SLOVENSKI STANDARD
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Definicija in razvrġ anje grodljev

Definition and classification of pig-irons

Begriffsbestimmung und Einteilung von Roheisen

Définition et classification des fontes brutes

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English version

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This European Standard was accepted by CEN on 1990-07-28.
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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue Bréderode 2, B-1000 Brussels

Brief history

This European Standard was prepared by the Technical Committee ECISS/TC 5 "Definition, classification and conventional designation of pig iron and ferro-alloys". The secretariat is held by FES/DIN "Normenausschuß Eisen und Stahl im DIN, Deutsches Institut für Normung".

This European Standard replaces the EURONORM

EU 1-81 Definition and classification of pig-irons.

This European Standard was adopted by CEN on 1990-07-28.

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

Contents

1 Purpose

The purpose of this European Standard is to standardize the definition of pig-irons and to standardize the sub-division of pig-irons into different classes.

2 Definition

A pig-iron is an iron-carbon alloy with more than 2 %C and with contents of other elements equal to or less than the limit values given for them in table 1. It is intended for further processing in the molten condition into steel or cast-iron. Pig-iron is delivered either in the molten state or in the solid state in primary forms such as pigs or similar solid pieces, and granulates.

Table 1 Limits of the alloy contents for pig-iron

Element	Limit 1)
Manganese	30.0 %
Silicon	8.0 %
Phosphorus	3.0 %
Chromium	10.0 %
Other alloying elements in total 2)	10.0 %

1) Materials with higher contents are ferro-alloys.
2) In cases of doubt, all elements for which a minimum content is specified or whose content exceeds the lower limit given in table 2, footnote 8, paragraph (d), are, in accordance with table 2, footnote 8, paragraphs (c) and (d), regarded as 'Other alloying elements' with the exception of carbon, silicon, manganese, phosphorus and chromium.

3 Sub-division of pig-irons

3.1 Pig-iron is sub-divided into the classes indicated in table 2 on the basis of its chemical composition.

3.2 In cases of doubt, the correct classification of the pig-iron into one of the classes indicated in table 2 is to be determined by check analysis. The conditions for sampling including the conditions for the number of tests shall correspond to the conditions usually applied in cases of dispute for deliveries of disputed chemical composition (see annex A).

3.3 The designations used in the different languages for the various classes of pig-iron are given in table 3.

Table 2

Table 2 — Classification and designation of pig-iron according to its chemical composition[1)]

1.	2			3	4	5	6	7	8	9
No	Pig-iron class Designation			Abbreviation	% C_{total}	% Si	% Mn	% P	% S max.	Other
1.1	Unalloyed	Steel-making pig-iron	Low phosphorus	Pig-P2	(3,3 to 4,8)	< 1,0[2)]	0,4 to 6,0 (0,5 to 1,5)	< 0,25	0,06	3)
1.2			High phosphorus	Pig-P20	(3,0 to 4,5)		< 1,5	1,5 to 2,5	0,08	
2.1		Foundry pig-iron	4)	Pig-P1 Si	(3,3 to 4,5)	1,0 to 4,0[2)] (1,5 to 3,5)	0,4 to 1,5[2)]	< 0,12	0,06	
2.2				Pig-P3 Si				> 0,12 to 0,5		
2.3				Pig-P6 Si				> 0,5 to 1,0 (> 0,5 to 0,7)		
2.4				Pig-P12 Si				> 1,0 to 1,4		
2.5				Pig-P17 Si				> 1,4 to 2,0		
3.1			Nodular (SG) base	Pig-Nod	(3,5 to 4,6)	< 3,0[2)]	< 0,1	< 0,08	0,03	3), 6)
3.2			Nodular (SG) base higher manganese[5)]	Pig-Nod Mn		< 4,0[2)]	> 0,1 to 0,4[2)]			
3.3			Low carbon	Pig-LC	> 2,0 to 3,5	< 3,0[2)]	> 0,4 to 1,5	< 0,30	0,06	3)
4.0			Other unalloyed pig-iron	Pig-SPU	7)					
5.1	Alloyed		Spiegel iron	Pig-Mn	(4,0 to 6,5)	max. 1,5	> 6,0 to 30,0[2)]	< 0,30 (< 0,20)	0,05	3)
5.2			Other alloyed pig-iron	Pig-SPA	8)					

1) The unbracketed values are those which determine the classification of the pig-iron. Values given in brackets indicate, for information only, the ranges in which actual contents of the elements concerned normally lie.

