International Standard 5445

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Ferrosilicon — Specification and conditions of delivery

Ferro-silicium — Spécifications et conditions de livraison

First edition — 1980-12-01

UDC 669.15'782-198 **Ref. No. ISO 5445-1980 (E)**

Descriptors : ferroalloys, ferrosilicon, materials specifications, chemical composition, delivery, quality control, grain size.

Price based on 4 pages

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 5445 was developed by Technical Committee ISO/TC 132, *Ferroalloys*, and was circulated to the member bodies in November 1979.

It has been approved by the member bodies of the following countries :

Australia	India	Romania
Austria	Italy	South Africa, Rep. of
Brazil	Japan	Sweden
Canada	Libyan Arab Jamahiriya	United Kingdom
China	Norway	USA
Czechoslovakia	Pakistan	USSR
France	Poland	Yugoslavia
Germany, F.R.	Portugal	

No member body expressed disapproval of the document.

Printed in Switzerland

Ferrosilicon — Specification and conditions of delivery

1 Scope and field of application

This International Standard specifies requirements and conditions of delivery for ferrosilicon usually supplied for steelmaking and foundry use.

2 References

ISO 565, *Test sieves — Woven metal wire cloth and perforated plate — Nominal sizes of apertures.*

ISO 3713, *Ferroalloys — Sampling and preparation of samples — General rules.*[1]

ISO 4139, *Ferrosilicon — Determination of aluminium content — Flame atomic absorption spectrometric method.*

ISO 4158, *Ferrosilicon, ferrosilicomanganese and ferrosilicochromium — Determination of silicon content — Gravimetric method.*

3 Definition

3.1 ferrosilicon : A master alloy of iron and silicon with a minimum silicon content of 8,0 % by mass, and a maximum silicon content of 95,0 % by mass, obtained by reduction.

4 Information for ordering

Orders for ferrosilicon shall include the following information.

a) Quantity.

b) Constitution of consignment.

c) Chemical composition in accordance with the designations given in table 1.

d) Particle size ranges in accordance with the classes given in table 2.

e) Necessary requirements for analysis reports, packing, etc., as appropriate.

5 Requirements

5.1 Constitution of consignment

Ferrosilicon shall be delivered in consignments constituted by one of the following methods.

5.1.1 Tapped lot method

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

5.1.2 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 silicon content of the melts (or parts of continuous taps) constituting the consignment shall not differ from each other by more than 3 % absolute.

5.1.3 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 crushed to a particle size less than x mm[2] and thoroughly 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.

5.2 Chemical composition

5.2.1 The chemical composition of ferrosilicon shall be as specified in table 1. The limits stated correspond to particle size ranges in classes 1 to 8 in accordance with table 2.

1) At present at the stage of draft.

2) To be defined after further investigation.

5.2.2 The chemical compositions given in table 1 show only the main constituent elements and usual impurities. 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, this shall be agreed upon between supplier and purchaser.

5.2.3 The chemical compositions given in table 1 are subject to the precision of the methods of sampling and analysis for ferrosilicon (see clause 6).

5.3 Particle size ranges

5.3.1 Ferrosilicon is supplied in lumps or as crushed and screened particles. The particle size ranges and tolerances shall be in accordance with table 2. The undersize values shall be valid at the point of delivery to the purchaser.[1)]

The particle sizes specified refer to screening on a steel sieve with square openings; see ISO 565.

5.3.2 If the purchaser requires particle size ranges and/or tolerances other than those given in table 2, these shall be agreed upon between supplier and purchaser.

5.4 Extraneous contamination

The material shall be as free as possible from extraneous contamination.

6 Testing

6.1 Sampling for chemical analysis and sieve analysis

6.1.1 Sampling for chemical analysis and sieve analysis[2)] shall preferably be carried out by the method specified in ISO 3713[3)], but other methods of sampling having similar precision may also be used.

6.1.2 Sampling is usually carried out at the supplier's stockyard, unless otherwise agreed. Wherever sampling is carried out, representatives of both supplier and purchaser may be present.

6.1.3 If required, arbitration sampling shall be carried out by an arbitrator chosen by mutual agreement between supplier and purchaser. Sampling shall be carried out by the method specified in ISO 3713[3)], but other methods of sampling having similar precision may be agreed upon between supplier, purchaser and arbitrator.

The sample obtained by arbitration shall be accepted by both parties.

6.2 Analysis

6.2.1 The chemical analysis of ferrosilicon shall preferably be carried out by the methods specified in ISO 4139 and ISO 4158, but other methods of chemical analysis having similar precision may also be used.

6.2.2 Ferrosilicon shall be furnished with an analysis certificate, established by the supplier, for the silicon content and, if agreed, the contents of other elements either specified in table 1 or additionally agreed and, upon request of the purchaser, with a sample representative of the consignment.

