

फेर्रोसिलिकॉन — विशिष्टि
(पांचवां पुनरीक्षण)

Ferrosilicon — Specification
(*Fifth Revision*)

ICS 77.100

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FOREWORD

This Indian Standard (Fifth Revision) was adopted by Bureau of Indian Standards, after the draft finalized by Ores and Feed Stock for Iron and Steel Industry Sectional Committee had been approved by the Metallurgical Engineering Division Council.

The standard was first published in 1957 and subsequently revised in 1964, 1981 and 1990. This revision has been brought out to bring the standard in the latest style and format of the Indian Standards. It also incorporates 3 amendments issued to the last version of the standard.

In addition, the following changes have been made:

- a) Reference clause has been updated;
- b) In Table 1, FeSi73Al2Ca2 was substituted with FeSi73Al20Ca20;
- c) In Table 1, FeSi65 was substituted with FeSi65Al10;
- d) In Table 1, a new grade is included FeSi65Al30;
- e) Clause 8 has been modified to bring more clarity;
- f) Specifications for particle size analysis were included; and
- g) Clause **12.2** BIS certification marking is added.

This standard contains clauses **7.2.1**, **7.2.2**, **8.2** and **11** which call for an agreement between the purchaser and the supplier.

The composition of the committee responsible for formulation of this standard is listed in Annex B.

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 : 2022 'Rules for rounding off numerical values (*second revision*)'. 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***FERROSILICON — SPECIFICATION***(Fifth Revision)***1 SCOPE**

This standard covers the requirements of ferrosilicon used in ferrous industry.

2 REFERENCES

The standards listed in Annex A contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in Annex A.

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Ferrosilicon — A master alloy of iron and silicon with a minimum silicon content of 15.0 percent by mass and a maximum silicon content of 95.0 percent by mass, obtained by reduction.

3.2 Cast (Melt) — Cast is the product of any of the following:

- a) One furnace heat; or
- b) One tap of continuous furnace; or
- c) A number of furnace or crucible heats of similar composition mixed in a ladle or holding furnace and used for making a cast.

3.3 Constitution of Consignment

3.3.1 Tapped Lot Method — A consignment constituted by the tapped lot method consists of a ferrosilicon mass of one melt (or one part of continuous tap).

3.3.2 Graded Lot Method — A consignment constituted by the graded lot method consists of a number of melts (or parts of continuous taps) of one ferrosilicon designation.

The ferrosilicon content of the melts (or parts of continuous taps) constituting the consignment shall not differ from each other by more than 3 percent.

3.3.3 Blended Lot Method — A consignment constituted by the blended lot method consists of a number of melts (or parts of continuous taps) of one ferrosilicon designation, which have been rushed to a particle size less than 50 mm and thorough mixed.

The content of the main constituent of the melts (or parts of continuous taps) constituting the consignment may vary between the minimum and maximum limits specified for the appropriate ferrosilicon designation.

4 GRADES

This standard covers 13 grades of ferrosilicon, as specified in Table 1.

5 PARTICULARS TO BE SPECIFIED WHILE ORDERING

For the benefit of the purchaser, particulars to be specified while ordering for the material to this specification shall be as follows:

- a) Constitution of consignment;
- b) Name of the material;
- c) Grade designation;
- d) Size range;
- e) Quantity of the material; and
- f) Necessary requirements for analysis reports, packing, etc as appropriate.

6 SUPPLY OF MATERIALS

General requirements relating to supply of the materials to this specification shall be as laid down in IS 1387.

7 REQUIREMENTS

7.1 Constitution of Consignment — Ferrosilicon shall be delivered in consignments constituted by one of the methods defined in **3.3**.

