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Compacted (vermicular) graphite cast irons — Classification

Fontes à graphite vermiculaire (compacté) — Classification

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 25, *Cast irons and pig irons*.

This second edition cancels and replaces the first edition (ISO 16112:2006), which has been technically revised with the following changes:

— Brinell hardness values have been moved from Table 1 and Table 2 to Table A.1;

— property values for cast-on samples with relevant wall thickness $t \leq 12{,}5$ mm have been removed from Table 2 because all data entries for $t \leq 12{,}5$ mm were the same as the values for relevant wall thickness 12,5 mm < $t \leq 30$ mm;

— Annex B has been expanded to provide a more comprehensive explanation of the nodularity evaluation technique;

— Annex C has been deleted and replaced because the series production experience gained since the first publication of ISO 16112 in 2006 has surpassed the scope of the annex.

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Introduction

This document deals with the classification of compacted (vermicular) graphite cast irons (CGI) in accordance with the mechanical properties of the material.

The properties of compacted (vermicular) graphite cast irons depend on their graphite and matrix microstructure.

The mechanical properties of the material can be evaluated on machined test pieces prepared from

— separately cast samples,

— samples cast in the mould alongside the casting, with a joint running system, hereafter called side-by-side samples, or

— samples cast onto either the casting or the running system, hereafter referred to as cast-on samples, or

— samples cut from a casting (only when an agreement is made between the manufacturer and the purchaser).

The material grade is defined by mechanical properties measured on machined test pieces prepared from separately cast samples, cast-on samples, or samples cut from the casting by agreement between the manufacturer and the purchaser.

Annex A provides typical properties for compacted (vermicular) graphite cast irons obtained in separately cast test bars.

Annex B provides information on a procedure to determine the graphite nodularity of the microstructure.

Annex C provides information on properties and examples for typical applications of compacted (vermicular) graphite cast irons.

Annex D provides cross-references of ISO 16112 grade designations to other national and international standard grades of compacted (vermicular) graphite cast iron.

References used in the preparation of this document are listed in the Bibliography.

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Compacted (vermicular) graphite cast irons — Classification

1 Scope

This document specifies five grades of compacted (vermicular) graphite cast irons.

This document specifies five grades based on the minimum mechanical properties measured on machined test pieces prepared from

— separately cast samples,

— side-by-side cast samples,

— cast-on samples, or

— samples cut from a casting.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 945-1, *Microstructure of cast irons — Part 1: Graphite classification by visual analysis*

ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method*

ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

ISO/TR 15931, *Designation system for cast irons and pig irons*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
compacted (vermicular) graphite cast iron
cast material, iron and carbon based, the carbon being present mainly in the form of compacted (vermicular) graphite particles that appear vermicular on a two-dimensional plane of polish, the graphite particles being embedded in a matrix consisting of ferrite, ferrite/pearlite, or pearlite

Note 1 to entry: Reference micrographs are provided in Annex B.

3.2
graphite modification treatment
process that brings the liquid iron into contact with a substance to produce graphite in the predominantly compacted (vermicular) form during solidification

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3.3
separately cast sample
sample cast in a separate sand mould under representative manufacturing conditions and material grade

3.4
side-by-side cast sample
sample cast in the mould alongside the casting, with a connected but separate running system

3.5
cast-on sample
sample attached directly to the running system or the casting

3.6
sample cut from the casting
sample obtained directly from the casting

3.7
relevant wall thickness
section of the casting, agreed between the manufacturer and the purchaser, to which the determined mechanical properties shall apply

Note 1 to entry: The cooling rate of the relevant wall thickness can be used to determine the size of separately cast or cast-on samples to ensure representative microstructures and properties.

4 Designation

The material is designated according to ISO/TR 15931. The relevant designations are given in Tables 1 and 2.

In the case of test pieces prepared from separately cast samples, the letter "S" is added at the end of the grade designation. In the case of test pieces prepared from side-by-side or cast-on samples, the letter "U" is added at the end of the grade designation.

5 Order information

The following information shall be supplied by the purchaser:

a) the complete designation of the material;

b) any special requirements which shall be agreed upon between the manufacturer and the purchaser.

All agreements between the manufacturer and the purchaser shall be made by the time of acceptance of the order.

6 Manufacture

The method of producing compacted (vermicular) graphite cast iron and its chemical composition shall be left to the discretion of the manufacturer, who shall ensure that the requirements of this document are met for the material grade specified in the order.

NOTE When compacted (vermicular) graphite cast iron is to be used for special applications, the chemical composition and heat treatment can be agreed upon between the manufacturer and the purchaser.

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