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Žito - Določanje prostorninske mase, imenovane “hektolitrska masa” (Referenčna metoda)

Cereals -- Determination of bulk density, called "mass per hectolitre" (Reference method)

Céréales -- Détermination de la masse volumique, dite "masse à l'hectolitre" (Méthode de référence)

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International Standard 7971

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Cereals — Determination of bulk density, called "mass per hectolitre" (Reference method)

Céréales — Détermination de la masse volumique, dite «masse à l'hectolitre» (Méthode de référence)

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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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7971 was prepared by Technical Committee ISO/TC 34, *Agricultural food products*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Cereals — Determination of bulk density, called "mass per hectolitre" (Reference method)

1 Scope and field of application

This International Standard specifies the reference method for the determination of the bulk density, called "mass per hectolitre", of cereals.

2 Reference

ISO 950, *Cereals — Sampling (as grain).*

3 Definition

mass per hectolitre: Ratio of the mass of a cereal to the volume it occupies after being freely poured into a container under well-defined conditions.

It is expressed in kilograms per hectolitre.

4 Principle

Pouring a sample through a hopper into a 20 litre container and weighing.

5 Apparatus

The apparatus used shall comply with the following requirements, which correspond to those in OIML Recommendation No. 15, and shall be similar to that shown in the figure.

5.1 Description and operation

5.1.1 Prefilling measure

The prefilling measure has a capacity of 24 litres. Its internal form is a right circular cylinder of height approximately equal to its diameter.

5.1.2 Filling hopper

The hopper has the shape of a truncated vertical circular cone surmounted by a cylindrical rim; its lower part terminates in an axial tube with a slightly tapering bore, the wider end of which is at the bottom. A shutter, hinge-mounted on the tube and able to close the tube completely, controls the emptying process.

The hopper receives from the prefilling measure a quantity of grain greater than the capacity of the measuring container.

5.1.3 Distributor

The distributor is an inverted circular mushroom-shaped element connected to the bottom end of a vertical rod positioned in the axis of the hopper.

The rod lowers the distributor inside the tapered tube to an adjustable level from top to bottom to allow adjustment of the apparatus: lowering the distributor increases the rate of flow of the grain, which collects in greater quantity owing to compaction in the measuring container, thus giving higher results; conversely, the results are lower when the distributor is raised.

5.1.4 Measuring container

The measuring container has a capacity of 20 litres. Its internal form is a right circular cylinder of height approximately equal to its diameter. Its upper edge is ground flat.

5.1.5 Base support for the measuring container

A base on rails supports the container and allows it to travel underneath the hopper, in the axis of which it can be locked, or to be taken out of the chassis for easy removal.

5.1.6 Protection and guiding collar for grain flow

A cylindrical collar, of the same diameter as the measuring container, is placed between the hopper and the measuring container, leaving a horizontal space between its lower edge and the upper edge of the container to allow the passage of a straightedge.

During filling, the collar, which is surmounted by a truncated cone-shaped section, protects the grain as it drops and at the end retains the surplus grain.

5.1.7 Straightedge (levelling blade)

The straightedge is a flat, thin but rigid steel blade, sharpened to the form of an open V at the front. It is fixed horizontally in a frame mounted on rollers and driven in its plane by a counterweight.

The frame guides the straightedge across the grain in the gap between the collar and the upper edge of the measuring container. The movement shall be continuous and not jerky, and the straightedge shall touch neither the collar nor the container.

In its movement, the straightedge levels the grain to the level of the measuring container, thus giving a determined volume.

5.1.8 Collecting box for surplus grain

At the same time as levelling the grain, the straightedge also closes off the lower surface of the collar as it removes from the container the grain surplus to its capacity.

When the straightedge is drawn back, with the container removed, this surplus grain falls into a collecting box placed beneath the base of the container and towards which the grain is guided by a skirt.

5.1.9 Overall assembly

The apparatus is assembled in a rigid chassis equipped with a verticality adjustment screw; verticality is checked by means of a plumb-line or a spirit-level.

The hopper with its tube and distributor, the collar, and the measuring container shall be coaxial and positioned vertically by means of the adjustment device described above, the upper edge of the measuring container thus being horizontal.

5.1.10 Weighing device

The grain contained in the measuring container is weighed using an equal-beam balance which has been weighted to compensate for the mass of the empty container; therefore, one single weighing gives the mass of the grain.

5.2 Dimensions

The dimensions of the different parts of the apparatus shall be strictly as given below.

5.2.1 Prefilling measure

Volume to top:	24 ± 0,1 litres
Internal diameter:	300 ± 10 mm
Internal height: (approximately 340 mm) adjusted to obtain the specified volume.	

