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**Žito in proizvodi iz žita - Skupna pšenica (*Triticum aestivum* L.) - Določevanje lastnosti testa iz običajnih komercialnih ali preskusnih mok z alveografom ob stalni hidraciji in s preskusnim postopkom mletja (ISO/DIS 27971:2014)**

Cereals and cereal products - Common wheat (*Triticum aestivum* L.) - Determination of alveograph properties of dough at constant hydration from commercial or test flours and test milling methodology (ISO/DIS 27971:2014)

Getreide und Getreideerzeugnisse - Weizen (*Triticum aestivum* L.) - Bestimmung der Eigenschaften von Teig bei konstanter Flüssigkeitszufuhr zu handelsüblichen Mehlen oder Versuchsmehlen bei gleichen Versuchsmahlverfahren mittels Alveograph (ISO/DIS 27971:2014)

Céréales et produits céréaliers - Blé tendre (*Triticum aestivum* L.) - Détermination des propriétés alvéographiques d'une pâte à hydratation constante de farine industrielle ou d'essai et méthodologie pour la mouture d'essai (ISO/DIS 27971:2014)

**Ta slovenski standard je istoveten z: prEN ISO 27971**

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67.060      Žita, stročnice in proizvodi iz njih      Cereals, pulses and derived products

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**en**



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### Cereals and cereal products — Common wheat (*Triticum aestivum* L.) — Determination of alveograph properties of dough at constant hydration from commercial or test flours and test milling methodology

*Céréales et produits céréaliers — Blé tendre (Triticum aestivum L.) — Détermination des propriétés alvéographiques d'une pâte à hydratation constante de farine industrielle ou d'essai et méthodologie pour la mouture d'essai*

[Revision of first edition (ISO 27971:2008)]

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#### ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.



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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 27971 was prepared by Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 4, *cereals and pulse*.

This second edition cancels and replaces the first edition, which has been technically revised.

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## Introduction

The end-use value of wheat is determined by a number of properties that are useful in the manufacture of baked products such as bread, rusks, and biscuits.

Such properties include the important viscoelastic (rheological) properties of dough formed as a result of flour hydration and kneading. An alveograph is used to study the main parameters by subjecting a dough test piece to biaxial extension (producing a dough bubble) by inflating it with air, which is similar to the deformation to which it is subjected during panary fermentation.

Recording the pressure generated inside the bubble throughout the deformation of the dough test piece until it ruptures provides information on:

- the resistance of the dough to deformation, or its strength. It is expressed by the maximum pressure parameter,  $P$ ;
- the extensibility or the possibility of inflating the dough to form a bubble; It is expressed by the parameters of extensibility,  $L$ , or swelling,  $G$ ;
- the elasticity of the dough during biaxial extension. It is expressed by the elasticity index,  $I_e$ ;
- the work required to deform the dough bubble until it ruptures, which is proportional to the area of the alveogram (sum of the pressures throughout the deformation process). It is expressed by the parameter,  $W$ .

The  $P/L$  ratio is a measurement of the balance between strength and extensibility.

Alveographs are commonly used throughout the wheat and flour industry, for the following purposes:

- selecting and assessing different varieties of wheat and marketing batches of wheat;
- blending different batches of wheat or flour to produce a batch with given values for the alveographic criteria ( $W$ ,  $P$  and  $L$ ) complying with the proportional laws of blending.

Alveographs are used both on the upstream side of the industry for marketing, selecting and assessing the different wheat varieties and on the downstream side throughout the baking industries (see Bibliography).



# Cereals and cereal products — Common wheat (*Triticum aestivum* L.) — Determination of alveograph properties of dough at constant hydration from commercial or test flours and test milling methodology

## 1 Scope

This International Standard specifies a method of determining, using an alveograph, the rheological properties of different types of dough obtained from "soft" to "hard" wheat flour (*Triticum aestivum* L.) produced by industrial milling or laboratory milling.

It describes the alveograph test and how to use a laboratory mill to produce flour in two stages:

- stage 1: preparation of the wheat grain for milling to make it easier to separate the bran from the endosperm (see Clause 7);
- stage 2: the milling process, including breaking between three fluted rollers, reduction of particle size between two smooth rollers and the use of a centrifugal sieving machine to grade the products (see Clause 8).

## 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 385, *Laboratory glassware — Burettes*.

ISO 660, *Animal and vegetable fats and oils — Determination of acid value and acidity*.

ISO 712, *Cereals and cereal products — Determination of moisture content - Reference method*.

ISO 835, *Laboratory glassware — Graduated pipettes*.

