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फेर्रोनिकेल – विशिष्टि  
(द्वितीय पुनरीक्षण)

**Ferronickel Specification**  
( Second Revision )

ICS 77.100

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Price Group 5

## FOREWORD

This Indian Standard (Second Revision) was adopted by Bureau of Indian Standards, after the draft recommended by Ferroalloys Subcommittee and subsequently 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 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 has been modified; and
- e) “Form of delivery and formation of lots” have been added.

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

- a) ISO 6501 : 2020 “Ferronickel — Specification and delivery requirements”.

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 Composition of the subcommittee, MTD 13:01 and the sectional committee, MTD 13 responsible for the formulation of this standard is given at Annex B.

*Indian Standard*  
**FERRONICKEL — SPECIFICATION**  
*( Second Revision )*

**1 SCOPE**

This standard covers the requirements for ferronickel (ingots, pieces and shot) used in iron and steel industry.

**2 REFERENCES**

The following standards 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 indicated below:

<i>IS No.</i>	<i>Title</i>
1387 : 1993	General Requirements for the Supply of Metallurgical Materials ( <i>second revision</i> )
1472 : 1977	Methods of sampling ferro-alloys for determination of chemical composition ( <i>first revision</i> )
17319 : 2020	Ferronickel Determination of Nickel Content Dimethylglyoxime Gravimetric Method
17320 : 2020	Nickel Ferronickel and Nickel Alloys Determination of Phosphorus Content Phosphovanadomolybdate Molecular Absorption Spectrometric Method
17321 : 2020	Ferronickel Determination of Silicon Content Gravimetric Method
17322 : 2020	Nickel Ferronickel and Nickel Alloys Determination of Sulfur Content Iodimetric Titration Method after Induction Furnace Combustion
17323 : 2020	Nickel Ferronickel and Nickel Alloys Determination of Sulfur Content Infra-Red Absorption Method After Induction Furnace Combustion

*IS No.**Title*

17324 : 2020	Nickel Ferronickel and Nickel Alloys Determination of Carbon Content Infra-Red Absorption Method after Induction Furnace Combustion
17325 : 2020	Ferronickel Determination of Cobalt Content Flame Atomic Absorption Spectrometric Method
IS 17835/ISO 23156	Ferronickels — Determination of phosphorus, manganese, chromium, copper and cobalt contents — Inductively coupled plasma atomic emission spectrometric method

**3 TERMINOLOGY**

**3.0** 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**

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

**4.1** The designation of ferronickel product is given with the combination of the elements of Tables 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 A

## 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.

6.2 The material shall be supplied in the form of properly cleaned lumps free from any slag and non-metallic residues.

6.3 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 5t.

## 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, 4.1, 7.1, 7.3 and Annex A)

	Ni (in percentage mass fraction)	
	From (incl.)	To (not incl.)
Fe Ni 20	15	25
Fe Ni 30	25	35
Fe Ni 40	35	45
Fe Ni 50	45	60
Fe Ni 70	60	80

### NOTES

- 1 For other elements see Table 2
- 2 Cobalt content shall not be more than 0.05 times that of the Nickel content

**Table 2 Chemical Composition of Main Constituent Elements and Usual Impurities of Ferronickel (in percentage mass fraction)**  
(Clauses 4.1, 7.1, 7.3 and Annex A)

Designation	C		Si		S		P		Cr (Max)
	From (incl.)	To (Not Incl.)	From (incl.)	To (Not Incl.)	From (incl.)	To (Not Incl.)	From (incl.)	To (Not Incl.)	
Low	----	0.03	----	0.20	----	0.03	----	0.01	0.10
Medium	0.03	1.00	0.20	1.00	0.03	0.10	0.01	0.02	0.50
High	1.00	2.50	1.00	4.00	0.10	0.40	0.02	0.03	2.00

### NOTES

- 1 For Ni content *see* Table 1
- 2 Copper *max.* 0.2%
- 3 Manganese *max.* 0.5%
- 4 Other elements such as arsenic, bismuth, lead, antimony and tin each shall not exceed mass fraction of 0.010%. If exceeds, this shall be indicated and agreed upon between the supplier and the purchaser.

**7.2** The chemical composition of ferronickel shall be determined by the method specified in IS 17319, IS 17320, 17321, 17322, 17323, 17324, 17325 and IS 17835.

**7.3** The chemical compositions given in Tables 1 and 2 are subject to the precision of the methods of sampling and analysis for ferronickel. In case no adequate method is given for analysis of a particular element for the limits specified in Table 1 and 2, the analysis shall be carried out with any other instrumental/chemical method as agreed upon by the manufacturer and the purchaser.

## **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.

**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 (*first revision*).

## **10 PACKING**

10.1 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:

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

### **11.2 BIS Certification Marking**

The material may also be marked with the Standard Mark:

**11.2.1** 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**

(Informative)

(Clause 4.1)

**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 B***(Foreword)***COMMITTEE COMPOSITION**

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

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*Member Secretary*

SHRI G RAM SAI KUMAR  
SCIENTIST 'B' AND ASSISTANT DIRECTOR (MTD), BIS

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