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Packaging — Sacks — Determination of the friction of filled sacks

Emballages — Sacs — Détermination du frottement des sacs pleins

Reference number
ISO 15119:2000(E)

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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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 15119 was prepared by Technical Committee ISO/TC 122, *Packaging*, Subcommittee SC 2, *Sacks*.

Introduction

This International Standard specifies three methods for the determination of the friction of filled sacks.

The friction of filled sacks is of importance for sacks which are usually stacked for transport and/or storage. It is important to determine the friction filled sacks will undergo so as to detemine, for example, if additional strapping is necessary when transporting palletized loads or, if additional means are necessary when loading a pallet with sacks.

The friction of filled sacks is influenced not only by the material of the sack, but also by the printing on the sack, the characteristics of the filling commodity of the sack and the filling degree of the sack. Therefore this International Standard specifies test methods for sacks filled as is intended for final use.

The methods in this International Standard are intended to be an aid to designers and users of sacks to make the right choice for the type of sack for a given product to be packed and a given handling method. The described methods give a basis for comparison of different designs and filling degrees of sacks. The results of the different methods are not interchangeable.

The inclined plane method is used for determining the coefficient of coherent friction of a layer of sacks against a second layer of stacked sacks, especially palletized sacks.

The pendulum method and the tilting plane method are suitable for testing the friction behaviour of a single sack and are important, for example during the process of filling.

Packaging — Sacks — Determination of the friction of filled sacks

1 Scope

This International Standard specifies three methods for the determination of the friction of filled sacks.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 2233, *Packaging — Complete, filled transport packages and unit loads — Conditioning for testing*.

ISO 2244, *Packaging — Complete, filled transport packages and unit loads — Horizontal impact tests.*

ISO 7023, *Packaging — Sacks — Method of sampling empty sacks for testing.*

3 Principle

3.1 Inclined plane method

Use of a rolling carriage on an inclined plane to bring stacked sacks to a given velocity. Then to stop the stacked sacks by impact of their carrying surface with a vertical impact surface.

The friction force is measured as a threshold value of the resisting force exerted against displacement by sack surfaces when laying one on top of another, mainly the upper layers.

3.2 Pendulum method

Use of a pendulum to bring stacked sacks to a given horizontal velocity. Then to stop the stacked sacks by impact of their carrying surface with a vertical impact surface.

The friction coefficient is determined from the displacement of the sacks and the damper.

3.3 Tilting plane method

Stacked sacks are placed on a plane surface of which the angle to the horizontal is increased. The angle at which the upper sack starts moving is measured. The tangent of this angle gives the initial coefficient of friction.

4 Apparatus

4.1 Inclined plane method (see Figure 1)

4.1.1 Inclined plane tester, in accordance with ISO 2244.

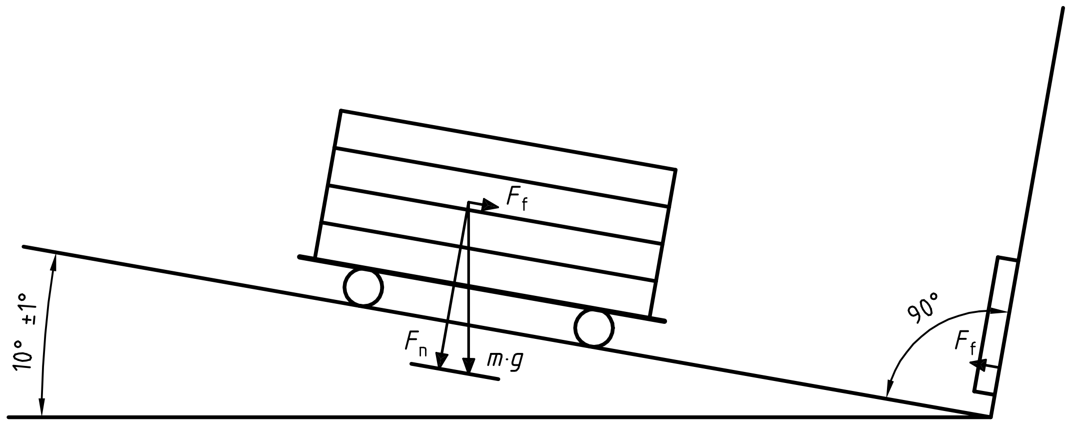

Figure 1 — Inclined plane method

4.2 Pendulum method (see Figure 2)

4.2.1 Pendulum apparatus, in accordance with ISO 2244 with the addition of a damper which stops the platform without rebounding.