6.2.3 In case of dispute, one of the following two procedures may be used.

6.2.3.1 Contradictory analysis

The chemical analysis shall be carried out on the same sample and preferably by the methods specified in ISO 4139 and ISO 4158. Other methods of chemical analysis having similar precision may be used, but shall be agreed upon between supplier and purchaser.

If the difference between the results of the two analyses is within x %[4)], the mean value shall apply. If the difference exceeds x %, then, provided that no other agreement is reached, arbitration analysis shall be carried out by an arbitrator chosen by mutual agreement between supplier and purchaser.

1) The point of delivery is defined as that point where the responsibility for the consignment passes from supplier to purchaser. If neither the supplier nor the purchaser is responsible for the transportation, then the point at which the values become valid shall be agreed upon.

2) Sieve analysis of ferroalloys will form the subject of ISO 4551.

3) A method of sampling specific to ferrosilicon will form the subject of ISO 4552.

4) The value of x will be specified later. In the meantime, the value should be agreed upon between purchaser and supplier.

6.2.3.2 Arbitration analysis

Arbitration analysis shall preferably be carried out by the methods specified in ISO 4139 and ISO 4158. Other methods of chemical analysis having similar precision may be used, but shall be agreed upon between supplier, purchaser and arbitrator.

The arbitrator's result is final, provided it is within the two disputed values or not more than y %[1] outside one of these values.

7 Despatch and storage

Ferrosilicon shall be packed, stored and transported according to international regulations.[2]

Table 1 — Chemical composition

Designation	Chemical composition, %									
	Si		Al		P	S	C	Mn[1]	Cr[1]	Ti[1]
	over	up to and including	over	up to and including	max.	max.	max.	max.	max.	max.
FeSi10	8,0	13,0	—	0,2	0,15	0,06	2,0	3,0	0,8	0,30
FeSi15	14,0	20,0	—	1,0	0,15	0,06	1,5	1,5	0,8	0,30
FeSi25	20,0	30,0	—	1,5	0,15	0,06	1,0	1,0	0,8	0,30
FeSi45	41,0	47,0	—	2,0	0,05	0,05	0,20	1,0	0,5	0,30
FeSi50	47,0	51,0	—	1,5	0,05	0,05	0,20	0,8	0,5	0,30
FeSi65	63,0	68,0	—	2,0	0,05	0,04	0,20	0,4	0,4	0,30
FeSi75Al1	72,0	80,0	—	1,0	0,05	0,04	0,15	0,5	0,3	0,20
FeSi75Al1,5	72,0	80,0	1,0	1,5	0,05	0,04	0,15	0,5	0,3	0,20
FeSi75Al2	72,0	80,0	1,5	2,0	0,05	0,04	0,20	0,5	0,3	0,30
FeSi75Al3	72,0	80,0	2,0	3,0	0,05	0,04	0,20	0,5	0,5	0,30
FeSi90Al1	87,0	95,0	—	1,5	0,04	0,04	0,15	0,5	0,2	0,30
FeSi90Al2	87,0	95,0	1,5	3,0	0,04	0,04	0,15	0,5	0,2	0,30

1) If not otherwise specified, these values are for information only.

Table 2 — Particle size

Class	Particle size range mm	Undersize, max. % by mass		Oversize[1], max. % by mass
		total	below 3,15 mm	
1	100 to 315	20	6[2]	10 No piece to exceed 1,15 × the maximum limit of the size range specified in two or three directions.
2	75 to 200	20	6[2]	
3	35 to 100	18	6[2]	
4	10 to 75	18	7[2]	
5	3,15 to 35	8		
6	3,15 to 10	10		
7	3,15 to 6,3	10		
8	up to 3,15	—		

1) See the annex.

2) If not otherwise specified, these values are for information only.

1) This value, as an overall precision, will be specified as β_{SDM}.

2) Examples of appropriate international regulations are :

a) RID : Règlement International concernant le transport des marchandises dangereuses par chemin de fer, Annexe C.

b) International maritime dangerous goods code.

Annex

Recommended minimum dimensions of openings for feeding systems

(This annex does not form part of the standard.)

Ferrosilicon, when crushed, has a great tendency to break into pieces where the ratio between length and thickness can be considerable. Therefore openings for feeders, tubes or any other equipment for transportation of ferrosilicon, must have suitable dimensions to avoid blocking.

The dimensions given in table 3 are the recommended smallest dimensions of any critical openings in a system for transportation and feeding ferrosilicon.

Table 3 — Recommended dimensions of openings

Class	Smallest dimension, mm min.
1	750
2	600
3	450
4	400
5	250