INTERNATIONAL STANDARD

ISO 3944

Third edition
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Fertilizers — Determination of bulk density (loose)

Engrais — Détermination de la masse volumique sans tassement

INTERNATIONAL ISO

Reference number
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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.

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.

International Standard ISO 3944 was prepared by Technical Committee ISO/TC 134, *Fertilizers and soil conditioners*, Sub-Committee SC 3, *Physical properties*.

This third edition cancels and replaces the second edition (ISO 3944:1980), which has been technically revised.

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Introduction

The bulk densities (loose and tapped) of a fertilizer provide information relative to the required size of packaging materials, store-houses, stock-rooms, etc. Generally, the bulk density (tapped) is up to 10 % greater than the bulk density (loose), and sometimes it may exceed this value. Both bulk densities depend on the actual density, surface form and particle size of the fertilizers.

The bulk density (loose) can be used to calculate the maximum volume of a given weight of fertilizer which may be expected in practice. The actual volume occupied by a given weight of fertilizer will normally be within the range calculated from the bulk density (loose) and the bulk density (tapped).

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Fertilizers — Determination of bulk density (loose)

1 Scope

This International Standard specifies a method for the determination of the bulk density (loose) of solid fertilizers, except powder fertilizers.

The method is applicable to dry fertilizers only. If the fertilizer has absorbed moisture during transport or storage, it is necessary to dry it in an environmental chamber, with constant low humidity, prior to the determination.

The method is not suitable for materials which contain a large proportion of particles exceeding 5 mm in diameter.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 7742:1988, *Solid fertilizers — Reduction of samples.*

ISO 8358:1991, *Solid fertilizers — Preparation of samples for chemical and physical analysis.*

3 Definition

For the purposes of this International Standard, the following definition applies.

3.1 bulk density (loose) of a fertilizer: The mass per volume of a material after it has been tipped freely into a container under specified conditions.

The bulk density (loose) is expressed in grams per cubic centimetre (g/cm^3).

4 Principle

Pouring of the fertilizer from a specified funnel into a specified measuring cylinder of known volume and weighing of the contents of the cylinder.

5 Apparatus

5.1 Balance, capable of weighing to the nearest 1 g.

5.2 Apparatus for determination of bulk density (loose), having the approximate dimensions given in figure 1 and consisting of the following.

5.2.1 Removable measuring cylinder, without a spout. The capacity up to the brim shall be known to the nearest cubic centimetre.

CAUTION — It is important that those parts of the apparatus which are in contact with the fertilizer are made of corrosion-resistant material (glass, plastics, etc.).

5.2.2 Firmly mounted funnel.

5.3 Spatula, approximately 120 mm × 20 mm, or other suitable scraper.

6 Preparation of test sample

Prepare the test sample by the methods given in ISO 7742 and ISO 8358, ensuring that the sample is sufficient to carry out two separate determinations.

7 Procedure

Pour into the closed funnel (5.2.2) a quantity of the fertilizer greater than that needed to fill the measuring cylinder (5.2.1). Fully open the slide of the funnel so that the contents discharge into the measuring cylinder in 6 s to 12 s.

If the fertilizer does not flow freely, keep the outlet clear by inserting a rod of 3 mm to 4 mm diameter into the opening.

When the cylinder overflows, close the slide of the funnel and scrape away the surplus fertilizer using the spatula or other suitable tool (5.3). Avoid vibration of the filled measuring cylinder.

Remove the measuring cylinder from below the funnel and weigh its contents to the nearest 1 g of the total mass.

Carry out two determinations, in rapid succession, on separate test portions taken from the same test sample.

8 Expression of results

8.1 Method of calculation

The bulk density (loose), ρ, of the fertilizer, in grams per cubic centimetre, is given by the equation

$$\rho = \frac{m}{V}$$

where

m is the mass, in grams, of the test portion;

V is the volume up to the brim, in cubic centimetres, of the measuring cylinder.