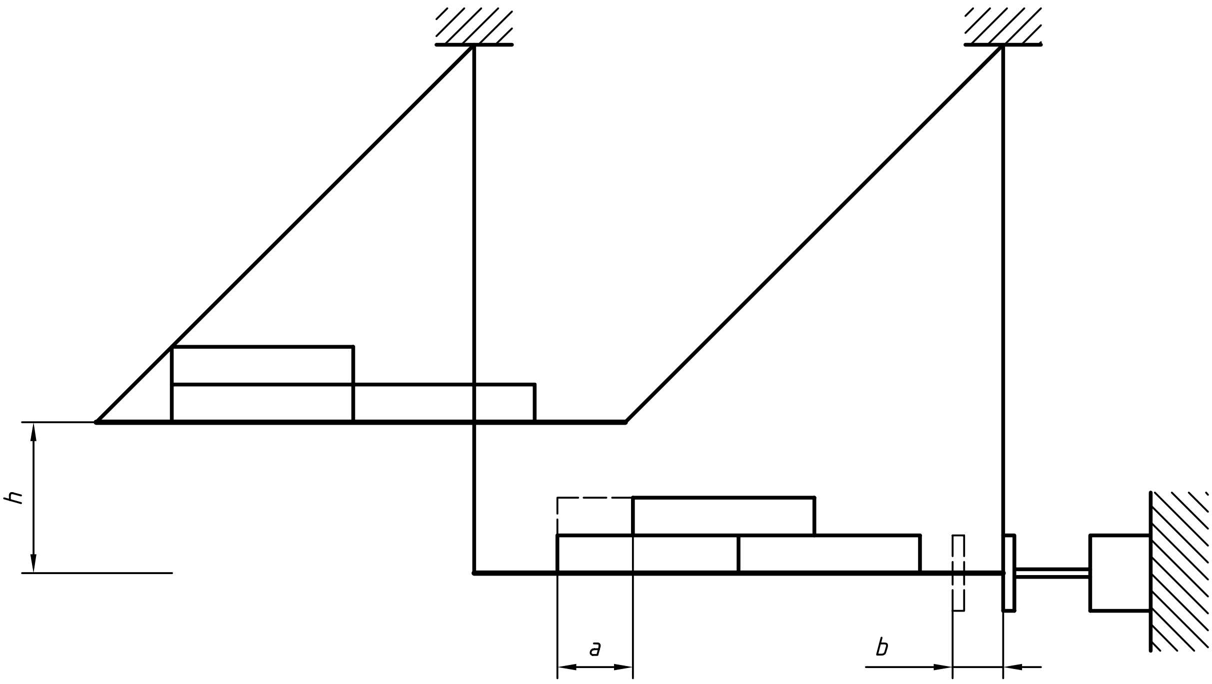

Figure 2 — Pendulum method

4.3 Tilting plane method (See Figure 3)

4.3.1 Plane surface, hinged so that it can be tilted, with a smooth, incompressible top surface, having a larger width and length than the maximum length of a filled sack and provided with a stopper at the lower end.

4.3.2 Means to indicate the angular displacement of the plane, within 0,5° and means for smoothly increasing the inclination of the plane from the horizontal through an arc of at least 45° at a rate of (1,5 ± 0,5)°/s. The method used to increase the inclination of the plane should not cause any vibration to the plane.

4.3.3 Bench, for mounting the plane on a rigid, vibration-free surface.

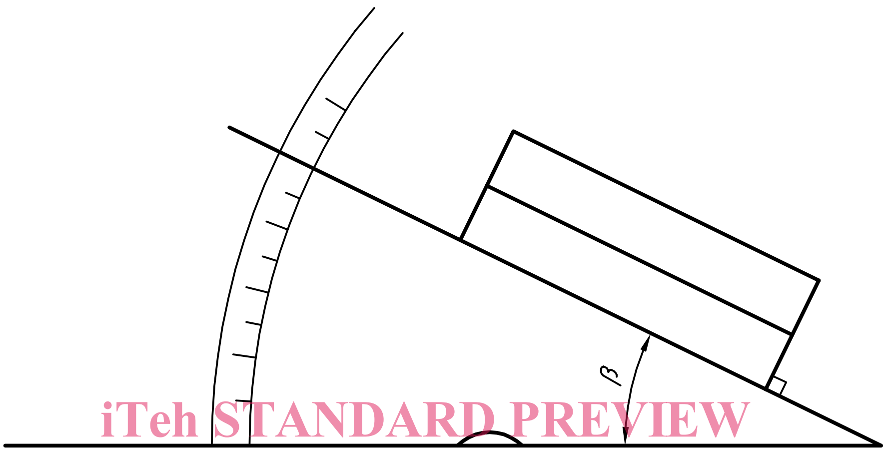

Figure 3 — Tilting plane method

5 Sampling

Carry out the sampling in accordance with ISO 7023.

