SLOVENSKI STANDARD
oSIST prEN 12513:2009

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Livarstvo - Železova litina, odporna proti obrabi

Founding - Abrasion resistant cast irons

Gießereiwesen - Verschleißbeständige Gusseisen

Fonderie - Fontes résistant à l'usure par abrasion

Ta slovenski standard je istoveten z: **prEN 12513**

ICS:

77.080.10 Železo Irons

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Founding - Abrasion resistant cast irons

Fonderie - Fontes résistant à l'usure par abrasion

Gießereiwesen - Verschleißbeständige Gusseisen

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (prEN 12513:2009) has been prepared by Technical Committee CEN/TC 190 “Founding”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 12513:2000.

This document is a draft for public comment.

Within its programme of work, Technical Committee CEN/TC 190 requested CEN/TC 190/WG 8 "Wear resistant and abrasion resistant cast iron" to prepare the following standard:

EN 12513, *Founding — Abrasion resistant cast irons*

Introduction

This European Standard deals with the classification of abrasion resistant white cast irons in accordance with their chemical composition and hardness. Such cast irons are widely used in the mining, earth moving, milling and manufacturing industries where high resistance to abrading minerals and other abrading solids is required.

The abrasion resistance of these cast irons depends on them having the appropriate structure and hardness for the application. These properties are obtained by careful control of the material composition and the processing route.

1 Scope

This European Standard defines the grades of abrasion resistant white cast irons. It specifies the grades in terms of:

— chemical composition;

— hardness.

The types of abrasion resistant white cast irons covered by this standard are:

a) unalloyed or low alloy cast irons;

b) nickel-chromium cast irons covering two general types:

— 4 % Ni 2 % Cr cast irons;

— 9 % Cr 5 % Ni cast irons;

c) high chromium cast irons covering five ranges of chromium content:

— 11 % < Cr ≤ 14 %;

— 14 % < Cr ≤ 18 %;

— 18 % < Cr ≤ 23 %;

— 23 % < Cr ≤ 30 %;

— 30% < Cr ≤ 40 %.

This European Standard does not define the abrasion resistant grades of ausferritic spheroidal graphite cast iron which are subject of EN 1564 [1].

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.

EN ISO 6506-1, *Metallic materials —Brinell hardness test — Part 1: Test method (ISO 6506-1:2005)*

NOTE Informative references to documents used in the preparation of this standard, and cited at the appropriate places in the text, are listed in a bibliography.

3 Terms and definitions

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

3.1
unalloyed or low alloy abrasion-resistant cast iron
cast iron having a structure which consists of eutectic iron carbides in a predominantly pearlitic matrix

3.2
nickel-chromium abrasion-resistant cast iron
cast iron having a structure consisting of either

— simple eutectic carbides M_3C type (M = Fe, Cr) in a matrix which is predominantly martensitic, referred to as 4 % Ni 2 % Cr cast irons,

or

— complex eutectic carbides (M_7C_3 and M_3C) in a matrix which is predominantly martensitic, referred to as 9 % Cr 5 % Ni cast irons.

NOTE 1 Both of these materials can contain some bainite and retained austenite.

NOTE 2 All these grades referred to in this subclause are free of pearlite.

3.3
high chromium abrasion resistant cast iron
cast iron containing between 11 % and 40 % Cr having a structure consisting of complex carbides in a matrix which, in the hardened condition, is predominantly martensitic, but which can also contain some austenite or other transformation products of austenite.

3.4
relevant wall thickness
section of the casting, agreed between the manufacturer and the purchaser, to which the determined properties apply.

4 Designation

The material shall be designated either by symbol or by number, in accordance with the designations given in Tables 1 to 3.

NOTE Comparison of EN 12513 grade designations to the grades from the current ISO standard for abrasion resistant cast iron (ISO 21988) is given in Annex E.

5 Order information

The following information shall be supplied by the purchaser:

a) number of this European Standard (EN 12513);

b) designation of the material;

c) any special requirements which have to be agreed upon between the manufacturer and the purchaser by the time of the acceptance of the order (see EN 1559-3).

6 Manufacture

6.1 General

The manufacturing methods for abrasion-resistant cast irons, unless otherwise specified by the purchaser, shall be left to the discretion of the manufacturer.

The manufacturer shall ensure that the requirements of this European Standard are met for the material grade specified in the order.

6.2 Heat treatment

Unless otherwise specified by the purchaser, the manufacturer shall supply castings in the condition which he considers to be suitable for the type of casting and the material grade specified.

When it is required to machine castings produced in the high chromium cast iron grades, they shall be ordered in the soft annealed condition. When the purchaser specifies delivery in the soft annealed condition, the subsequent hardening and tempering shall be the responsibility of the purchaser.

NOTE 1 Castings can be supplied in one of the following conditions:

— as-cast;

— as-cast and tempered;

— hardened;

— hardened and tempered;

— soft annealed;

— soft annealed

— soft annealed and hardened

— soft annealed, hardened and tempered.

