SLOVENSKI STANDARD
SIST EN 12513:2011

01-september-2011

Nadomešča:
SIST EN 12513:2001

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: EN 12513:2011

ICS:

77.080.10	Železo	Irons

SIST EN 12513:2011	**en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12513

February 2011

ICS 77.080.10

Supersedes EN 12513:2000

English Version

Founding - Abrasion resistant cast irons

Fonderie - Fontes résistant à l'usure par abrasion

Gießereiwesen - Verschleißbeständige Gusseisen

This European Standard was approved by CEN on 8 January 2011.

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 12513:2011) has been prepared by Technical Committee CEN/TC 190 “Foundry technology”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2011, and conflicting national standards shall be withdrawn at the latest by August 2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12513:2000.

Within its programme of work, Technical Committee CEN/TC 190 requested CEN/TC 190/WG 8 "High alloyed cast iron" to revise EN 12513:2000.

Annexes A, B, C, D and E are informative.

Annex F provides information about significant technical changes between this European standard and the previous edition.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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.

In this edition of EN 12513, the designation by symbol is based on Brinell hardness instead of Vickers hardness, because it corresponds better with the measurement method applied in practice.

In this European Standard a new designation system by number, as established in EN 1560, is given.

NOTE This designation system by number is based on the structure and rules of EN 10027-2 and so corresponds with the European numbering system for steel and other materials.

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 four ranges of chromium content:

— 11 % < Cr ≤ 14 %;

— 14 % < Cr ≤ 18 %;

— 18 % < Cr ≤ 23 %;

— 23 % < Cr ≤ 30 %.

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

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)*

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 sub-clause are free of pearlite.

3.3
high chromium abrasion resistant cast iron
cast iron containing between 11 % and 30 % 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
wall thickness representative for the casting, defined for the determination of the size of the cast samples to which the mechanical properties apply

4 Designation

The material shall be designated either by symbol or by number, in accordance with the designations given in Table 1 to Table 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) the number of this European Standard (EN 12513);

b) the 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 1559-1 and 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 castings can be supplied in one of the following conditions:

— as-cast;

— as-cast and stress relieved;

— hardened;

— hardened and stress relieved;

— soft annealed.

When it is required to machine castings produced in the high chromium cast iron grades, they can be ordered in the soft annealed condition. When the purchaser specifies delivery in the soft annealed condition any subsequent machining or heat treatment shall be the responsibility of the purchaser.

NOTE 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 examination, if required, shall be agreed by the time of acceptance of the order. Where a microstructure examination is agreed, the location for sampling, the methods used to examine the microstructure, and acceptance criteria shall be subject to that agreement. The microstructure examination shall be performed in accordance with 9.3.

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 process quality assurance procedures used by the manufacturer or as agreed with the purchaser.

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 process quality assurance procedures used by the manufacturer.

In the absence of a 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 validated methods. 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 Optical emission spectrometry and X-ray fluorescence techniques are acceptable methods of analysis.

9.2 Hardness test

9.2.1 Brinell hardness test shall be carried out in accordance with EN ISO 6506-1, preferably using the 3 000 kgf load. Other hardness testing methods and corresponding hardness values can be agreed between the manufacturer and the purchaser.

NOTE Hardness determined by one test method is not necessarily comparable to hardness determined by other test methods. 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) a faulty mounting of the test piece or defective operation of the test machine;

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

In the above cases, a new test piece shall be taken from the same cast 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.

10.3 Nonconforming test results

If any test gives results which do not conform to the specified requirements, for reasons other than those given in 10.2, the manufacturer shall have the option to conduct retests. If the manufacturer conducts retests, two retests shall be carried out for each failed test.

If both retests give results that meet the specified requirements, the material shall be deemed to conform to this European standard.

If one or both retests give results that fail to meet the specified requirements, the material shall be deemed not to conform to this European standard.

10.4 Heat treatment of samples and castings

Unless otherwise specified, in the case of castings in the as-cast condition with properties not in conformance with this European Standard, a heat treatment may be carried out.

In the case of castings which have undergone a heat treatment and for which the test results are not valid or not satisfactory, the manufacturer shall be permitted to re-heat treat the castings and the representative samples. In this event, the samples shall receive the same number of heat treatments as the castings.

If the results of the tests carried out on the re-heat treated samples are satisfactory, then the re-heat treated castings shall be regarded as conforming to the specified requirements of this European Standard.

The number of re-heat treatment cycles shall not exceed two.

The heat treatment terms are defined in EN 10052.