
फेरोनिकेल – विशिष्टि

(दूसरा पुनरीक्षण)

Ferronickel – Specification

(Second Revision)

ICS 77.100

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भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002

www.bis.gov.in www.standardsbis.in

FOREWORD

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

The Standard was published in 1967 and was first revised in 1973. In view of the experience gained over these years, it was felt necessary to revise the standard again. The following modifications have been made in this revision:

- a) The ferronickel grades have been modified in line with ISO 6501 : 2020 'Ferronickel — Specification and delivery requirements';
- b) Test methods for determination of Ni, C, Si, Mn, Cu, Co, P, S and Cr have been added;
- c) Reference clause, terminology, size requirements and ordering information clause have been added;
- d) Supply of materials clause, packing clause and marking clause have been modified; and
- e) A clause on 'Form of delivery and formation of lots' has been added.

This standard contains clauses Table 2, **7.2**, **8.1** and **10** which call for an agreement between the purchaser and the supplier.

In the formulation of this standard, considerable assistance has been derived from the following publication:

ISO 6501 : 2020 'Ferronickel — Specification and delivery requirements'.

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

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
FERRONICKEL — SPECIFICATION
 (*Second Revision*)

1 SCOPE

This standard covers the requirements for ferronickel used in iron and steel 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 Ferronickel — A master alloy of iron and nickel with a minimum nickel content of 15.0 percent by mass and a maximum nickel content of 80.0 percent by mass, obtained from oxide ores or other nickel-bearing materials.

3.2 Lot — Discrete and defined quantity of ferronickel ingots, pieces or shots answering to the same quality specification (chemical composition and physical characteristics).

4 GRADES

4.1 Ferronickel shall be of five grades as specified in Table 1.

4.2 The designation of ferronickel product is given

with the combination of the elements of Table 1 and Table 2.

Example:

Fe Ni 30 HC MP MS HSi,

Where L = low, M = medium and H = high

Other examples of a combination of Tables 1 and 2 are given in Annex B.

5 ORDERING INFORMATION

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

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

6. SUPPLY OF MATERIAL

6.1 General requirements relating to the supply of ferronickel shall be as laid down in IS 1387.

7 CHEMICAL COMPOSITION

7.1 The chemical composition of ferronickel shall conform to the limits given in Table 1 for nickel content and Table 2 for the main constituent elements and usual impurities.

Table 1 Chemical Composition of Ferronickel
 (Clauses 4.1, 4.2, 7.1, 7.2, Table 2 and Annex B)

Sl No.	Designation	Ni (in Percentage Mass Fraction)	
		From (included)	To (not included)
(1)	(2)	(3)	(4)
i)	Fe Ni 20	15	25
ii)	Fe Ni 30	25	35
iii)	Fe Ni 40	35	45
iv)	Fe Ni 50	45	60
v)	Fe Ni 70	60	80

NOTES

- 1 For other elements *see* Table 2.
- 2 Cobalt content shall not be more than 5 percent of the nickel content.

Table 2 Chemical Composition of Main Constituent Elements and Usual Impurities of Ferronickel (in Percentage Mass Fraction)*(Clauses 4.2, 7.1, 7.2, Table 1 and Annex B)*

Sl No.	Designation	C		Si		S		P		Cr (Max)
		From (included)	To (not included)							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
i)	Low	---	0.03	---	0.20	---	0.03	---	0.01	0.10
ii)	Medium	0.03	1.00	0.20	1.00	0.03	0.10	0.01	0.02	0.50
iii)	High	1.00	3.00	1.00	4.00	0.10	0.40	0.02	0.03	2.00

NOTES

1 For Ni content, *see* Table 1.2 Copper 0.2 percent, *Max.*3 Manganese 0.5 percent, *Max.*

4 Other elements such as arsenic, bismuth, lead, antimony and tin each shall not exceed mass fraction of 0.010 percent. If exceeds, this shall be indicated and agreed upon between the supplier and the purchaser.