2) By sub-dividing this range into various sub-ranges, the class of pig-iron concerned is normally further sub-divided into different grades.

3) No minimum values are specified for other elements. Depending, for example, on the raw materials used, the pig-iron may unintentionally contain elements other than those indicated in columns 4 to 8 and in percentages, which, for some elements, may reach a value of about 0,5 %. The contents of these indicated elements should not be used in the classification of the pig-iron.

4) For these classes of foundry pig-iron, different terms such as low, medium, intermediate and high phosphorus, normal haematite and semi-haematite, Cleveland etc. are used in the various parts of the world and this partly in a very different sense. Consequently, it is recommended to renounce on the international level on such terms and to apply as designations in these cases only the abbreviations given in column 3.

5) Normally used for either pearlitic nodular cast-iron or for malleable cast-iron.

6) A further characteristic of these pig-iron grades is that the contents of elements prejudicing the formation of nodular graphite and promoting the formation of carbide are low according to the intended use of the grade concerned.

7) This class includes pig-iron that cannot be classified either in classes 1.1 to 3.3 or in classes 5.1 and 5.2.

8) Other alloyed pig-iron includes:

a) pig-iron with a silicon content between > 4,0 and 8,0 %;

b) pig-iron with a manganese content between > 6,0 and 30,0 %, provided that it cannot be classified as Spiegel iron (see class 5.1);

c) pig-iron for which a minimum content is specified for at least one of the elements not specified in columns 4 to 8;

d) pig-iron whose content of at least one of the following elements is within the limits indicated below:

Cr > 0,3 to 10,0 %
Mo > 0,1
Ni > 0,3
Ti > 0,2
V > 0,1
W > 0,1

} up to the total content of 10,0 % of "other" elements resulting from table 1.

Table 3

Designations of various pig-irons classes

	Pig-iron class Abbreviation	German			French			English					
1	Pig-P2		Stahl-roheisen	Phosphorarm		Fonte d'affinage	pauvre en phosphore		Steel-making pig iron	low phosphorus			
	Pig-P20			Phosphorreich			riche en phosphore			High phosphorus			
	Pig-P1 Si	Unlegiert	Gießereiroheisen	2)	Non alliées	Fonte de moulage	2)	Unalloyed	Foundry pig iron	2)			2)
	Pig-P3 Si												
	Pig-P6 Si												
	Pig-P12 Si												
5	Pig-P17 Si												
1	Pig-Nod			Sphaero			a graphite spheroidal			Nodular (SG) base			
2	Pig-Nod Mn			Sphaero-Mn			a graphite spheroidal Mn			Nodular (SG) base higher manganese			
3	Pig LC			Kohlenstoffarm			pauvre en carbone			Low carbon			
0	Pig SPU			Sonstiges unlegiertes Roheisen			autres fontes non alliées			Other unalloyed pig iron			
1	Pig Mn	Legiert		Spiegeleisen	Allies		fonte Spiegel	Alloyed		Spiegel iron			
2	Pig SPA			Sonstiges legiertes Roheisen			Autres fontes alliées			Other alloyed pig iron			

1) See Table 2
2) See footnote 4 in Table 2

ANNEX A

Sampling and preparation of samples intended for the determination of the chemical composition of pig-irons

A.1 Field of application

This annex is applicable to pig-iron in the solid state, unless otherwise agreed at the time of ordering.

NOTE. In the case of pig-iron in the liquid state, special regulations are to be agreed between the producer and the purchaser.

A.2 Number of pigs to be taken

The number of pigs to be taken shall be representative of the batch. In cases of dispute, and if there has been no other agreement between the parties, the minimum number of pigs to be taken from each batch is given in the table below.

Mass of the batch t	Minimum number of pigs to be taken
$\leqslant$ 10	9
>10 $\leqslant$ 20	11
>20 $\leqslant$ 40	12
>40 $\leqslant$ 80	14
>80 $\leqslant$ 160	16
>160 $\leqslant$ 300	18
>300 $\leqslant$ 600	21
> 600	24

A.3 Selection of samples

A.3.1

The samples are to be taken at random, preferably in accordance with one of the procedures described below.

A.3.1.1 Case of pigs arranged in piles

Throw a rope having a certain number of knots onto the pile. Take as samples the pigs touched by these knots. Repeat the operation until a sufficient number of pigs are obtained.

A.3.1.2 Case of pigs being loaded or unloaded

Throughout the loading or unloading operations, take pigs as samples so that the time intervals between pigs are approximately equal.