SLOVENSKI STANDARD
SIST EN 13835:2003

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Livarstvo - Avstenitna siva litina

Founding - Austenitic cast irons

Gießereiwesen - Austenitische Gusseisen

Fonderie - Fonte austénitique

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Founding - Austenitic cast irons

Fonderie - Fonte austénitique

Gießereiwesen - Austenitische Gusseisen

This European Standard was approved by CEN on 19 August 2002.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Contents

Foreword

This document (EN 13835:2002) has been prepared by Technical Committee CEN/TC 190 “Founding 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of an identical text or by endorsement, at the latest by May 2003, and conflicting national standards shall be withdrawn at the latest by May 2003.

Within its programme of work, Technical Committee CEN/TC 190 requested CEN/TC 190/WG 2.40 “Wear resistant and abrasion resistant cast iron” to prepare the following standard:

EN 13835, *Founding — Austenitic cast irons.*

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

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

Introduction

This European Standard deals with the classification of a range of cast irons principally used for their heat and corrosion resistance properties. These properties are obtainable from the Engineering grades in this standard. The Special Purpose grades also exhibit heat and corrosion resistance properties, but are used principally for their magnetic properties, or very low expansion characteristics.

The austenitic cast irons are a range of high-alloyed materials with an austenitic matrix, containing nickel, manganese and sometimes copper and chromium. Carbon is present either as graphite flakes or as spheroids. The spheroidal graphite grades have superior mechanical properties.

The properties of the austenitic cast irons depend upon them having the appropriate structure and mechanical properties for the application. These properties are dependent upon the control of metal composition within the specified grades and the metal processing route.

Typical applications for the various grades are given in annex A.

1 Scope

This European Standard specifies the grades and corresponding requirements for austenitic cast irons. These requirements are specified in terms of:

— graphite form and metal structure: either flake or spheroidal graphite in an austenitic matrix;

— chemical composition: as given for each of the grades;

— mechanical properties: obtained from separately cast samples.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 1559-1, *Founding — Technical conditions of delivery — Part 1: General.*

EN 1559-3, *Founding — Technical conditions of delivery — Part 3: Additional requirements for iron castings.*

EN 10002-1, *Metallic materials — Tensile testing — Part 1: Method of test at ambient temperature.*

EN 10045-1, *Metallic materials — Charpy impact test — Part 1: Test method.*

3 Terms and definitions

For the purposes of this European Standard, the following term and definition apply.

3.1
austenitic cast iron
cast material with an austenitic matrix which is iron and carbon based and alloyed with nickel and manganese, copper and/or chromium in order to stabilize the austenitic structure at room temperature. The graphite can be present in flake or spheroidal form

4 Designation

The material shall be designated either by symbol or by number as given in Tables 1 to 4.

5 Order information

The following information shall be supplied by the purchaser:

a) the number of this European Standard (EN 13835);

b) the designation of the material;

c) any special requirements which have to be agreed by the time of acceptance of the order in accordance with EN 1559-1 and EN 1559-3.

6 Manufacture

Unless otherwise specified by the purchaser, the method of manufacture of austenitic cast irons shall be left to the discretion of the manufacturer. The manufacturer shall ensure that the requirements defined in this standard are met for the material grade specified in the order.

Any agreement between the manufacturer and the purchaser shall be made by the time of acceptance of the order.

NOTE For certain applications heat treatment of austenitic cast irons is beneficial, but should only be specified where service conditions demand such treatment. The heat treatment processes employed are stress relieving and high temperature stabilising treatments. Details of these treatments are given in annex B.

7 Requirements

7.1 Chemical composition

The chemical composition of austenitic cast iron grades shall be in accordance with Table 1 for the Engineering grades and Table 2 for the Special Purpose grades. Spheroidal graphite grades are produced either by magnesium treatment or by treatment with another suitable nodulariser. Unless otherwise specified, other elements may be present at the discretion of the manufacturer provided that they do not alter the structure or adversely affect the properties. If the presence of any element specified in Tables 1 or 2 is required to be outside the limits indicated, or if any other elements are required, their contents shall be agreed between the manufacturer and the purchaser and specified in the order.

7.2 Mechanical properties

The mechanical properties of the grades of austenitic cast irons obtained from separately cast samples shall be in accordance with Table 3 for the Engineering grades and Table 4 for the Special Purpose grades.

Other requirements, such as the mechanical properties to be met on cast-on samples or at specified locations on the castings, shall be agreed between the manufacturer and the purchaser and specified in the order. In such cases the position of the cast-on sample or the specified location on the casting shall be agreed between the manufacturer and the purchaser and specified in the order.

8 Sampling

8.1 General

Samples shall be provided from the same melt as that used to produce the castings which they represent.

8.2 Frequency and number of tests

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

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

When impact tests are agreed by the time of acceptance of the order, samples shall be produced at a frequency to be agreed between the manufacturer and the purchaser.

8.3 Samples

Unless otherwise agreed by the time of acceptance of the order, samples for mechanical testing shall be cast separately in sand moulds from the same ladle as that used to pour the casting(s).

