IS 13502 : 1992 (Superseding IS 224 : 1979, IS 2841 : 1978 and IS 2842 : 1980) (Reaffirmed 2005)

भारतीय मानक

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कच्चा लोहा — विशिष्टि

Indian Standard PIG IRON — SPECIFICATION

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BUREAU OF INDIAN STANDARDS MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG NEW DELHI 110002

September 1992

Price Group 2

Pig Iron and Cast Iron Sectional Committee, MTD 6

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Pig Iron and Cast Iron Sectional Committee had been approved by the Metallurgical Engineering Division Council.

While reviewing the following three Indian Standards on Pig Iron, namely:

IS 224: 1977 Foundry pig iron for general purposes (fourth revision)

IS 2841 : 1978 Pig iron for special purposes (second revision)

IS 2842 : 1980 Basic pig iron for steel making purposes (second revision)

the committee decided to amalgamate them into one standard. In the preparation of this standard necessary assistance has been derived from ISO 9147 : 1987 'Pig iron — Definition and classification' issued by the International Organization for Standardization.

Grade designation of pig iron has been modified on the basis of IS 2084 : 1991 'Code for designation of pig iron (second revision)'. Silicon (Si) is represented by a single integer (X) obtained after rounding off twice the average percentage of silicon content.

Manganese (Mn) content is indicated as four time, the average percentage of manganese rounded off to the nearest integer. Phosphorus (P) content is indicated as hundred times the maximum percentage of phosphorus.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

PIG IRON — SPECIFICATION

1 SCOPE

1.1 This standard covers requirements of pig iron for steel making and for foundry purposes.

2 REFERENCES

IS	No.	Title
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228: 1959 Methods of chemical analysis of pig iron and plain carbon low alloy steels (*revised*)
397 Method for statistical quality control during production:

(Part 1): 1972 Control charts for variables (first revision)

- (Part 2): 1985 Control charts for attributes and count of defects (second revision)
- 1387: 1967 General requirements for the supply of metallurgical materials (first revision)
- 2084 : 1991 Code for designation of pig iron (second revision)

3 DEFINITIONS

3.1 Pig Iron

An iron-carbon alloy with more than 2 percent carbon and with contents of other elements equal to or less than the limits given 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 Alloy Elements for Pig Iron

Element Li	imit [*] (Percent)
Manganese	≤ 30.0
Silicon	< 8'0
Phosphorus	< 3.0
Chromium	< 10.0
Other alloying elements (Total)	< 10.0

*Iron with higher contents than specified above are ferro alloys and not 'pig iron.

4 GRADES

4.1 Gradewise classification of pig iron indicated in Table 2 is based on the chemical composition. When analysed in accordance with IS 228 : 1959 pig iron shall meet the requirements for the grade(s) as given in Table 2.

4.2 In case of doubt the correct classification of the pig iron into one of the grade indicated in Table 2 shall 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.

4.3 The purchaser should clearly state the grade designation required both in the enquiry and in the order. Supply of material of composition within limits narrower than those covered in Table 2 may be mutually agreed between the purchaser and the manufacturer.

5 SUPPLY OF MATERIAL

5.1 General requirements relating to the supply of material shall be as laid down in IS 1387: 1967.

6 SIZE AND MASS

6.1 The mass of pig shall be either 45 kg having two notches or 22.5 kg having one notch subject to mutual agreement between the purchaser and the manufacturer. The depth of the notches shall be such as to make the pig easily breakable. Any size smaller than that mentioned above shall be acceptable.

6.1.1 The dimensions of the two sizes of pigs as given in 6.1 and the particulars of the notches are shown in Fig. 1 and Fig. 2.

7 SAMPLING AND CRITERIA FOR CONFORMITY

7.1 The methods for chemical analysis are described in Annex A.

7.2 A lot (see Table 3) shall be declared as conforming to the requirements of the specifications (see Table 2) if the test results of the analysis (see 4.1) are found satisfactory.

8 MARKING

8.1 The material shall be legibly marked with the following:

- a) Cast number/grade of the material, and
- b) Manufacturer's name or trade-mark.

8.2 The material may be colour coded as agreed to between the purchaser and the manufacturer.

8.3 The material may also be marked with the Standard Mark, which a licence for the use of the standard mark may be granted to manufacturers or processors, may be obtained from the Bureau of Indian Standards.

Table 2 Gradewise Classification and Designation of Pig Iron According toChemical Composition

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No	Pig Iron	Designation		Chemical Com	emical Composition, Percent		
740.	for		Silicon	Manganese	Phosphorus	Sulphur Max	
1.1 1.2 1.3	Steel making	PG Si × Mn 1 P 40 PG Si × Mn 3 P 40 PG Si × Mn 5 P 40		< 0.5 0.5 to 1.0 1.0 to 1.5	< 0.4	0.06	
2.1	Foundry purpose	PG Si \times Mn P 8 PG Si \times Mn 1 P 8	See Note 1	< 0'1 0'1 to 0'5	< 0.08	0.05	
2.2 3.1 3.2 3.3 3.4 3.5 3.6		PG Si × Mn 3 P 8 PG Si × Mn 3 P 12 PG Si × Mn 3 P 20 PG Si × Mn 3 P 40 PG Si × Mn 3 P 100 PG Si × Mn 3 P 130	Below	0.5 to 1.0	< 0'08 0'08-0'12 0'12-0'20 0'20-0'40 0'40-1'00 1'00-1'30	0.06	
3.7 3.8 3.9 3.10 3.11 3.12		PG Si × Mn 5 P 8 PG Si × Mn 5 P 12 PG Si × Mn 5 P 20 PG Si × Mn 5 P 40 PG Si × Mn 5 P 100 PG Si × Mn 5 P 130		1'0 to 1'5	< 0'08 0'08-0'12 0'12-0'20 0'20-0 40 0'40-1'00 1'00-1'30		
4.0		PG-Any other purpos	e*				