7.2 The chemical composition of the material shall be determined either by the methods specified in IS 17319, IS 17320, IS 17321, IS 17322, IS 17323, IS 17324, IS 17325 and IS 17835 or any other established instrumental/chemical method. In case of dispute, the procedure given in the latest version of above mentioned Indian standard shall be the referee method. However, where the method is not given in IS 17319, IS 17320, IS 17321, IS 17322, IS 17323, IS 17324, IS 17325 and IS 17835, the referee method shall be agreed to between the purchaser and the manufacturer.

8 FORM OF DELIVERY AND FORMATION OF LOTS**8.1 General**

Ferronickel may be delivered as agreed between the supplier and the purchaser in various forms, for example, ingots, pieces or shot. The delivered lots, except by special agreement, shall have a minimum tonnage of 5 t. The sizes range and tolerance of ferronickel shall be as agreed by the supplier and the purchaser.

8.1.1 Ferronickel in Ingots

Ingots may be supplied notched or unnotched. Their maximum mass is 100 kg. Their thickness may be within a range of 30 mm to 150 mm. Their length shall not exceed 1 100 mm.

8.1.2 Ferronickel in Pieces

Pieces are either cast or cut from ingots. A lot is formed from only one of these two categories of pieces. The maximum dimension is between 25 mm

and 100 mm. Within a lot, the sizes of pieces shall be uniform.

8.1.3 Ferronickel in Shots

The size of the shot obtained by shotting of liquid material should be within a range of 2 mm to 50 mm. The ferronickel shot shall be delivered after drying.

9 SAMPLING

Representative samples of ferronickel for testing shall be drawn in accordance with IS 1472

10 PACKING

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

11 MARKING

11.1 The material shall be marked with the following:

- Indication of the source of manufacture;
- Grade designation, cast or lot and size distribution;
- Quantity;
- Date of manufacture, if required; and
- Shelf life, if required.

11.2 BIS Certification Marking

The material may also be marked with the Standard Mark. 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 Standard Act, 2016* and the Rules and Regulations framed thereunder, and the product may be marked with the Standard Mark.

ANNEX A
(Clause 2)

LIST OF REFERRED STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
IS 1387 : 1993	General requirements for the supply of metallurgical materials (<i>second revision</i>)		content iodimetric titration method after induction furnace combustion
IS 1472 : 1977	Methods of sampling ferro-alloys for determination of chemical composition (<i>first revision</i>)	IS 17323 : 2020/ISO 7526 : 1985	Nickel, ferronickel and nickel alloys — Determination of sulphur content infra-red absorption method after induction furnace combustion
IS 17319 : 2020/ISO 6352 : 1985	Ferronickel — Determination of nickel content dimethylglyoxime gravimetric method	IS 17324 : 2020/ISO 7524 : 1985	Nickel, ferronickel and nickel alloys — Determination of carbon content infra-red absorption method after induction furnace combustion
IS 17320 : 2020/ISO 11400 : 1992	Nickel, ferronickel and nickel alloys — Determination of phosphorus content phosphovanadomolybdate molecular absorption spectrometric method	IS 17325 : 2020/ISO 7520 : 1985	Ferronickel — Determination of cobalt content flame atomic absorption spectrometric method
IS 17321 : 2020/ISO 8343 : 1985	Ferronickel — Determination of silicon content gravimetric method	IS 17835 : 2022/ISO 23156 : 2021	Ferronickels — Determination of phosphorus, manganese, chromium, copper and cobalt contents — Inductively coupled plasma atomic emission spectrometric method
IS 17322 : 2020/ISO 7527 : 1985	Nickel, ferronickel and nickel alloys — Determination of sulphur		

ANNEX B
(Informative)
(Clause 4.2)

EXAMPLES OF FERRONICKEL CLASSIFICATION

The combination of Tables 1 and 2 provides a more complete designation to all possible types of ferronickel, considering the range of all main constituents (Ni, C, S, Si, P). Supposing the ferronickel lot has the following quality:

Ni % : 40
C % : 0.035
S % : 0.040
P % : 0.010
Si % : 0.46

The designation will be Fe Ni 40 MC MS MP MSi, where L = low, M = medium and H = high.