NOTE 2 Annex B gives guidance on the types of heat treatment which can be used to obtain the required hardness, structure and properties.

When it is required to machine castings produced in the high chromium cast iron grades, there are two options:

a) Machining castings in the soft annealed condition

When the purchaser specifies delivery in the soft annealed condition, responsibility for any subsequent hardening and tempering operation shall be agreed between the manufacturer and purchaser at the time of acceptance of the order. There may be some distortion and scaling of the machined castings due to the heat treatment.

b) Machining castings in the as-cast or hardened condition

With appropriate equipment and cutting tools such as cubic boron nitride (CBN), it is feasible to machine high chromium cast iron grades in the as-cast or hardened condition.

NOTE 3 Annex A gives guidance on the types of heat treatment which can be used to obtain the required hardness, structure and properties.

7 Requirements

7.1 Chemical composition

The chemical composition of the grades of abrasion-resistant cast iron shall be in accordance with Tables 1, 2 or 3. Unless otherwise specified by the purchaser, the manufacturer shall choose the appropriate chemical composition to obtain the required properties of the casting.

NOTE Unless otherwise specified, other elements may be present, at the discretion of the manufacturer.

7.2 Brinell hardness

The Brinell hardness of the grades of abrasion-resistant cast iron shall be in accordance with Tables 1, 2 or 3.

7.3 Microstructure

Microstructure shall only be specified when agreed between the manufacturer and purchaser, by the time of acceptance of the order. When a microstructure is agreed, the location for sampling, the methods used to examine the microstructure, and acceptance criteria shall be subject to that agreement. If the graphite structure is agreed upon, it shall be specified in accordance with EN ISO 945:Part 1. The microstructure examination shall be performed in accordance with Clause 9.5

8 Sampling

8.1 Frequency of sampling for chemical analysis

Samples representative of the material shall be produced at a frequency in accordance with the in-process quality assurance procedures used by the manufacturer.

Samples for chemical analysis shall be cast in a manner which ensures that their representative chemical composition can be determined.

8.2 Number and frequency of Brinell hardness tests

Unless otherwise specified by the purchaser by the time of acceptance of the order, the number and frequency of Brinell hardness tests shall be in accordance with the in-process quality assurance procedures used by the manufacturer.

In the absence of an in-process quality assurance procedure or any other agreement between the manufacturer and the purchaser, a minimum of one sample shall be produced to confirm the material grade, at a frequency to be agreed between the manufacturer and the purchaser at the time of the acceptance of the order.

9 Test methods

9.1 Chemical analysis

The methods used to determine the chemical composition of the material shall be in accordance with recognized standards. Any requirement for traceability shall be agreed between the manufacturer and the purchaser at the time of the acceptance of the order. The chemical analysis shall be carried out on a test sample made from the same melt as the castings the sample represents.

NOTE Spectrographic, X-ray or wet chemical laboratory techniques are acceptable methods of analysis.

9.2 Hardness test

9.2.1 The Brinell hardness test shall be carried out in accordance with EN ISO 6506-1.

NOTE Hardness determined by one test method is not necessarily comparable to hardness determined by other test methods. Hardness conversion from other test methods can be done by agreement between the manufacturer and the purchaser. Conversions between Brinell, Vickers and Rockwell C hardness considered to be applicable to abrasion resistant cast irons are given in annex B, for guidance only.

9.2.2 Each Brinell hardness test shall be carried out on a casting at locations agreed by the manufacturer and purchaser, or on a test block cast-on to the casting itself.

Unless otherwise specified by the purchaser, the dimensions and location of the cast-on block shall be left to the discretion of the manufacturer.

NOTE A cast-on test block can be used when the size of the casting or the number of castings to be tested makes direct testing on the castings impracticable.

9.2.3 If the test is to be carried out on a cast-on block the latter shall not be removed until after any required heat treatment has been carried out.

9.2.4 When castings are too large or too difficult to be tested in a conventional hardness testing machine or when there is need for on-line inspection of a large number of castings, a portable hardness testing device may be used. When using portable hardness testing devices, its accuracy shall be validated using a calibrated test block. The use of such devices shall be agreed upon between the manufacturer and the purchaser at the time of the acceptance of the order.

9.3 Microstructure examination

Microstructure examination shall be performed on a sample cut from a casting, or from a separately cast, side-by-side cast or cast-on sample. The sample shall have comparable solidification and cooling conditions as the critical sections of the casting.

NOTE Descriptions of typical microstructures are given for guidance in Annex D.

10 Retests

10.1 Need for retests

Retests shall be carried out if a test is not valid (see 10.2).

Retests are permitted to be carried out if a test result does not meet the specified requirements for the specified grade (see 10.3).

10.2 Test validity

A test is not valid if there is:

a) faulty mounting of the test piece or defective operation of the test machine;

b) defective test piece because of incorrect pouring or incorrect machining.

In the above cases, a retest shall be taken from the same sample or from a duplicate sample cast at the same time to replace those invalid test results.

The result of the retest shall be used.