(Clauses 4.1 and 4.2)

*Pig iron with limits given in Table 1.

NOTES

1 When ordering, the integer given below shall be substituted for the symbol 'X' in the designation to specify silicon range:

Integer	Steel Marking Pig Iron	Foundry Piz Iron
1	< 0'75	-
2	> 0.75 but < 1.25	> 0.75 but < 1.25
3	> 1.25 but < 1.75	> 1.25 but < 1.75
4		> 1.75 but < 2.25
5		> 2°25 but < 2°75
6	_	> 2.75 but < 3.25
7		> 3.25 but < 3.75
8		> 3.75 but < 4.25

2 Other elements such as Cr, Mo, Ni, Ti, V, etc., may be present in traces (total not exceeding 10%). The content of these elements shall not be used in the classification of pig iron.

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BHEL, Ramachandrapuram. Date: 16-07-2009 Time: 11:59:26

ANNEX A

(Clause 7.1)

SAMPLING FOR CHEMICAL ANALYSIS OF PIG IRON FOR STEEL MAKING AND FOUNDRY PURPOSES

A-0 GENERAL

A-0.1 The reliability of conclusions reached by . following any sampling plan is largely dependent on the homogeneity of the material sampled. for reducing the quality fluctuations of pig iron to a minimum, it is necessary to adopt a stable control of production. In this connection guidance may be obtained from IS 397 (Part 1): 1972 and IS 397 (Part 2): 1975.

A-0.2 For the grading of pig iron, it is recommended that representative samples be taken from the molten metal as described in A-1. However, if the purchaser so desires, he may ascertain the correct gradings of the material by the procedure recommended in A-2.

A-1 SAMPLING MOLTEN METAL DURING PRODUCTION

A-1.1 Sampling of molten metal be done laddlewise either while collecting during tapping or while pouring it at the pig casting machine, depending upon the convenience of the manufacturer. In either case, spoon samples shall be taken from the flow, one in the beginning, the other in the middle and the third in the end and poured into suitable moulds (consisting of test ingot mould and bar or finger sample mould).

A-1.2 The surface of the test ingots shall be thoroughly cleaned and the ingots shall be drilled from a point on the control longitudinal line of the upper surface to within 6 mm of the bottom. The drillings so obtained from different test ingots (each representing a ladle) shall be mixed and crushed if necessary, to pass through 500-micron IS Sieve.

A-1.3 The average sample obtained as in A-1.2 shall be analysed and the grade of pig iron cast from any ladle shall be determined on the basis of the average test result obtained for that ladle.

A-2 SAMPLING OF PIGS

A-2.1 Lot

In any consignment, all the pigs of the same grade from the same manufacturer shall be grouped together to constitute a lot of not more than 1 000 tonnes.

A-2.2 The number of pigs to be selected from a lot shall depend on the size of the lot as given in Table 3. The sample shall be selected at random from different locations throughout the bulk.

Table 3 Scale of Sampling

	And the second sec	
Mass of the Lot (In tonnes)	No. of Pigs to be Selected	
Up to 25	4	
26 to 50	5	
51 to 100	7	
101 to 150	10	
151 to 300	15	
301 to 500	20	
501 and above	25	

A-2.3 From each of the pigs chosen according to A-2.2, drillings shall be obtained in the following manner.

The entire surface of the pigs shall be thoroughly cleaned with a strong wire-brush prior to drilling to prevent any extraneous matter getting mixed up with the drillings. Two holes shall be drilled in each pig with a suitable drill to a depth of 6 mm without the use of any cutting fluid and the drillings discarded. The drill shall then be replaced in the holes and the pigs drilled until the drill almost penetrates to a depth of 6 mm from the other side. These drillings shall be collected, and approximately the same mass of drillings shall be taken from each pig and mixed togther. The mixed drillings, shall then be crushed gently in an iron mortar until the whole quantity passes through 500 micron 1S Sieve. After thorough mixing, the bulk of the crushed drillings may be reduced in qauntity by coning and quartering method till a suitable mass of sample is obtained for analysis.

A-2.3.1 Should any pig be found too hard for drilling, the sample may be prepared by annealing before drilling as specified in A-2.3 or by breaking small portions from the pig and crushing.

A-2.3.2 The sample for analysis shall then be divided into three equal parts in the presence of the supplier and the purchaser or their representatives, if they so desire. One of these three parts shall be marked for the purchaser, another for the supplier an the third as referee sample to be used in case of any dispute between the purchaser and the manufacturer.

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The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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