SLOVENSKI STANDARD
oSIST prEN ISO 27971:2022

01-april-2022

Žito in proizvodi iz žita - Navadna pšenica (Triticum aestivum L.) - Določevanje lastnosti testa iz običajnih komercialnih ali preskusnih mok z alveografom ob stalnem dodajanju vode in s preskusom postopka mletja (ISO/DIS 27971:2022)

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 27971:2022)

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 27971:2022)

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 27971:2022)

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ICS:

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

oSIST prEN ISO 27971:2022 **en,fr,de**

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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

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 34, *Food products*, Subcommittee SC 4, *Cereals and pulse*.

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 bread dough fermentation.

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

a) the resistance of the dough to deformation, or its stiffness. It is expressed by the maximum pressure parameter, *P*;

b) 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*;

c) the elasticity of the dough during biaxial extension. It is expressed by the elasticity index, I_e;

d) the work required to deform the dough bubble until it ruptures, ot its strength, 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 stiffness 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

Type text.

This International Standard specifies a method of determining, using an Alveograph, the rheological properties of different types of dough obtained from common 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;

— 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.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 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*

NF EN 15948, *Cereals — Determination of moisture and protein — Method using Near-Infrared-Spectroscopy in whole kernels*

ISO 7700-1:2008, *Food products — Checking the performance of moisture meters in use — Part 1: Moisture meters for cereals*

NF EN ISO 12099, *Animal feeding stuffs, cereals and milled cereal products — Guidelines for the application of near infrared spectrometry*

3 Principle

The behaviour of dough obtained from a mixture of flour and salt water is evaluated during deformation. A dough disk (patty) 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.

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 ± 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 ± 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 three months).

Alternatively, **liquid paraffin** (also known as "soft petroleum paraffin"), with an acid value of 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.

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, of 50 ml in capacity, graduated in 1 ml divisions.

5.5 Rotary blender[1], 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 (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:

5.7.1 Kneading machine [see Figure 1 for Alveo NG and Alveo PC models; for model Alveolab, see Figure 2], with accurate temperature control, for dough sample preparation.

5.7.2 Dedicated software on to record the pressure curve as a function of time, perform the calculations and store the tests or other registration systems such as the Alveolink[2]

[1] 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.

[2] For the details concerning the use of the different registration systems please refer to the manufacturer's instructions.

5.7.3 Alveograph[3] for measuring the biaxial deformation of the dough test pieces.]. [for models Alveo NG and Alveo PC, see Figure 1; for model Alveolab, see Figure 2; Including accurate temperature control and hygrometry control for the AlveoLab mode., It has two rest chambers (Three for the Alveolab), each containing five plates on which the dough test pieces can be arranged for resting prior to deformation.

5.8 Burette with stopcock, supplied with the apparatus (only for models NG and PC), 160 ml capacity, graduated in divisions of 0,1 % of moisture content.

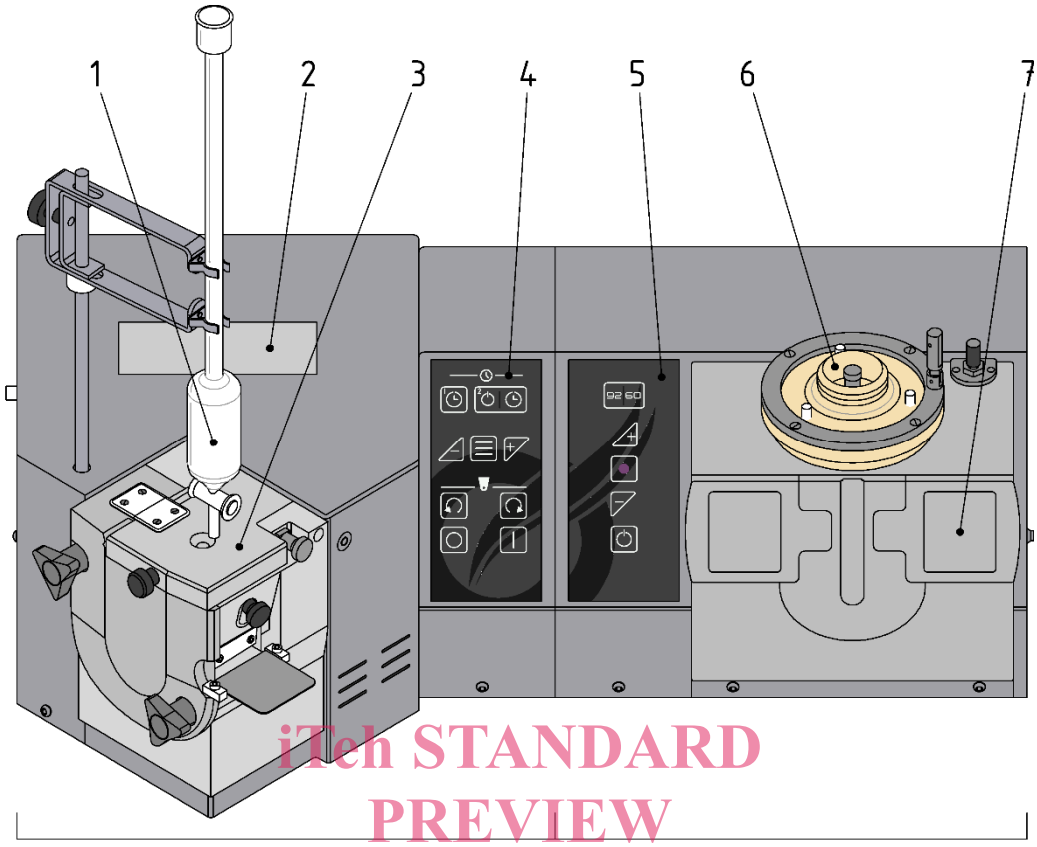
NOTE Throughout this International Standard, "content" is expressed as a "mass fraction" (see ISO 80000-9, 12[6]), i.e. the ratio of the mass of substance in a mixture to the total mass of the mixture.