ISO 1042, *Laboratory glassware — One-mark volumetric flasks*.

ISO 7700-1, *Checking the performance of moisture meters in use — Part 1: Moisture meters for cereals*.

## 3 Principle

The behaviour of dough obtained from a mixture of different types of flour and salt water is evaluated during deformation. A dough disk is subjected to a constant air flow; at first it withstands the pressure. Subsequently, it inflates into a bubble, according to its extensibility, and ruptures. The change in the dough is measured and recorded in the form of a curve called an alveogram.

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### 4 Reagents

Unless otherwise specified, use only reagents of recognized analytical grade, and only distilled or demineralized water or water of equivalent purity.

**4.1 Sodium chloride solution**, obtained by dissolving  $(25 \pm 0,2)$  g of sodium chloride (NaCl) in water and then making the volume up to 1 000 ml. This solution shall not be stored for more than 15 days and its temperature shall be  $(20 \pm 2)$  °C when used.

**4.2 Refined vegetable oil**, low in polyunsaturates, such as peanut oil. It is possible to use olive oil if its acid value is less than 0,4 (determined according to ISO 660). Store in a dark place in a closed container and replace regularly (at least every 3 months).

Alternatively, **liquid paraffin** (also known as "soft petroleum paraffin"), with an acid value less than or equal to 0,05 and the lowest possible viscosity [maximum 60 mPa·s (60 cP) at 20 °C].

**4.3 Cold degreasing agent**, optimum safety<sup>1)</sup>.

### 5 Apparatus

Usual laboratory apparatus, and in particular the following.

**5.1 Mechanical cleaner**, fitted with sieves for wheat cleaning, in accordance with the manufacturer's instructions.

**5.2 Conical or riffle sample divider**.

**5.3 Analytical balance**, accurate to 0,01 g.

**5.4 Glass burette**, 50 ml capacity, graduated in 0,1 ml divisions, complying with the requirements of ISO 385, Class A, stand-mounted.

**5.5 Rotary blender**<sup>2)</sup> for grain conditioning and flour homogenization, including the following components:

**5.5.1 Constant speed stirrer**.

**5.5.2 Two worm screws** integral with the flask, possibly via the stopper (one for wheat preparation, the other for flour homogenization).

**5.5.3 Several wide-necked plastic flasks**, 2 l capacity.

**5.6 Test mill**<sup>3)</sup> (laboratory mill), manually or automatically operated (see Annex A).

**5.7 Complete alveograph system** (see Table 1 for specifications and characteristics of the accessories) including the following devices:

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1) ITECMA "Securclean ER" is an example of a suitable product available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of this product.

2) The Chopin MR 2 l rotary blender is an example of a suitable product available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of this product.

3) The Chopin-Dubois CD1 test mill is an example of a suitable product available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of this product.

**5.7.1 Kneading machine** [for models MA 82, MA 87 and MA 95, see Figure 1 a); for model NG, see label a in Figure 2 and Figure 3], with accurate temperature control, for dough sample preparation.

**5.7.2 Hydraulic manometer or Alveolink<sup>4)</sup>** [for models MA 82, MA 87 and MA 95, see Figure 1 b); for model NG, see label b in Figure 2 and Figure 3] for recording the pressure curve.

**5.7.3 Alveograph<sup>5)</sup>** [for models MA 82, MA 87 and MA 95, see Figure 1 c); for model NG, see label c in Figures 2 and Figure 3] with accurate temperature control, for biaxial deformation of the dough test pieces. It has two rest chambers, each containing five plates on which the dough test pieces can be arranged prior to deformation.

**5.8 Burette with stopcock**, supplied with the apparatus, 160 ml capacity, graduated in divisions of 0,1 % of moisture content<sup>6)</sup>.

**5.9 Timer**, for use with model MA 82 only.

**5.10 Planimetric scales**, supplied with the apparatus where an Alveolink is not included.

**5.11 System for recording the test environment conditions** (temperature and relative air humidity) as specified in 8.1 and 9.1.

**5.12 Volumetric flask**, 1 000 ml capacity, complying with the requirements of ISO 1042, class A.

**5.13 Pipette**, 25 ml capacity, graduated in divisions of 0,1 ml, complying with the requirements of ISO 835, class A.

## 6 Sampling

A representative wheat or flour sample should have been sent to the laboratory. It shall not have been damaged or changed during transport or storage.

