



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

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Alloy steel castings with special physical properties

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Table of Contents

Foreword	3
1 Scope	4
2 Normative references	4
3 Terms and definitions	7
4 Technical requirements	8
5 Test methods	12
6 Inspection rules	13
7 Marks, quality certificates, packaging and storage	16
Annex A (informative) Comparison on chapter numbers between this document and ISO 19960:2015	18
Annex B (informative) Technical differences between this document and ISO 19960:2015 and their reasons	19
Annex C (informative) Comparison on designations between this document, ISO 19960:2015 and UNS	21

1 Scope

This document specifies the material designations, technical requirements, test methods, inspection rules and marks, quality certificates, packaging and storage for alloy steel castings with special physical properties.

This document applies to alloy steel castings with weak magnetic properties, small expansion coefficient and special physical properties of self-lubricating and wear-resistant.

2 Normative references

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

GB/T 222, Permissible tolerances for chemical composition of steel products

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

GB/T 223.5, Steel and iron - Determination of acid-soluble silicon and total silicon content - Reduced molybdsilicate spectrophotometric method

GB/T 223.9, Iron, steel and alloy - Determination of aluminium content - Chrome azurol S

photometric method

GB/T 223.11, Iron, steel and alloy - Determination of chromium content - Visual titration or potentiometric titration method (GB/T 223.11-2008, ISO 4937:1986, MOD)

GB/T 223.14, Methods for chemical analysis of iron, steel and alloy - The N-benzoyl-N-phenylhydroxylamine extraction photometric method for the determination of vanadium content

GB/T 223.20, Methods for chemical analysis of iron steel and alloy - The Potentiometric titration method for the determination of cobalt content

GB/T 223.21, Methods for chemical analysis of iron steel and alloy - The 5-Cl-PADAB spectrophotometric method for the determination of cobalt content

GB/T 223.22, Methods for chemical analysis of iron, steel and alloy - The nitroso-R-salt spectrophotometric method for the determination of cobalt content The tensile test shall be carried out in accordance with the provisions of GB/T 228.1 and GB/T 2975.

5.3 Impact test The impact absorption energy test is carried out according to the provisions of GB/T 229 and GB/T 2975.

5.4 Magnetic permeability test The magnetic permeability test is carried out according to the provisions of GB/T 35690.

5.5 Coefficient of linear expansion test The coefficient of linear expansion test is carried out according to the provisions of

GB/T 4339.

5.6 Surface quality

5.6.1 The surface quality of castings should be checked visually.

5.6.2 The surface roughness shall be carried out according to the provisions of GB/T 6060.1 and GB/T 15056.

5.7 Internal quality

5.7.1 Penetration test is carried out in accordance with the provisions of GB/T 9443.

5.7.2 Ultrasonic testing is carried out in accordance with the provisions of GB/T 7233.1 and GB/T 7233.2.

5.7.3 Radiographic testing shall be carried out in accordance with the provisions of GB/T 5677.

5.8 Geometry, dimensional tolerances and weight tolerances

5.8.1 The geometrical shape and dimensional tolerance of castings should be checked by

selecting inspection tools, gauge blocks, templates or scribing lines with corresponding precision. Dimensional tolerances shall be implemented in accordance with the provisions of GB/T 6414.

5.8.2 The weight tolerance shall be implemented in accordance with the provisions of GB/T 11351.

6 Inspection rules

6.1 Batching Divide inspection lots in one of the following ways.

- a) Batch by heat: Castings of the same designation, poured in the same heat and heat-treated in the same heat constitute an inspection batch.
- b) Batch by quantity or weight: Under the condition of stable smelting or manufacturing process, a certain number or weight of castings of the same designation, which are cast in multiple heats or in the same casting process and subjected to the same heat treatment process for multiple heats, constitute an inspection batch.
- c) Batch by piece: For some with special casting process requirements, one or several pieces constitute an inspection batch.

6.2 Chemical composition analysis

6.2.1 The chemical composition shall be inspected one by one according to the smelting heat. Analytical samples shall be taken at least 6mm below the surface of the test block or casting.

6.2.2 When pouring a casting in multiple packs, the analysis results of each pack should meet the technical requirements of the selected designation.

6.3 Mechanical properties

6.3.1 The specimens for mechanical properties shall be taken from the attached casting test block of the casting or the single casting test block of the same smelting heat. They are heat treated in the same furnace as the castings they represent. The main dimensions of the single cast test block and the location of the cut sample are shown in Figure 1.

6.3.2 The thickness of the attached casting test block for mechanical properties shall be $\geq 28\text{mm}$ (including the test block cut from the casting as agreed upon by both parties).

6.3.3 The additional casting position, size and quantity of the additional casting test block shall be determined by the supplier.

6.3.4 For tensile test, take one specimen from each batch for the test. The test results should meet the requirements of Table 2.

6.3.5 For impact absorption energy test, take three impact specimens from each batch for the test. The average value of the three impact specimens shall meet the requirements of

Table 2. Among them, the impact value of one specimen is allowed to be lower than the specified value and not less than 70% of the specified value.

6.3.6 If the test results do not meet the requirements of Table 2, the re-inspection shall be carried out according to the provisions of 6.8.

6.4 Surface quality are still accepted. If there is still one specimen rejected in the re-inspection, the supplier shall deal with it according to 6.9.

6.8.2 Take three spare impact specimens from the same batch for testing. This result is added to the original result to recalculate the average value. If the recalculated average value meets the requirements in Table 2, the impact value of this batch of castings can be judged as accepted, otherwise the supplier shall deal with it according to 6.9.

6.9 Reheat treatment When the re-inspection results of mechanical properties do not meet the requirements in Table 2 and the physical properties do not reach the values in Tables 3 and 4, the castings and test blocks can be re-heated and then re-inspected. Without the consent of the purchaser, the number of re-heat treatment shall not exceed two times.

6.10 Nondestructive testing According to the requirements of the purchaser, castings shall be inspected by penetration, ultrasonic or radiography. Testing methods, testing locations, acceptance levels and acceptance criteria shall be agreed upon by both parties.

6.11 Round-off of test results The mechanical properties and chemical composition analysis results shall be rounded according to the principles specified in the test method or according to the provisions of GB/T 8170.

7 Marks, quality certificates, packaging and storage

7.1 Marks The following marks shall be made on the surface of each casting:

- a) Purchaser name, address and destination;
- b) Casting name, specification and designation;
- c) Packing number;
- d) Gross and net weight;
- e) Supplier name and address;
- f) When marking cannot be made on castings, the marks may be printed on labels attached to each batch of castings.

7.2 Quality certificates The exit-factory castings should be accompanied by the product certificate or quality certificate issued by the inspection department, including:

- a) Supplier name and address;
- b) Trademark;