Separately cast samples shall meet the requirements of either Figures 1, 2 or 3.

Separately cast samples shall not be removed from the mould at a temperature higher than that of the castings. If heat treatment is necessary, then the samples shall be heat treated with the castings which they represent.

The samples for chemical analysis shall be cast in a manner which ensures that the accurate chemical composition can be determined.

9 Testing

9.1 Chemical analysis

The methods used to determine the chemical composition of the material shall be in accordance with recognised standards. Any requirement for traceability shall be agreed between the manufacturer and the purchaser by the time of acceptance of the order.

9.2 Tensile test

The tensile test shall be carried out in accordance with EN 10002-1.

The tensile test piece (see Figure 4) shall be machined from one of the samples shown in Figures 1, and 2 (hatched parts) or 3. Unless otherwise agreed, the selection of the sample type and option shall be left to the discretion of the manufacturer.

If, for technical reasons, it is necessary to use a tensile test piece having a different diameter, its original gauge length shall conform to the following formula:

$$L_o = 5{,}65 \times \sqrt{S_o}$$

where

L_o is the original gauge length;

S_o is the original cross-sectional area of the test piece.

9.3 Impact test

The impact test shall be carried out on three Charpy V-notched impact test pieces (see Figure 5) in accordance with EN 10045-1 using test equipment with available energy compatible with the properties of the austenitic cast iron being tested.

9.4 Other properties

Annexes C, D and E give information on other properties. Annex F gives cross references to other standards.

10 Retests

If any result of tests as given in 7.2 are in non-conformance, then two further test pieces shall be tested. The samples required to produce these two further test pieces shall have come from the same melt and shall have been heat treated in the same manner as the castings that they represent.

If the test result from either of the two further test pieces is in non-conformance, then the castings that they represent shall be deemed to be in non-conformance.

Table 1 — Chemical composition of austenitic cast irons — Engineering grades

Graphite form	Material designation		Chemical composition in % (mass fraction)						
	Symbol	Number	C	Si	Mn	Ni	Cr	P	Cu
Flake	EN-GJLA-XNiCuCr15-6-2	EN-JL3011	max. 3,0	1,0 to 2,8	0,5 to 1,5	13,5 to 17,5	1,0 to 3,5	max. 0,25	5,5 to 7,5
Spheroidal	EN-GJSA-XNiCr20-2	EN-JS3011	max. 3,0	1,5 to 3,0	0,5 to 1,5	18,0 to 22,0	1,0 to 3,5	max. 0,08	max. 0,50
	EN-GJSA-XNiMn23-4	EN-JS3021	max. 2,6	1,5 to 2,5	4,0 to 4,5	22,0 to 24,0	max. 0,2	max. 0,08	max. 0,50
	EN-GJSA-XNiCrNb20-2[a]	EN-JS3031[a]	max. 3,0	1,5 to 2,4	0,5 to 1,5	18,0 to 22,0	1,0 to 3,5	max. 0,08	max. 0,50
	EN-GJSA-XNi22	EN-JS3041	max. 3,0	1,0 to 3,0	1,5 to 2,5	21,0 to 24,0	max. 0,5	max. 0,08	max. 0,50
	EN-GJSA-XNi35	EN-JS3051	max. 2,4	1,5 to 3,0	0,5 to 1,5	34,0 to 36,0	max. 0,2	max. 0,08	max. 0,50
	EN-GJSA-XNiSiCr35-5-2	EN-JS3061	max. 2,0	4,0 to 6,0	0,5 to 1,5	34,0 to 36,0	1,5 to 2,5	max. 0,08	max. 0,50

[a] Good weldability of this material with: % Nb ≤ [0,353 – 0,032 (% Si + 64 × % Mg)]. The normal range of Nb is 0,12 % to 0,20 %.

Table 2 — Chemical composition of austenitic cast irons — Special Purpose grades

Graphite form	Material designation		Chemical composition in % (mass fraction)						
	Symbol	Number	C	Si	Mn	Ni	Cr	P	Cu
Flake	EN-GJLA-XNiMn13-7	EN-JL3021	max. 3,0	1,5 to 3,0	6,0 to 7,0	12,0 to 14,0	max. 0,2	max. 0,25	max. 0,5
Spheroidal	EN-GJSA-XNiMn13-7	EN-JS3071	max. 3,0	2,0 to 3,0	6,0 to 7,0	12,0 to 14,0	max. 0,2	max. 0,08	max. 0,5
	EN-GJSA-XNiCr30-3	EN-JS3081	max. 2,6	1,5 to 3,0	0,5 to 1,5	28,0 to 32,0	2,5 to 3,5	max. 0,08	max. 0,5
	EN-GJSA-XNiSiCr30-5-5	EN-JS3091	max. 2,6	5,0 to 6,0	0,5 to 1,5	28,0 to 32,0	4,5 to 5,5	max. 0,08	max. 0,5
	EN-GJSA-XNiCr35-3	EN-JS3101	max. 2,4	1,5 to 3,0	0,5 to 1,5	34,0 to 36,0	2,0 to 3,0	max. 0,08	max. 0,5