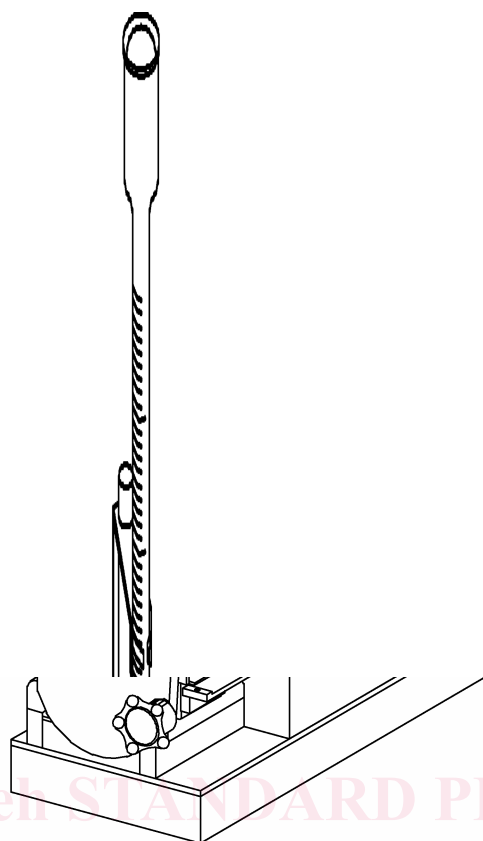
Sampling is not part of the method specified in this International Standard. Recommended sampling methods are given in ISO 24333 [1].

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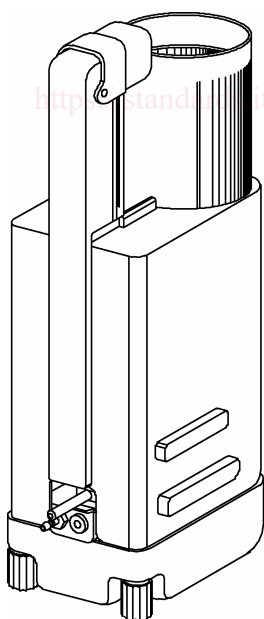
4) Alveolink is an example of a suitable product available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of this product.

5) The methods specified in this International Standard are based on the use of the MA 82, MA 87, MA 95 and NG models of Chopin alveograph.

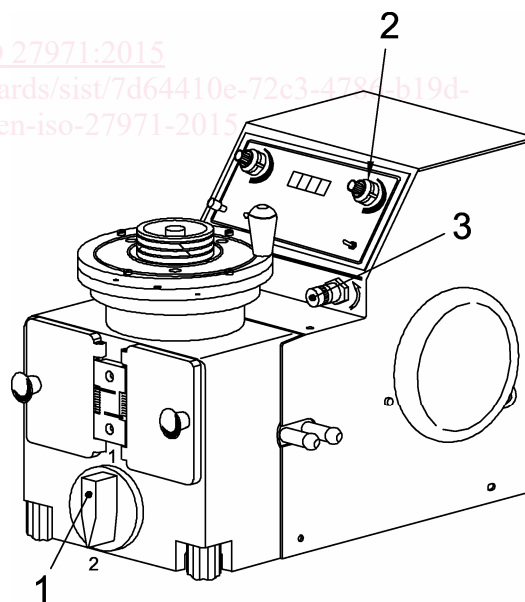
6) Throughout this International Standard, "content" is to be understood as a "mass fraction" (see EN ISO 80000-9[6], 12), i.e. the ratio of the mass of substance in a mixture to the total mass of the mixture.



