
International Standard



4296/1

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Manganese ores — Sampling — Part 1: Increment sampling

Minerais de manganèse — Échantillonnage — Partie 1: Échantillonnage par prélèvements

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Foreword

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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 4296/1 was developed by Technical Committee ISO/TC 65, *Manganese and chromium ores*, and was circulated to the member bodies in May 1983.

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

Austria	India	South Africa, Rep. of
Bulgaria	Italy	Thailand
China	Japan	United Kingdom
Czechoslovakia	Poland	USSR
France	Romania	

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

Australia

Manganese ores — Sampling —

Part 1: Increment sampling

0 Introduction

ISO 4296 consists of the following parts :

Part 1 : Increment sampling

Part 2 : Preparation of samples

1 Scope and field of application

This part of ISO 4296 specifies methods for taking samples of manganese ores to be used at the places of dispatch and acceptance of ores for determining the chemical composition and moisture content of a consignment.

The methods are applicable to both the manual and mechanical sampling of all manganese ores, whether natural or processed.

Details of the hammer and shovel method for sampling ores containing lumps of size greater than 100 mm are given in the annex.

2 References

ISO 3084, *Iron ores — Experimental methods for evaluation of quality variation*.

ISO 3085, *Iron ores — Experimental methods for checking the precision of sampling*.

ISO 3086, *Iron ores — Experimental methods for checking the bias of sampling*.

ISO 4296/2, *Manganese ores — Sampling — Part 2 : Preparation of samples*.

3 Definitions

3.1 lot : A definite quantity of an ore, processed or produced under conditions which are presumed uniform.

3.2 consignment : A quantity of an ore delivered at one time. The consignment may consist of one or more lots or parts of lots.

3.3 increment :

- 1) A quantity of ore taken at one time from a consignment using a sampling device.
- 2) A quantity of ore taken in the increment division method.

3.4 subsample :

- 1) A quantity of an ore consisting of several increments taken from a part of a consignment.
- 2) A composite of several increments which have been crushed and divided individually.

3.5 gross sample :

- 1) The quantity of an ore consisting of all increments taken from a consignment.
- 2) An aggregation of all the increments or all the subsamples after they have been crushed and divided individually.

3.6 divided sample : A sample obtained by a method of division.

3.7 moisture sample : The sample taken for the determination of moisture content of the consignment or part of the consignment.

3.8 sample for chemical analysis : The sample taken for the determination of chemical composition of the consignment or part of the consignment.

3.9 final sample : Any sample for determination of moisture content or chemical composition, which is prepared from each increment, each subsample, or from the gross sample in accordance with the specified method for that type of sample.

3.10 maximum particle size : The aperture size of the sieve on which approximately 5 % of the mass of the manganese ore is retained.

3.11 stratified sampling : For a consignment which can be divided into strata, sampling carried out in such a way that specified proportions of the sample are drawn from different strata.

NOTE — The strata are part of a consignment which is derived by division of the consignment according to specific criteria.

3.12 periodic systematic sampling : Sampling in which increments are taken from a consignment at regular intervals.

3.13 two-stage sampling : Sampling carried out by selecting the units to be sampled (wagons, trucks, large containers) and then taking increments at random from each unit selected.

4 General rules

The rules given below are general and obligatory for the interested parties.

4.1 Sampling shall be carried out by qualified samplers authorized by the seller and/or purchaser.

4.2 Sampling should preferably be carried out during handling immediately before or immediately after weighing.

4.3 Sampling shall be carried out by a systematic method with a random start. Sampling from wagons shall be conducted by the two-stage method or the stratified method.

4.4 The mass of the increment shall be determined in accordance with the maximum particle size of the ore in order to avoid the introduction of bias at the time of collecting the sample.

4.5 The number of increments to be taken from a consignment shall be determined according to the quality variation of the ore and the required precision of sampling.

4.6 Throughout all the procedures of sampling, the samples shall be protected from any contamination.

4.7 All sampling methods shall be demonstrated to have no bias (see ISO 3086).

4.8 When the planned number of increments has been taken before the handling has been completed, additional increments shall be taken at the same interval until the handling operation is completed.

5 Methods of sampling in general

5.1 General sampling procedure

The general sampling procedure is as follows :

- identify the consignment or part of the consignment to be sampled;
- ascertain the maximum particle size;
- determine the mass of increment;
- ascertain the quality variation of the consignment (see ISO 3084);
- determine the number of increments;

f) determine the point of sampling and the method of taking and combining the increments;

g) constitute a gross sample or subsample.

NOTE — If a consignment contains ores of different quality, it shall be divided into an appropriate number of lots and sampling and quality variation assessment shall be carried out on the lot basis.

5.2 Sampling plan

The gross sample or subsamples shall be constituted according to 5.7. (See figure 1.)

5.3 Mass of increment

5.3.1 The minimum mass of increment in manual sampling, depending on maximum particle size, is specified in table 1.

The increments shall be taken in such a manner as to ensure that they have an almost uniform mass.

NOTE — “Almost uniform mass” means that the variation in mass must be less than 20 % in terms of coefficient of variation.

The coefficient of variation (CV) is defined as the ratio of the standard deviation, σ , to the absolute value of the arithmetic mean, $\bar{m}_1$, of the masses of the increments, expressed as a percentage :

$$\frac{\sigma}{\bar{m}_1} \times 100 \quad \dots (1)$$

Table 1 — Mass of increment in manual sampling

Maximum particle size	Minimum mass of increment
mm	kg
> 150	25
> 100 to 150	13
> 50 to 100	4
> 40 to 50	3
> 30 to 40	2
> 20 to 30	1
> 10 to 20	0,5
> 2,8 (3,0) to 10	0,2

5.3.2 The mass of increment, m_1 , in kilograms, taken by means of mechanical samplers from the ore stream, is directly proportional to the flow rate of the belt conveyor and to the cutting aperture of the sampler, and inversely proportional to the cutter speed of the sampler; it may be calculated by the equation

$$m_1 = \frac{q_m b}{3,6 v} \quad \dots (2)$$

where

q_m is the flow rate, expressed in tonnes per hour, of the belt conveyor;

b is the cutting aperture, in metres, of the sampler;

v is the cutter speed, expressed in metres per second, of the sampler.