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# International Standard



# 5449

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

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## Ferrosilicochromium — Specification and conditions of delivery

*Ferro-silico-chrome — Spécifications et conditions de livraison*

First edition — 1980-12-15

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UDC 669.15'26'782-198

Ref. No. ISO 5449-1980 (E)

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

## 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 5449 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      | Germany, F.R.          | Portugal              |
| Austria        | India                  | Romania               |
| Brazil         | Italy                  | South Africa, Rep. of |
| Bulgaria       | Japan                  | Sweden                |
| Canada         | Libyan Arab Jamahiriya | United Kingdom        |
| China          | Norway                 | USSR                  |
| Czechoslovakia | Pakistan               | Yugoslavia            |
| France         | Poland                 |                       |

The member body of the following country expressed disapproval of the document on technical grounds :

USA

# Ferrosilicochromium — Specification and conditions of delivery

## 1 Scope and field of application

This International Standard specifies requirements and conditions of delivery for ferrosilicomanganese 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.*<sup>1)</sup>

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

ISO 4140, *Ferrochromium and ferrosilicochromium — Determination of chromium content — Potentiometric method.*

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

## 3 Definition

**3.1 ferrosilicochromium:** A master alloy of iron, chromium and silicon with chromium contents in the range from 20,0 to 65,0 % by mass and silicon contents in the range from 10,0 to 60,0 % by mass, obtained by reduction.

## 4 Information for ordering

Orders for ferrosilicochromium 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

Ferrosilicochromium 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 ferrosilicochromium 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 ferrosilicochromium designation.

The chromium and 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 ferrosilicochromium designation, which have been crushed to a particle size less than  $x$  mm<sup>2)</sup> 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 ferrosilicochromium designation.

1) At present at the stage of draft.

2) To be defined after further investigation.

## 5.2 Chemical composition

**5.2.1** The chemical composition of ferrosilicochromium shall be as specified in table 1. The limits stated correspond to particle size ranges in classes 1 to 7 in accordance with table 2.

**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 ferrosilicochromium (see clause 6).

## 5.3 Particle size ranges

**5.3.1** Ferrosilicochromium 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.<sup>1)</sup>

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<sup>2)</sup> shall preferably be carried out by the method specified in ISO 3713<sup>3)</sup>, 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<sup>3)</sup>, 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 ferrosilicochromium shall preferably be carried out by the methods specified in ISO 4139, ISO 4140 and ISO 4158, but other methods of chemical analysis having similar precision may also be used.

**6.2.2** Ferrosilicochromium shall be furnished with an analysis certificate, established by the supplier, for the silicon and chromium contents 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, ISO 4140 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  $x\%$ <sup>4)</sup>, 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 ferrosilicochromium will form the subject of ISO 4556.

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, ISO 4140 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  $y\%$ <sup>1)</sup> outside one of these values.

## 7 Despatch and storage

Ferrosilicochromium shall be packed, stored and transported according to international regulations.<sup>2)</sup>

Table 1 — Chemical composition

| Designation | Chemical composition, % |      |                              |           |           |           |
|-------------|-------------------------|------|------------------------------|-----------|-----------|-----------|
|             | Cr<br>min.              | over | Si<br>up to and<br>including | C<br>max. | P<br>max. | S<br>max. |
| FeCrSi15    | 55,0                    | 10,0 | 18,0                         | 6,0       | 0,050     | 0,030     |
| FeCrSi22    | 55,0                    | 20,0 | 25,0                         | 0,05      | 0,030     | 0,030     |
| FeCrSi23    | 45,0                    | 18,0 | 28,0                         | 3,5       | 0,050     | 0,030     |
| FeCrSi26    | 45,0                    | 24,0 | 28,0                         | 1,5       | 0,030     | 0,030     |
| FeCrSi33    | 43,0                    | 28,0 | 38,0                         | 1,0       | 0,050     | 0,030     |
| FeCrSi40    | 35,0                    | 35,0 | 40,0                         | 0,2       | 0,030     | 0,030     |
| FeCrSi45    | 28,0                    | 40,0 | 45,0                         | 0,1       | 0,030     | 0,030     |
| FeCrSi50    | 20,0                    | 45,0 | 60,0                         | 0,1       | 0,030     | 0,030     |
| FeCrSi50LC  |                         |      |                              | 0,05      |           |           |
| FeCrSi55    | 28,0                    | 50,0 | 55,0                         | 0,03      | 0,030     | 0,030     |
| FeCrSi48    | 35,0                    | 42,0 | 55,0                         | 0,05      | 0,030     | 0,010     |
| FeCrSi48LP  |                         |      |                              |           | 0,020     |           |

Table 2 — Particle size

| Class | Particle size range<br>mm | Undersize, max. % by mass |                 | Oversize, max.<br>% by mass                                                                               |
|-------|---------------------------|---------------------------|-----------------|-----------------------------------------------------------------------------------------------------------|
|       |                           | total                     | below 3,15 mm   |                                                                                                           |
| 1     | 100 to 315                | 20                        | 5 <sup>1)</sup> | 10<br>No piece to exceed 1,15 × the maximum limit of the size range specified in two or three directions. |
| 2     | 25 to 200                 | 15                        | 7 <sup>1)</sup> |                                                                                                           |
| 3     | 10 to 100                 | 15                        | 7 <sup>1)</sup> |                                                                                                           |
| 4     | 3,15 to 150               |                           | 7               |                                                                                                           |
| 5     | 3,15 to 50                |                           | 7               |                                                                                                           |
| 6     | 3,15 to 25                |                           | 7               |                                                                                                           |
| 7     | up to 3,15                |                           | —               |                                                                                                           |

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

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

2) Examples of appropriate international regulations are :

- RID : Règlement International concernant le transport des marchandises dangereuses par chemin de fer, Annexe C.
- International maritime dangerous goods code.

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