a) Kneading machine



b) Manometer

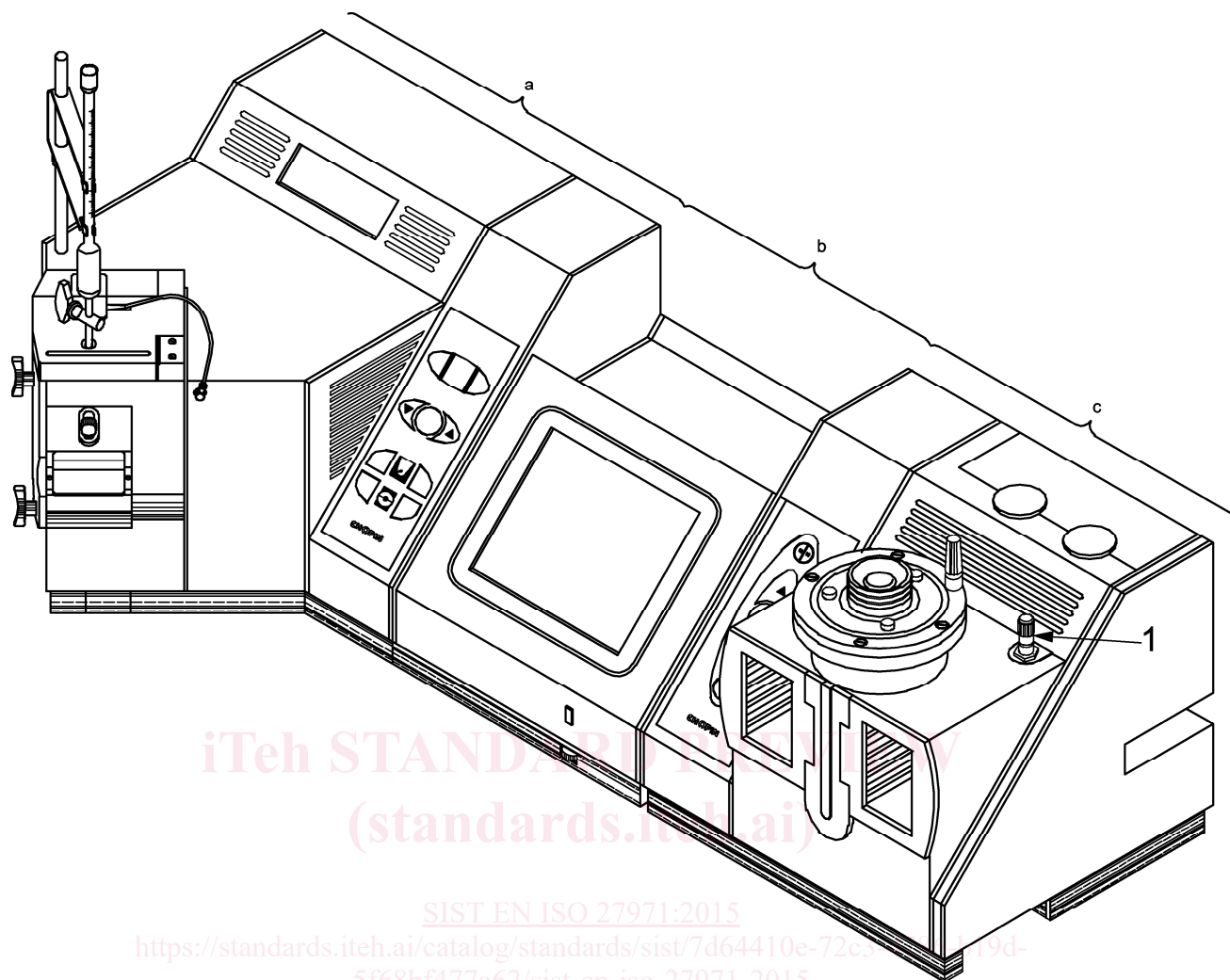


c) Alveograph

**Key**

- 1 handle A in position 2
- 2 pump potentiometer
- 3 micrometric valve for air flow adjustment

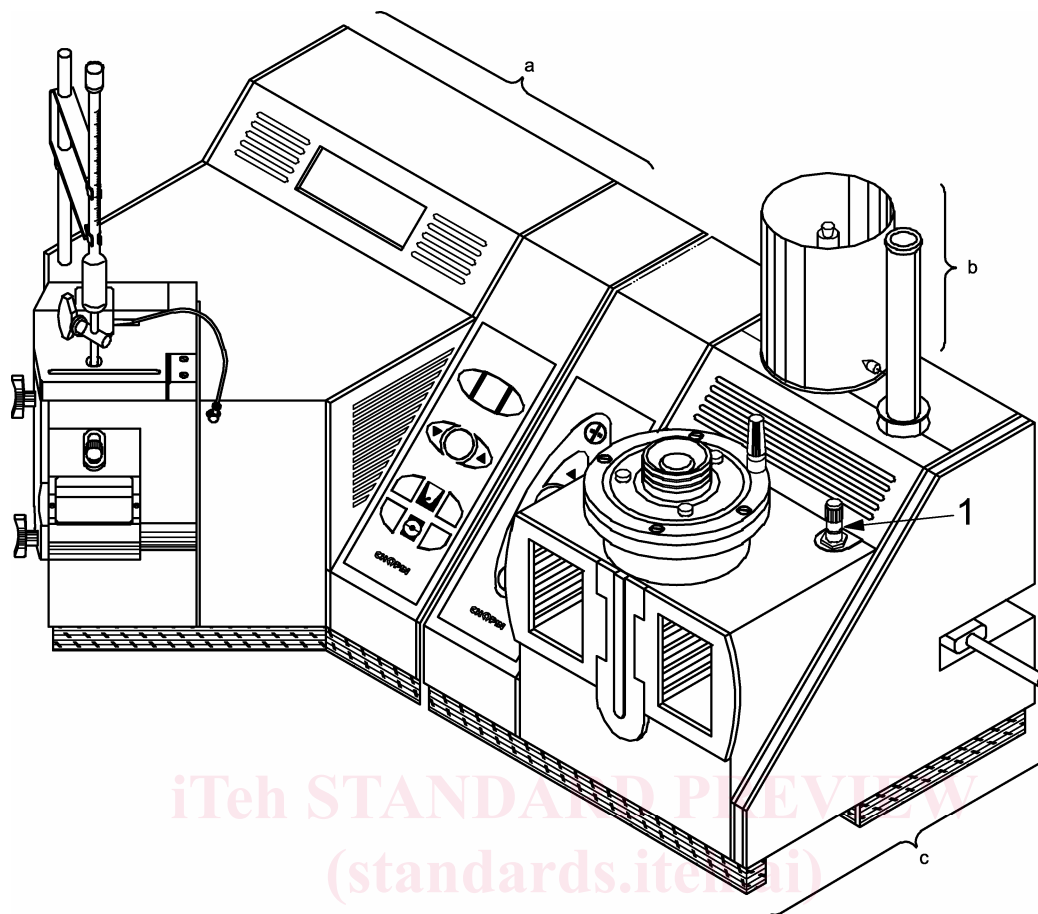
**Figure 1 — Model MA 82, MA 87 and MA 95 alveograph assemblies**



