
**Iron ores for blast furnace feedstocks —
Determination of the decrepitation index**

*Minerais de fer pour charges de hauts fourneaux — Détermination de
l'indice de décrépitation*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 8371 was prepared by Technical Committee ISO/TC 102, *Iron ore and direct reduced iron*, Subcommittee SC 3, *Physical testing*.

This second edition cancels and replaces the first edition (ISO 8371:1994), which has been revised to homogenise with other physical test standards.

Introduction

This International Standard concerns one of a number of physical test methods that have been developed to measure various physical parameters and to evaluate the behaviour of iron ores, including reducibility, disintegration, crushing strength, apparent density, etc. This method was developed to provide a uniform procedure, validated by collaborative testing, to facilitate comparisons of tests made in different laboratories.

The results of this test should be considered in conjunction with other tests used to evaluate the quality of iron ores as feedstocks for blast furnace processes.

This International Standard may be used to provide test results as part of a production quality control system, as a basis of a contract, or as part of a research project.

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Iron ores for blast furnace feedstocks — Determination of the decrepitation index

CAUTION — This International Standard may involve hazardous operations and equipment. This International Standard does not purport to address all of the safety issues associated with its use. It is the responsibility of the user of this International Standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to its use.

1 Scope

This International Standard specifies a method to provide a relative measure for evaluating the degree of size degradation caused by rapid heating of iron ores. It specifies the determination of the decrepitation index.

This International Standard is applicable to lump ores for blast furnace feedstocks.

2 Normative references

The following referenced documents are indispensable for the application 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 3082:2000, *Iron ores — Sampling and sample preparation procedures*¹⁾

ISO 3310-1:2000, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

ISO 3310-2:1999, *Test sieves — Technical requirements and testing — Part 2: Test sieves of perforated metal plate*

ISO 4701:—²⁾, *Iron ores and direct reduced iron — Determination of size distribution by sieving*

ISO 11323:2002, *Iron ore and direct reduced iron — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11323 apply.

4 Principle

The test portion is rapidly heated from room temperature to 700 °C, maintained at this temperature for 30 min and then cooled in air down to room temperature. It is sieved with a test sieve having square openings of 6,3 mm. The decrepitation index is calculated as the mass percentage of material of size — 6,3 mm.

1) Under revision to incorporate ISO 10836, *Iron ores — Method of sampling and sample preparation for physical testing*.

2) To be published. (Revision of ISO 4701:1999)

5 Sampling, sample preparation and preparation of test portions

5.1 Sampling and sample preparation

Sampling of a lot and preparation of a test sample shall be in accordance with ISO 3082.

The size range for lump ores shall be $- 25,0 \text{ mm} + 20,0 \text{ mm}$.

A test sample of at least 5,0 kg, on a dry basis, of sized lump ores shall be obtained.

Oven-dry the test sample to constant mass at $105^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and cool it to room temperature. Screen the sized sample again on a 20,0 mm sieve to remove any adhering fines, and keep the test material in a desiccator until testing.

NOTE Constant mass is achieved when the difference in mass between two subsequent measurements becomes less than 0,05 % of the initial mass of the test sample.

5.2 Preparation of test portions

Only particles taken at random shall be used to constitute a test portion.

At least 10 test portions, each of approximately 500 g ($\pm$ the mass of 1 particle) shall be prepared from the test sample.

Weigh the test portions to the nearest 1 g and register the mass of each test portion on its recipient label.

6 Apparatus

6.1 General

The test apparatus shall comprise:

- a) ordinary laboratory equipment, such as an oven, hand tools, time-control device and safety equipment;
- b) a furnace;
- c) a test-portion holder;
- d) test sieves;
- e) a weighing device.

6.2 Furnace, having a heating capacity and temperature control able to heat the test portion from room temperature to 700°C in 30 min.

6.3 Test-portion holder, made of non-scaling, heat-resistant metal to withstand temperatures higher than 700°C , equipped with a thermocouple to measure the temperature of the sample. The cover shall be of the loose fitting type and shall not provide a gas-tight seal.

6.4 Test sieves, conforming to ISO 3310-1 or ISO 3310-2 and having square apertures of the following nominal sizes: 6,30 mm; 3,15 mm and 500 μm .

6.5 Weighing device, capable of weighing the test sample and test portions to an accuracy of 1 g.

7 Procedure

7.1 Number of determinations for the test

Owing to the heterogeneity of lump ores, carry out the test 10 times on each test sample.

7.2 Heating

DANGER — This test involves handling of hot apparatus. In addition, for some iron ores, spitting may occur when loading the sample into the hot container. Suitable hand and eye protection shall be used by the operator.

Turn on the furnace and begin heating. When its temperature reaches 700 °C, keep it constant for a further 20 min. Place the test portion in the sample holder, cover and put the set in the furnace. After 30 min, remove the holder and the test portion from the furnace and allow the test portion to cool to below 50 °C.

7.3 Sieving

Discharge the test portion carefully from the sample holder, determine and record its mass (m_1). Hand sieve on the 6,30 mm, 3,15 mm and 500 µm sieves (6.4), in accordance with ISO 4701. Determine and record the mass passing 6,30 mm (m_2), 3,15 mm and 500 µm to one decimal place.

8 Expression of results

The decrepitation index, $DI_{-6,3}$, expressed as a percentage by mass, is calculated from the following formula:

$$DI_{-6,3} = 100 \times \frac{m_2}{m_1}$$

where

m_1 is the mass, in grams, of the test portion after thermal treatment;

m_2 is the mass, in grams, of the undersize fraction passing the 6,30 mm sieve.

Express the result to one decimal place.

Also record the percentage mass passing 3,15 mm (m_3) and 500 µm (m_4) to one decimal place.

9 Test report

The test report shall include the following information:

- a reference to this International Standard, i.e. ISO 8371:2007;
- all details necessary for the identification of the sample;
- the name and address of the test laboratory;
- the date of the test;
- the date of the test report;
- the signature of the person responsible for the test;
- details of any operation and any test conditions not specified in this International Standard or regarded as optional, as well as any incident which may have had an influence on the results;
- the decrepitation index, $DI_{-6,3}$ and the individual results of the 10 tests;
- the mean values of the decrepitation index for the whole 10 tests;
- the type of sieve used.