7.2 Chemical Composition

7.2.1 The chemical composition of ferrosilicon shall be as specified in Table 1.

Table 1 Chemical Composition of Ferrosilicon, Percentage
(Clauses 4 and 7.2.1)

SI No.	Grade Designation	Si	C	S	P	Al	Ca
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	FeSi93	90 – 95	0.15	0.050	0.050	2.5	--
ii)	FeSi88	85 – 90	0.15	0.050	0.050	2.0	--
iii)	FeSi83	80 – 85	0.15	0.050	0.050	1.75	--
iv)	FeSi78	75 – 80	0.15	0.050	0.050	1.50	--
v)	FeSi76Al01 (High Purity)	74 – 78	0.03	0.050	0.050	0.10	--
vi)	FeSi73Al05	70 – 75	0.15	0.050	0.050	0.50	--
vii)	FeSi73Al15	70 – 75	0.15	0.050	0.050	1.50	--
viii)	FeSi73Al25	70 – 75	0.15	0.050	0.050	2.50	--
ix)	FeSi65Al10	60 – 70	0.15	0.050	0.050	1.00	--
x)	FeSi65Al30	60 – 70	0.35	0.050	0.050	3.00	--
xi)	FeSi48	45 – 50	0.15	0.050	0.050	1.00	--
xii)	FeSi20P15	15 – 25	1.50	0.050	0.150	1.00	--
xiii)	FeSi73Al20Ca20	70 – 75	0.15	0.050	0.050	1.0 - 2.0	1.0 - 2.0

NOTES

1 All the elemental content is maximum limit, except where range is specified.

2 Residual elements, percentage, Max. Titanium-0.40, Boron-0.02, Zirconium-0.015 and Manganese-0.35. If exceeds, this shall be indicated and agreed upon between the supplier and the purchaser.

3 Remainder element in all 13 Grades mentioned above is Fe.

7.2.2 The chemical composition of the material shall be determined either by the methods specified in relevant parts of IS 1559 or any other established instrumental/chemical method. In case of dispute, the procedure given in the latest version of IS 1559 shall be the referee method. However, where the method is not given in IS 1559, the referee method shall be agreed to between the purchaser and the manufacturer.

8 SIZE

8.1 Unless otherwise specified the material shall be supplied in lumps or as crushed and screened particles.

8.2 If Ferrosilicon is supplied in crushed and screened particles, the size ranges may be as agreed between manufacturer and purchaser. However, the tolerance on such agreed size ranges shall be oversize 10 % maximum and undersize 15 % maximum.

NOTES

1 For oversize, no piece to exceed 1.15 times the maximum limit of the size range specified in two or three directions.

2 In the undersized material –3.15 mm fraction shall not exceed 5 percent. If exceeds, this shall be agreed upon between the supplier and the purchaser.

8.3 The undersize and oversize values shall be valid at the point of delivery to the purchaser. The test sieves used shall be in accordance with sizes specified in IS 460 (Part 1) and IS 460 (Part 2). As the standard test sieve will become less accurate after period of time, the sieve shall therefore be periodically checked according to IS 460 (Part 3) and the correction factor shall be determined and applied to the result.

8.4 For conducting the sieve analysis and size determination, the methods specified in IS 15765 shall be applied.

9 EXTRANEEOUS CONTAMINATIONS

The material should be reasonably free from extraneous contaminations like slag and non-metallic inclusions, etc.

10 SAMPLING

For conducting chemical analysis to each batch of the material, these shall be sampled in accordance with IS 1472.

11 PACKING

The material shall be packed in suitable containers, in quantities as mutually agreed to between the supplier and the purchaser.

12 MARKING

12.1 The material shall be marked with the following:

- a) Indication of the source of manufacture;
- b) Grade designation, cast or lot and size designation;
- c) Quantity;
- d) Date of manufacture; and
- e) Shelf life, if required.

12.2 BIS Certification Marking

The products(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provision of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the product may be marked with the Standard Mark.

