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Ferronickel — Specification and delivery requirements

Ferro-nickel — Spécifications et conditions de livraison

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 155, *Nickel and nickel alloys*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC SS M14, *Nickel*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 6501:1988), which has been technically revised. The main changes compared with the previous edition are as follows:

— expressions such as "agreement between parties" have been reduced or eliminated (because if a standard or part of it is to be agreed, there is no need for that International Standard);

— the ferronickel delivery market requirements have been updated;

— FeNi classification has been clarified according chemical composition and combination of Ni content (Table 1) and impurities (Table 2); this was previously in one table.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Ferronickel — Specification and delivery requirements

1 Scope

This document specifies the technical delivery requirements for the various forms of ferronickel (ingots, pieces and shot) usually supplied for steel making and foundry use.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6352, *Ferronickel — Determination of nickel content — Dimethylglyoxime gravimetric method*

ISO 8049, *Ferronickel shot — Sampling for analysis*

ISO 8050, *Ferronickel ingots or pieces — Sampling for analysis*

ISO 14284, *Steel and iron — Sampling and preparation of samples for the determination of chemical composition*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
ferronickel
master alloy of iron and nickel having a nickel content equal to or greater than a mass fraction of 15 % and less than a mass fraction of 80 %, obtained from oxide ores or other nickel-bearing materials

3.2
K
number that represents the lowest nickel content that is part of the lot to be delivered

3.3
splitting limit
maximum acceptable difference between analytical results of nickel or other element agreed by two parties (buyer and seller)

3.4
lot
discrete and defined quantity of ferronickel ingots, pieces or shots answering to the same quality specification (chemical composition and physical characteristics)

4 Information for ordering

Orders for ferronickel shall include the following information:

a) quantity;

b) chemical composition, according to the designations in Tables 1 and 2;

c) form of delivery, according to 5.2;

d) delivery requirements;

e) size distribution;

f) requirements for the analysis report, packing, etc., as appropriate;

g) transportation and storage requirements.

5 Requirements

5.1 Chemical composition

5.1.1 The chemical compositions of the various types of ferronickel are specified in Tables 1 and 2.

5.1.2 In Table 1, only the nickel content is given.

Table 1 — Ni content in ferronickel

Designation	Chemical composition, % (mass fraction)		
	Ni		Other elements
	From (incl.)	Up to (not incl.)	
FE Ni 20	15	25	See Table 2
FE Ni 30	25	35	
FE Ni 40	35	45	
FE Ni 50	45	60	
FE Ni 70	60	80	

5.1.3 In Table 2, the main constituent elements and usual impurities are given. Other elements may be decided between the parties.

If the purchaser requires closer ranges for the main element contents and/or different limits for specified elements, and/or limits for non-specified elements, and/or if the contents of elements such as arsenic, bismuth, lead, antimony and tin each exceed mass fraction of 0,010 %, this shall be indicated and agreed upon between the supplier and the purchaser.

Table 2 — Chemical composition of main constituent elements of ferronickel and usual impurities of ferronickel

Designation	Chemical composition, % (mass fraction)											
	C		Si		P		S		Cr	Co	Cu	Other elements
	From (incl.)	Up to (not incl.)	From (incl.)	Up to (not incl.)	From (incl.)	Up to (not incl.)	From (incl.)	Up to (not incl.)	Max.	a	b	See 5.1.3
Low	—	0,030	—	0,20	—	0,010	—	0,030	0,10			
Medium	0,030	1,000	0,20	1,00	0,010	0,020	0,030	0,100	0,50			
High	1,000	2,500	1,00	4,00	0,020	0,030	0,100	0,400	2,0			

a $\frac{Co}{Ni} = \frac{1}{20}$ to $\frac{1}{40}$, for information only.

b Cu max. 0,20 %.

5.1.4 The designation of ferronickel product is given with the combination of the elements of Tables 1 and 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.