Supposing the ferronickel lot has the following quality:

Ni % : 25

C % : 0.012
S % : 0.030
P % : 0.020
Si % : 1.10

The designation will be Fe Ni 30 LC MS HP HSi, where L = low, M = medium and H = high.

Supposing the ferronickel lot has the following quality:

Ni % : 55
C % : 2.000
S % : 0.020
P % : 0.029
Si % : 0.65

The designation will be Fe Ni 50 HC LS HP MSi, where L = low, M = medium and H = high.

ANNEX C
(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 Limited, Hyderabad	SHRI RAJAN KUMAR (<i>Chairperson</i>)
Agni Steel Private Limited, Erode	SHRI A. RAJASEKARAN
Arcelor Mittal and Nippon steel India Limited, Visakhapatnam	DR ATANU RANJAN OJHA SHRI CH V. S. ND HARIPRASAD (<i>Alternate</i>)
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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 MAHENDRAMANGUESH RAMANI SHRI ABHIJIT PEDNEKAR RAMANI (<i>Alternate</i>)
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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
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National Mineral Development Corporation Limited, Hyderabad	SHRI VIBHUTI ROSHAN
National Test House, Kolkata	DR S. K. KULSHRESTHA

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Shriram Institute for Industrial Research New Delhi	SHRI BALAN GOVIDAN SHRI SHAMBHU THAKUR (<i>Alternate</i>)
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>)]

Member Secretary
SHRI G. RAM SAI KUMAR
SCIENTIST 'B'/ASSISTANT DIRECTOR
(METALLURGICAL ENGINEERING), BIS

Ferroalloys Subcommittee involved in the Finalization-MTD 13:01

<i>Organization</i>	<i>Representative(s)</i>
Indira Gandhi Centre for Atomic Research, Kalpakkam	DR M. VASUDEVAN (<i>Convener</i>)
Bhabha Atomic Research Centre, Mumbai	DR BIKAS CHANDRA MAJI
CSIR - Institute of Minerals & Materials Technology, Bhubaneswar	DR ASHOK SAHU DR S. P. DAS (<i>Alternate</i>)
CSIR - National Metallurgical Laboratory, Jamshedpur	DR SANJAY AGARWAL DR DAYANAND PASWAN (<i>Alternate</i>)
Essar Steel India Limited, Mumbai	SHRI J. MAKVANA SHRI MANOJ SWAMY (<i>Alternate</i>)
Facor Alloys Limited, Vizianagaram	SHRI N. S. S. RAMA RAO SHRI R. BHASKARA RAO (<i>Alternate</i>)
Indian Ferro Alloy Producers Association, Mumbai	SHRI TANMAYA KUMAR PATTNAIK
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Jindal Stainless Limited, Hissar	SHRI ASHISH GOYAL SHRI SUYASH TRIVEDI (<i>Alternate</i>)
JSW Steel Limited, Karnataka	SHRI C. R. PRAMOD KUMAR
Midhani, Hyderabad	DR RAJASEKHAR
Manganese Ore (India) Limited (MOIL), Nagpur	SHRI RAJESH BHATTACHARYA SHRIMATI SNEHA TIWAR (<i>Alternate</i>)
Tata Steel Limited, Jamshedpur	DR A. K. MUKHERJEE

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BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002

Telephones: 2323 0131, 2323 3375, 2323 9402

Website: www.bis.gov.in

Regional Offices:

	Telephones
Central : 601/A, Konnectus Tower -1, 6 th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002	{ 2323 7617
Eastern : 8 th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091	{ 2367 0012 2320 9474
Northern : Plot No. 4-A, Sector 27-B, Madhya Marg, Chandigarh 160019	{ 265 9930
Southern : C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113	{ 2254 1442 2254 1216
Western : Plot No. E-9, Road No.-8, MIDC, Andheri (East), Mumbai 400093	{ 2821 8093

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