5.9 Thermohydrograph for recording the test environment conditions (temperature and relative air humidity) as specified in 8.1 and 9.1. In the case of the Alveolab, the test conditions (temperature and humidity) around the swelling bubble are automatically checked and controlled by the device.

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

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

3 The methods specified in this International Standard are based on the use of the NG, PC and Alveolab models of Chopin alveograph which are examples of suitable products commercially available. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of this product.



Key

A Mixer
B Alveograph
1 Burette for adding water
2 Mixer screen
3 Mixing bowl
4 Mixer control panel
5 Alveograph control panel
6 Test plate of the Alveograph unit
7 Resting chamber

Figure 1 — Mixer and Alveograph part of models Alveo NG and Alveo PC

Key

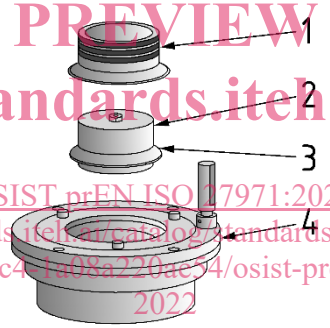
1 Mixing bowl
2 Water injection nozzle
3 Aveolab control panel
4 Alveograph test chamber
5 Storage compartment for accessories
6 Dough collector and humidifier
7 Resting chamber
8 Salt water tank

Figure 2 — Mixer and alveograph part of the Alveolab Model

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

Quantity	Value and tolerance
Rotational frequency of the kneading 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	(18 ± 2) ml
Air flow[a] ensuring inflation	(96 ± 2) l/h

[a] On models Alveo Ng and Alveo PC, 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 mmH_2O(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 mm H_2O(8,0 kPa) on the manometer chart, i.e.(96 ± 2) l/h (see Figure 4a, 4b and 4c). For Models Alveolab this control is automatized, no particular action is required.



Key

1 Knurled ring
2 Nozzle
3 Nozzle holder
4 Top plate

Figure 3—Flow control system (For models Alveo NG or Alveo PC)

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.

7 Preparation of the wheat for laboratory milling.

7.1 Cleaning the laboratory sample

If necessary, 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 or ISO 15948).

7.4 Wheat preparation

7.4.1 General

Preparing the wheat for milling makes it easier to separate the bran from the endosperm. The target moisture content is (16,0 ± 0,5) %.

7.4.2 Wheat with initial moisture content between 13 % and 15 % (one-stage moistening)

Using the balance (5.3), weigh a test portion (minimum 800 g) to the nearest 1 g of wheat and pour it into the blender.

Add the required amount of water (see Table B.1) to the grain from the burette (5.4) directly, or after weighing it to the nearest 0,5 g.

Immediately after adding the water, insert the stopper fitted with the worm screw provided for use with wheat into the flask, shake vigorously for a few seconds and place on the rotary blender (5.5).

Run the rotary blender for (30 ± 5) min (time required to distribute the water evenly across the surface of the grains).

Allow it to rest for a period that brings the total time of the moistening, shaking and resting operations to (24 ± 1) h.

7.4.3 Wheat with a moisture content less than 13 % (two-stage moistening)

As a larger volume of water is required, divide it into two halves and add in two stages during the preparation period.

Proceed as described in 7.4.2, using only half the total quantity of water required (see Table B.1).

Shake the flask as described in 7.4.2 and allow it to rest for at least 6 h.