5.2.2 Filling hopper

Top rim

internal diameter:	390 ± 1 mm
height:	120 ± 2 mm

Truncated-cone body

upper internal diameter:	390 ± 1 mm
lower internal diameter:	84,5 ± 0,2 mm
height:	240 ± 1 mm

Emptying tube

top internal diameter:	84,5 ± 0,2 mm
bottom internal diameter:	86,5 ± 0,2 mm
length:	80 ± 0,5 mm

5.2.3 Distributor

Diameter of the rod:	11 ± 0,2 mm

Mushroom-shaped element

diameter:	33 ± 0,2 mm
head thickness:	5 ± 0,2 mm
connecting radius to the rod:	16 ± 0,5 mm

Distance from bottom surface of mushroom to bottom end of emptying tube:	14 ± 0,5 mm*

5.2.4 Measuring container

Volume to ground top:	20 ± 0,01 litres
Internal diameter:	295 ± 1 mm
Internal height: (approximately 292 mm) adjusted to obtain the specified volume.	

5.2.5 Base support for measuring container

Distance between bottom of inside of container and bottom end of emptying tube:	500 ± 2 mm
Distance between top of container and lower surface of straightedge:	0,5 ± 0,2 mm

5.2.6 Protection and guiding collar for grain flow

Internal diameter:	295 ± 1 mm
Height:	78 ± 2 mm
Distance between lower edge of collar and upper surface of straightedge:	0,5 ± 0,2 mm

5.2.7 Straightedge (levelling blade)

Thickness of blade:	3 ± 0,2 mm
Mass of driving counterweight:	5 ± 0,1 kg

5.2.8 Chassis

Plumb-line for checking verticality, of length at least 500 mm (or spirit-level of the same sensitivity).

* For instruments which are not compared with the international standard apparatus (see definition in OIML Recommendation No. 15), this distance is fixed definitively during construction to ± 0,5 mm. For instruments which have been compared with the international standard apparatus, this distance is fixed during the comparison.

5.3 Calibration and adjustment

5.3.1 Calibration

Calibration of the apparatus (I) is carried out by comparison with a national or international standard apparatus* (E).

It is carried out on a cereal free from impurities at the same temperature and in the same condition of humidity as the atmosphere of the room where the measurement is to be made. For this purpose, spread the cereal in a thin layer and leave it for 10 h (one night) in the room where the measurement is to be made, ensuring that the relative humidity of the air does not exceed 60 %.

Carry out six measurements with each apparatus, using the same sample of 24 litres of grain, in the following order (before each new measurement, the grain contained in the measuring container should be intimately mixed with the grain that has fallen into the collecting box during the previous measurement):

Measurement No.	1	2	3	4	5	6
Order of measurements	E-I	I-E	E-I	I-E	E-I	I-E

5.3.2 Accuracy error

The accuracy error of the apparatus is the difference between the arithmetic mean of the six measurements using apparatus I and the arithmetic mean of the six measurements using apparatus E.

The maximum permissible accuracy error is ± 10 g.

5.3.3 Adjustment

If the maximum permissible error specified in 5.3.2 is exceeded, the apparatus shall be adjusted by changing the height of the distributor (5.1.3). In this case, repeat the test described in 5.3.1.

6 Sampling

See ISO 950.

7 Procedure

7.1 Preliminary operations

Place the measuring container (5.1.4) in its filling position and lock it in place so that its axis coincides with that of the guiding collar (5.1.6) and the filling hopper (5.1.2). Bring the straightedge (5.1.7) to its starting position and lock it in place. Close the shutter of the emptying tube. Check the verticality of the chassis and, if necessary, adjust it with the regulating screw so that the upper edge of the measuring container is horizontal during filling.

7.2 Determination

Fill the prefilling measure (5.1.1) to the top with the cereal, without compacting the grain, and pour the contents of the measure into the filling hopper (5.1.2) with the shutter in place. Open the shutter and let all the grain flow into the measuring container (5.1.4) and the protection and guiding collar (5.1.6). When the hopper is empty, release the retaining screw of the straightedge (5.1.7). As soon as the straightedge has reached its final position, unlock the measuring container, remove it from its rolling base and weigh its contents to the nearest 5 g using the weighing device (5.1.10).

Return the straightedge to its starting position and lock it in place, allowing the surplus grain to pass from the protection and guiding collar into the collecting box (5.1.8).

8 Expression of results

The mass per hectolitre, expressed in kilograms per hectolitre, is equal to

$$\frac{m}{0{,}2} = 5\,m$$

where m is the mass, in kilograms, of cereal contained in the 20 litre measuring container.

Express the result to two decimal places.

9 Test report

The test report shall show the method used and the results obtained. It shall also mention any operating conditions not specified in this International Standard or regarded as optional, together with any incidents likely to have affected the results.

The test report shall give all the information necessary for the complete identification of the sample.

* See definition in OIML Recommendation No. 15.

Dimensions in millimetres