Take as the result the arithmetic mean of the two determinations provided that the requirement for repeatability (see 8.2) is satisfied.

8.2 Repeatability

The difference between the results of two determinations, carried out in rapid succession by the same operator using the same apparatus, shall not exceed 0,01 g/cm^3.

9 Test report

The test report shall include the following particulars:

a) identification of the sample;

b) reference to the method used;

c) the result and the method of expression;

d) any unusual features noted during the determination;

e) any operation not included in this International Standard or regarded as optional.

Dimensions (approximate) in millimetres

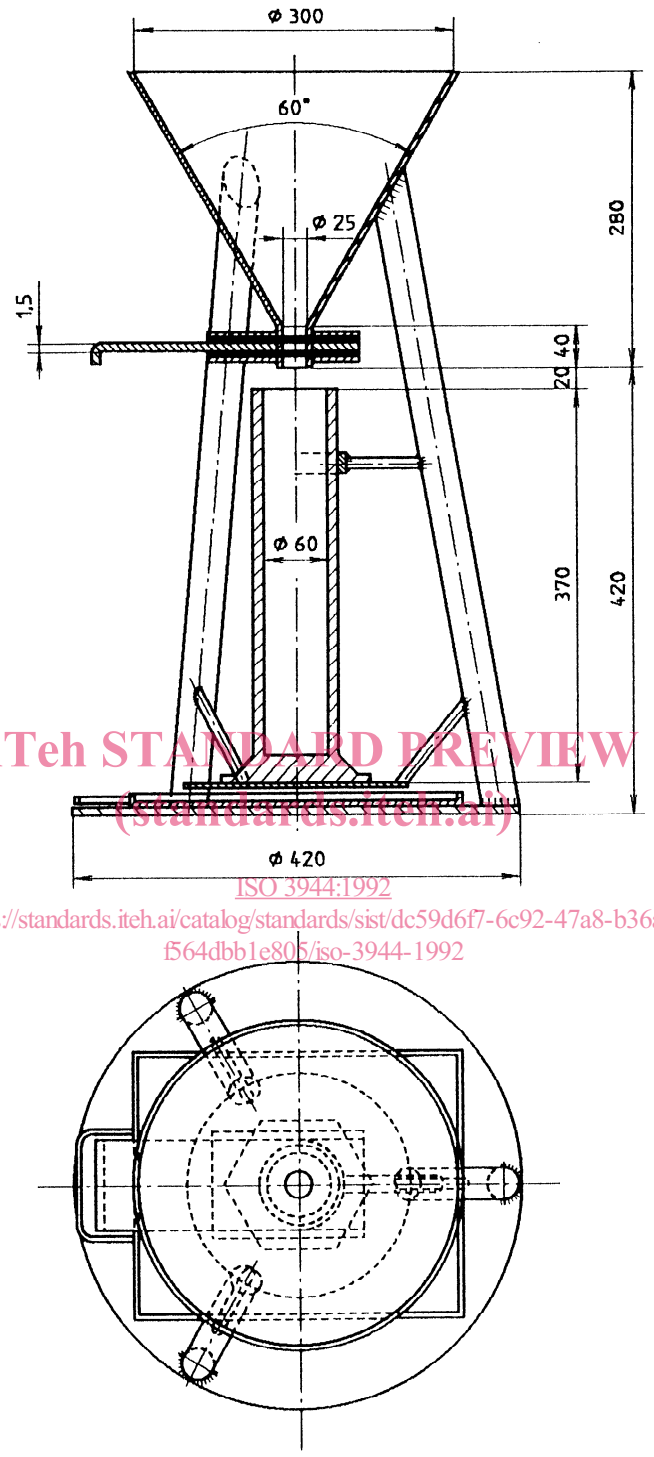

Figure 1 — Apparatus for the determination of bulk density (loose) of fertilizers

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Descriptors: fertilizers, tests, determination, bulk density, density measurement.

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