ANNEX A
LIST OF REFERRED STANDARDS

<i>IS No.</i>	<i>Title</i>
IS 460	Test sieves — Specifications:
(Part 1) : 2020	Wire cloth test sieve (<i>fourth revision</i>)
(Part 2) : 2020	Perforated plate test sieve (<i>fourth revision</i>)
(Part 3) : 2020	Methods of examination of apertures of test sieves (<i>fourth revision</i>)
IS 1387 : 1993	General requirements for the supply of metallurgical materials (<i>second revision</i>)
IS 1472 : 1977	Methods of sampling ferro-alloys for determination of chemical composition (<i>first revision</i>)
IS 1559	Methods of chemical analysis of ferrosilicon:
(Part 1) : 1988	Determination of silicon (<i>second revision</i>)
(Part 2) : 1982	Determination of carbon (<i>first revision</i>)
(Part 3) : 1982	Determination of sulphur (<i>first revision</i>)
(Part 4) : 1982	Determination of phosphorus (<i>first revision</i>)
(Part 5) : 2003	Determination of aluminium (<i>second revision</i>)
(Part 6) : 1982	Determination of calcium (<i>first revision</i>)
(Part 7) : 1982	Determination of manganese (<i>first revision</i>)
IS 15765 : 2008	Method of sampling ferro alloys for sieve analysis and size determination

ANNEX B
(Foreword)

COMMITTEE COMPOSITION

Ores and Feedstock for Iron and Steel Industry Sectional Committee, MTD 13

<i>Organization</i>	<i>Representative(s)</i>
National Mineral Development Corporation Ltd, Hyderabad	SHRI RAJAN KUMAR (<i>Chairperson</i>)
Agni Steel Private Limited, Erode	SHRI A. RAJASEKARAN
Arcelor Mittal and Nippon steel india Ltd, Visakhapatnam	DR ATANU RANJAN OJHA SHRI CH V. S. ND HARIPRASAD (<i>Alternate</i>)
Centre for Engineering and Technology (SAIL/CET), Ranchi	SHRI BRAJESH KUMAR SHRI D. K. JAGANI (<i>Alternate</i>)
CSIR-Institute of Minerals & Materials Technology, Bhubaneswar	DR ASHOK SAHU DR S. P. DAS (<i>Alternate</i>)
CSIR-National Metallurgical Laboratory, Jamshedpur	DR MANOJ KUMAR MOHANTA
Defence Metallurgical Research Lab, Hyderabad	DR CH R. V. S. NAGESH DR RANJAN KUMAR SINGH (<i>Alternate</i>)
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Fomento Resources Private Limited, Gao	SHRI MAHENDRA MANGUESH RAMANI SHRI ABHIJIT PEDNEKAR RAMANI (<i>Alternate</i>)
Geological Survey of India, Kolkata	SHRI S. K. KAR DR SHIVDAS (<i>Alternate</i>)
Jai Balaji Group, Kolkata	SHRI D. SAHOO
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JSW Steel Limited, Bellary	SHRI P. C. MAHAPATRA SHRI C. R. PRAMOD KUMAR (<i>Alternate</i>)
KIOCL Limited, Bengaluru	SHRI M. A. SALAM SHRI P. PALANI (<i>Alternate</i>)
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Mineral Exploration Corpn. Limited, Nagpur	SHRI P. RAVINDRAN SHRI SANTOSH KUMAR SATAPATHY (<i>Alternate</i>)
Mitra S.K. Private Limited, Kolkata	SHRI SAJAL MITRA SHRI P. L. BOSE (<i>Alternate</i>)
M.N. Dastur & Co. Limited, Kolkata	SHRI AVIJIT PODDAR
National Institute of Secondary Steel Technology, Mandi Gobindgarh	SHRI SHRI RAJIB KUMAR PAUL SHRI SANDEEP PAL SINGH (<i>Alternate</i>)
National Mineral Development Corporation Ltd, Hyderabad	SHRI VIBHUTI ROSHAN
National Test House, Kolkata	DR S. K. KULSHRESTHA
Pellet Manufacturer's Association of India, New Delhi	SHRI DEEPAK BHATNAGAR
Rashtriya Ispat Nigam Limited, Visakhapatnam	SHRI T. GOUTHAM SHRI R. MOHANTY (<i>Alternate</i>)

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Sponge Iron Manufacturers Association, New Delhi	SHRI D. KASHIVA
Tata Steel, Jamshedpur	DR A. K. MUKHERJEE
BIS Directorate General	SHRI SANJIV MAINI, SCIENTIST 'F'/SENIOR DIRECTOR AND HEAD (METALLURGICAL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (<i>Ex-officio</i>)]

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SHRI G. RAM SAI KUMAR
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