantity or weight: For castings of the same designation cast from multiple smelting furnaces under stable smelting process conditions and subjected to multiple heat treatments using the same process shall be one batch with a certain quantity or weight.

c) Batching by piece: For some castings with special requirements, one or several pieces shall be one batch.

8.3 Sampling regulations

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