
INTERNATIONAL STANDARD



3852

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

Iron ores (maximum particle size 40 mm or smaller) — Determination of bulk density

*Minerais de fer (particules de dimension granulométrique maximale inférieure ou égale à 40 mm) —
Détermination de la masse volumique apparente*

First edition — 1977-01-15

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[ISO 3852:1977](https://standards.iteh.ai/catalog/standards/sist/6bbdb36f-c4b4-444f-800e-82b13b541e65/iso-3852-1977)

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UDC 553.31 : 531.754

Ref. No. ISO 3852-1977 (E)

Descriptors : iron ores, physical tests, density measurement, bulk density, mass measurement.

Price based on 2 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 3852 was drawn up by Technical Committee ISO/TC 102, *Iron ores*, and was circulated to the Member Bodies in June 1975.

It has been approved by the Member Bodies of the following countries:

Australia	India	South Africa, Rep. of
Austria	Iran	Sweden
Belgium	Italy	Turkey
Brazil	Japan	United Kingdom
Canada	Mexico	U.S.A.
Czechoslovakia	New Zealand	U.S.S.R.
France	Portugal	Yugoslavia
Germany	Romania	

No Member Body expressed disapproval of the document.

Iron ores (maximum particle size 40 mm or smaller) — Determination of bulk density

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method for the determination of the bulk density of natural and processed iron ores using a calibrated measure.

This method is applicable to samples having a maximum particle size of 40 mm or smaller.

NOTE — The method of determining the bulk density of samples having a maximum particle size of over 40 mm is specified in ISO 5464, *Iron ores — Determination of bulk density using a large container*.¹⁾

2 REFERENCES

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

ISO 3081, *Iron ores — Increment sampling — Manual method*.

ISO 3082, *Iron ores — Increment sampling — Mechanical method*.¹⁾

ISO 3083, *Iron ores — Preparation of samples*.

ISO 3087, *Iron ores — Determination of moisture content*.

ISO 4701, *Iron ores — Determination of size distribution by sieving*.¹⁾

3 DEFINITION

For the purposes of this International Standard, the following definitions apply :

3.1 maximum particle size : The size of aperture of the sieve on which approximately 5 % by mass of an iron ore is retained.

3.2 bulk density : The mass in air of a unit volume of an iron ore, including the voids within and between the particles.

4 APPARATUS

4.1 Measure for bulk density, consisting of a cylindrical metal container having an internal diameter of 400 ± 2 mm and an internal height of 400 ± 2 mm.

The container shall be constructed of metal of sufficient thickness to ensure the rigidity of the walls and the base of the container under the conditions of the test.

The container shall be reinforced by a steel band around the outside periphery at the top, and shall have two handles, 180° apart, attached to the outer surface by welding. A carriage or other suitable device may be provided to facilitate transportation of the measure within the laboratory.

The volume of the measure, in litres, shall be determined with a precision of 0,1 l using potable water of known density.

4.2 Weighing device, having a sensitivity of 1/1 000 or better, and a capacity adequate for the masses to be determined.

4.3 Test sieves, of square aperture, conforming to ISO 565.

4.4 Drying oven, suitably ventilated, capable of being maintained at $105 \pm 5^\circ\text{C}$ and of sufficient size to accommodate the test sample.

4.5 Shovel, No. 50 in accordance with 5.3 of ISO 3081.

5 SAMPLE

5.1 Obtain the sample for the bulk density test from the sample for physical testing prepared in accordance with ISO 3083.

5.2 Obtain a sufficient quantity of each sample for the test to fill the measure (4.1) in one operation, until it overflows. Prepare three separate test samples.

1) In preparation.

5.3 The bulk density test may be carried out using an as-received, air-dried, or oven-dried sample. If the test is made on an oven-dried basis, dry the sample at $105 \pm 5^\circ\text{C}$.

5.4 The moisture content and the size distribution are the two main factors which affect bulk density. Determine the moisture content and the size distribution of the bulk density sample in accordance with ISO 3087 and ISO 4701, respectively.

6 PROCEDURE

6.1 Weigh the dried measure (4.1) and record the mass to the nearest 0,2 kg.

6.2 Fill the measure with the sample of as-received, air-dried or oven-dried material, using the shovel (4.5). Empty the shovel from a height not exceeding 50 mm above the surface of the material in the measure. Fill the measure carefully, in order to prevent evident segregation.

After filling the measure to overflowing, draw a straight-edge across the top of the measure to make the heaped surface level.

6.3 Transfer the filled measure to the weighing device (4.2) without loss of sample from the measure. Weigh the filled measure to the nearest 0,2 kg.

7 EXPRESSION OF RESULTS AND NUMBER OF TESTS

7.1 Calculation

The bulk density, Z , expressed in tonnes per cubic metre, shall be calculated to the second decimal place using the following formula :

$$Z = \frac{m_1 - m_0}{V}$$

where

m_0 is the mass, in kilograms, of the dried, empty measure;

m_1 is the mass, in kilograms, of the filled measure;

V is the volume, in litres, of the dried measure.

NOTE — $1 \text{ kg/l} = 1 \text{ t/m}^3$

7.2 Number of tests

The test shall be made in duplicate according to clause 6. If the two results do not meet the permissible tolerance specified in clause 8, a single third test shall be made. If any two results of the three tests comply with the tolerance requirement, the respective two values together with their mean value shall be reported; if any two results do not comply, all three values together with their mean value shall be reported. The mean value shall be given to the first decimal place.

8 PERMISSIBLE TOLERANCE

The absolute difference between the measured values of the two tests shall not exceed 5 % relative to the mean value of the two tests.

9 TEST REPORT

The test report shall include the following information :

- a) the accepted measured values of bulk density and their mean value;
- b) indications necessary for the identification of the sample;
- c) a statement of the condition of the sample as tested; i.e. as-received, air-dried, or oven-dried;
- d) the date on which the volume of the dried measure was determined;
- e) a statement of the capacity and sensitivity of the weighing device used;
- f) the percentage moisture content of the sample, if necessary;
- g) the size distribution of the sample, if necessary;
- h) reference to this International Standard.