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**Austempered ductile iron (ADI) castings
(English Translation)**

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1 Scope

This document specifies the material grades, ordering information, manufacturing process, technical requirements, sample preparation, test methods, inspection rules, and markings, quality certificate, rust prevention, packaging, and storage and transportation of austempered ductile iron (ADI) castings.

This document is applicable to ductile iron castings cast in sand molds or molds with thermal conductivity equivalent to sand molds, and subjected to austempering of ductile iron. This document can also be used as a reference for austempered ductile iron (ADI) castings produced by other casting methods (such as permanent mold casting, sand casting with metal molds, shell mold casting, investment casting, and continuous casting, etc.).

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 223.3 Methods for chemical analysis of iron, steel and alloy - The dianthipyryl methane phosphomolybdate gravimetric method for the determination of phosphorus content

GB/T 223.12 Methods for chemical analysis of iron, steel and alloy - The sodium carbonate

separation-diphenyl carbazide photometric method for the determination of chromium content

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

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

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

GB/T 223.58 Methods for chemical analysis of iron, steel and alloy - The sodium arsenite-sodium nitrite titrimetric method for the determination of manganese content

GB/T 223.60 Methods for chemical analysis of iron, steel and alloy - The perchloric acid dehydration gravimetric method for the determination of silicon content

GB/T 223.68 Methods for chemical analysis of iron, steel and alloy - The potassium iodate titration method after combustion in the pipe furnace for the determination of sulfur content

GB/T 223.69 Iron, steel and alloy - Determination of carbon contents - Gas-volumetric method after combustion in the pipe furnace

GB/T 228.1 Metallic materials - Tensile testing - Part 1. Method of test at room temperature

GB/T 229 Metallic materials - Charpy pendulum impact test method

GB/T 231.1 Metallic materials - Brinell hardness test - Part 1. Test method

GB/T 5611 Foundry terminology

GB/T 5612 Designation of cast irons

GB/T 5677 Castings - Radiographic testing

GB/T 5678 Sampling methods of spectrochemical analysis for cast alloys

GB/T 6060.1 Surface roughness comparison specimen - Part 1. Casting surface

GB/T 6414 Castings - Dimensional tolerances and geometrical tolerances and machining allowances

GB/T 9441 Metallographic test method for spheroidal graphite cast iron

GB/T 9443 Steel and iron castings - Liquid penetrant inspection

GB/T 9444 Steel and iron castings - Magnetic particle inspection

GB/T 11351 Mass tolerances of casting

GB/T 14203 General rules for spark discharge atomic emission spectrometry

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 20125 Low-alloy steel - Determination of multi-element contents - Inductively coupled plasma atomic emission spectrometric method

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

GB/T 34904 Spheroidal graphite iron castings - Ultrasonic testing

3 Terms and Definitions

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

3.1 Austempered Ductile Iron (ADI)

A ductile iron material with ausferrite as the main matrix obtained through austempering of ductile iron.

NOTE: The austempered ductile iron is also known as the ausferrite ductile iron.

3.2 Austempering of Ductile Iron

An austempering process in which ductile iron castings are heated to a certain temperature (above the temperature at which austenite begins to form) and held for a sufficient period of time to allow carbon to diffuse into the austenite, and then cooled at a rate that avoids the formation of pearlite to a certain temperature (above the temperature at which martensite begins to transform) and held for a sufficient period of time to allow the matrix structure to transform to achieve the desired properties.

3.3 Ausferrite

The microstructure of ductile iron mainly composed of acicular ferrite and high-carbon austenite.

3.4 Relevant Wall Thickness of Casting

The cross-sectional thickness of the casting that represents the mechanical properties of the casting material.

3.5 Side-by-Side Cast Sample

A test block that is poured side by side with the casting using the same gating system as the casting.

4 Material Grades

4.1

The designation of material grades for austempered ductile iron shall comply with the provisions of GB/T 5612.

4.2 Based on the minimum tensile strength and minimum elongation after fracture measured

from samples machined from the separated test bar of casting, side-by-side cast sample or cast-on sample ($L_0 = 5d$), the austempered ductile iron is classified into six grades, as shown in Table

1.

5 Manufacturing Process

5.1

The casting process and austempering process of ductile iron for austempered ductile iron shall be determined by the supplier itself.

5.2

The chemical composition of the castings shall be determined by the supplier itself, but it shall be ensured that the casting and austempering processes use the same process parameters as the first batch of samples that have been accepted and approved.

5.3

The manufacturing process of austempered ductile iron (ADI) castings can be found in Appendix A.

6.1 Mechanical Properties of the Separated Test Bar of Casting, Side-by-Side Cast

Sample or Cast-on Sample

6.1.1

The material grade is determined by the minimum mechanical properties measured from samples machined from the separated test bar of casting, side-by-side cast sample or