### Key

- 1 micrometric valve for air flow adjustment
- a NG kneading machine.
- b NG integrator-recorder.
- c NG alveograph (with NG integrator-recorder).

**Figure 2 — NG alveograph assembly with Alveolink integrator-recorder**

**Key**

- 1 micrometric valve for air flow adjustment  
 a NG kneading machine.  
 b NG recording manometer.  
 c NG alveograph (with hydraulic recording manometer).

**Figure 3 — NG alveograph assembly with hydraulic recording manometer**

**Table 1 — Specifications and characteristics of the accessories required for the test**

Quantity	Value and tolerance
Rotational frequency of the kneading machine blade	(60 ± 2) Hz
Height of sheeting guides	(12,0 ± 0,1) mm
Large diameter of the sheeting roller	(40,0 ± 0,1) mm
Small diameter of the sheeting roller	(33,3 ± 0,1) mm
Inside diameter of the dough cutter	(46,0 ± 0,5) mm
Diameter of the aperture created when the moving plate opens (which determines the effective diameter of the test piece)	(55,0 ± 0,1) mm
Theoretical distance between the fixed and moving plates after clamping (equal to the thickness of the test piece before inflation)	(2,67 ± 0,01) mm
Volume of air automatically injected to detach the test piece prior to inflating the bubble <sup>a</sup>	(18 ± 2) ml
Linear speed of the periphery of the recording drum	(5,5 ± 0,1) mm/s
Air flow <sup>b</sup> ensuring inflation	(96 ± 2) l/h
Rotation time of the manometer drum (from stop to stop)	(55 ± 1) s

<sup>a</sup> Some older devices are fitted with a pear-shaped rubber bulb for manual injection of the 18 ml required to detach the test piece.

<sup>b</sup> To adjust the flow rate of the air generator used to inflate the bubble, fit the nozzle (Figure 4) to create a specified pressure drop (and obtain a pressure corresponding to a height of 92 mmHg (12,3 kPa) on the manometer chart). The air flow rate is set with the standardized pressure drop to obtain a pressure corresponding to a height of 60 mmHg (8,0 kPa) on the manometer chart, i.e. (96 ± 2) l/h (see Figure 4 and Figure 5).

## 7 Preparation of the wheat for laboratory milling

### 7.1 Cleaning the laboratory sample

Pass the laboratory sample through a mechanical cleaner (5.1) to ensure that all stones and metal fragments are removed and to avoid damaging the rollers during milling. A magnetic device may also be used to remove ferrous metal fragments.

### 7.2 Test portion

The test portion shall be representative of the initial wheat mass. Use the sample divider (5.2) to homogenize and divide the laboratory sample until the mass required for laboratory milling plus moisture content determination is obtained. The minimum wheat mass of the test portion for milling shall be 800 g.

### 7.3 Wheat moisture content determination

Determine the moisture content of the test portion as specified in ISO 712, or using a rapid device the measurement of which does not differ from the reference value by ± 0,4 g water per 100 g of sample (see ISO 7700-1).