5.1.5 The chemical compositions given in Tables 1 and 2 are subject to the precision of the methods of sampling and analysis for ferronickel.

5.2 Form of delivery and formation of lots

5.2.1 General

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

5.2.2 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 to 150 mm. Their length shall not exceed 1 100 mm.

Lots may be formed in two different ways:

— from material stocked individually from each tapping operation;

— by blending several heats; in this case, except by special agreement, heats shall be selected in a nickel content range from K to (K + 1) %, K being a whole number.

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

Lots may be formed in two different ways:

— from material stocked individually from each tapping operation;

— by blending several heats; in this case, except by special agreement, heats shall be selected in a nickel content range from K to (K + 1) %, K being a whole number.

5.2.4 Ferronickel in the form of shot

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.

Lots generally delivered in bulk may be formed in three different ways:

— from material stocked individually from each tapping operation;

— by reclaiming from blended storage; in this case, the K to $(K + n)$ % range of the nickel content of the blended material may be selected with values of n up to 5;

— by reclaiming from unblended storage; in this case, n shall not exceed 1.

5.3 Contamination

The material shall be as free as possible from surface contaminants such as slag, sand, etc.

6 Control

6.1 General

Sampling and analysis procedures shall be carried out in accordance with relevant International Standards, in particular ISO 8049 for the sampling of ferronickel shot, ISO 8050 for the sampling of ferronickel ingot or pieces, ISO 14284 for the sampling and preparation of samples for analysis of steel and iron applicable for ferronickel in molten stage, and ISO 6352 for the determination of nickel content. Other procedures giving the same accuracy may be agreed upon between the supplier and the purchaser, and the arbitrator in the case of an arbitration procedure.

6.2 Sampling for analysis

6.2.1 During sampling procedures, representatives of both parties may be present, wherever sampling is carried out.

6.2.2 In case of dispute, one of the procedures described in 6.4 may be adopted.

6.3 Analysis

6.3.1 Ferronickel furnished with analysis certificate

The certificate, established by the supplier, gives the nickel content as specified in Table 1 and, if agreed, the content of other elements specified either in Table 2 or additionally agreed.

In case of dispute, the two parties may use the procedures described in 6.4 either for analysis only or for sampling and analysis.

6.3.2 Ferronickel settled with exchange analysis

When an exchange of analysis is decided on by the two parties, the values resulting from analysis of the samples obtained under 6.2.1 for nickel content, and possibly for the content of other elements, shall be exchanged.

If the differences between the results of the analyses of the two parties do not exceed the agreed splitting limits, the mean value shall be accepted.

If the differences exceed splitting limits, the two parties may use the procedures described in 6.4 either for analysis only or for sampling and analysis.

6.4 Procedures in case of dispute

6.4.1 General

The two cases below are applicable for both sampling and analytical problems and may be used either independently or successively.

In both cases, the acceptable analytical result shall be within a range with the following limits:

— the lower contested value minus the splitting limit (in accordance with 6.3.2);

— the higher contested value plus the splitting limit.

6.4.2 Contradictory procedure

The procedure is carried out at a place chosen by agreement between the two parties. The operations are performed by one of the two parties in the presence of the other or of an agreed representative.

If an analysis is carried out and if the value obtained is within the range defined in 6.4.1, it is adopted as the final result. If the value obtained is outside this range, a new check shall be decided upon, in conformity either by organizing another contradictory procedure or with 6.4.3.

6.4.3 Arbitration procedure

An arbitrator is chosen by agreement between the two parties.

The sample obtained by an arbitration sampling is final.

If the arbitrator has the sole responsibility for testing a sample, his/her result is final.

If a sample is analysed by the two parties and then by the arbitrator, and if the arbitration result is within the range defined in 6.4.1, it forms the basis for the final settlement. If the value found is outside this range, a new check shall be decided upon, in conformity either with 6.4.2 or by selecting another arbitrator.