6 Conditioning

Carry out the test in the same atmospheric conditions as those of the use of the sack. If this is not possible, choose one of the designated conditioning atmospheres from ISO 2233, which is as close as possible to the atmosphere of the use of the sacks.

7 Procedure

7.1 General

Carry out the tests in the same atmosphere as that used for conditioning (see clause 6). If this is not possible, commence the test within 3 min of removing the filled sacks from the conditioning atmosphere.

7.2 Filling

Fill the sack with the intended commodity and use the same filling method as for which the sack is intended. The mass of the filled sacks shall be within ± 0,2 % of its intended mass. Close the sack in the intended way.

7.3 Determination

7.3.1 Inclined plane method

Load the test specimen onto the running carriage in such a way that the test specimen is 2 cm to 5 cm from the front edge of the running carriage and the running carriage hits the impact panel first. If a pallet is used, strongly secure the pallet to the running carriage. If the sacks are placed directly onto the running carriage, place several double-sided adhesive strips of tape on the surface of the running carriage.

Choose a starting position of the running carriage so that the arrangement of the stacked sack does not change until impact.

Release the running carriage so that, loaded with the specimen, it runs downwards due to gravity only. Ensure that the arrangement of the stacked sacks remains undisturbed until impact with the panel.

If a running test leads to a toppling of parts of the stack without sliding, especially when the sacks are stacked in funnel formation or transversal to the inclined plane, rebuild the stack.

Increase the running length of the inclined plane in the smallest possible steps in order to identify the threshold value of the inclined plane at which the cohesion between the sacks is just surpassed.

Measure the friction force (F_f) electronically on the impact surface (see Figure 1).

7.3.2 Pendulum method

Paste two or more filled sacks to the platform. These filled sacks shall be the same as the sack to be tested. Place the sack to be tested on the secured sacks and mark it, in order to be able to measure the movement.

Raise the platform to a chosen height h (see Figure 2) and release it. The platform strikes against the bumper and is stopped without rebounding.

Record the displacement a of the sack and b of the piston of the bumper.

7.3.3 Tilting plane method

Level the plane so that it is horizontal when the inclinometer indicates zero. Place one filled sack on the plane, in the direction to be tested, and attach its end to the stopper. Then place another filled sack on this sack.

Incline the plane with the speed given in 4.3.2. Stop the inclination when the upper sack starts to move.

Record the angle β measured in degrees to the nearest 0,5°.

Repeat this procedure at least three times for every combination. The average angle of every combination is used for further expression.

8 Calculation

8.1 Inclined plane method

The friction coefficient (μ_i) is:

$$\mu_i = F_f/(m \cdot g \cdot \cos\alpha)$$

where

F_f is the measured friction force;

m is the mass of the running carriage and the load;

g is the acceleration due to gravity;

α is the angle of inclined plane to the horizontal; i.e. $(10 \pm 1)°$ in accordance with ISO 2244.

NOTE $m \cdot g \cdot \cos\alpha$ represents the normal force F_n.

8.2 Pendulum method

The friction coefficient (μ_p) is:

$$\mu_p = h/(a+b)$$

where

h is the initial height of the pendulum;

a is the displacement of the sack;

b is the displacement of the piston of the bumper.

NOTE This method is based on the principle of dissipation of energy when a moving platform with an object placed on it suddenly stops, obstructed by a hydraulic damper, and when the kinetic energy forces the sacks to move.

8.3 Tilting plane method

The friction coefficient (μ_t) is:

$$\mu_t = \tan \beta$$

where β is the average angle for a given combination for which the upper sack starts to move.

9 Test report

The test report shall include the following information:

a) a reference to this International Standard, i.e. ISO 15119;

b) the date and place of testing;

c) the full details of size, construction and type of the sacks to be tested, together with all the information which may influence the friction, such as the material of the outer ply, printing, mass of the filled sack and the filling commodity;

d) the atmospheric conditions;

e) the test method used and the friction coefficient;

f) as applicable:

— for the inclined plane method: the type of stacking;

— for the pendulum method and tilting plane method: the position of the moving sack relative to the fixed sacks;

g) the purpose of the test (design, stacking method, printing surface, type of ink, etc.).