SVENSK STANDARD
SS-EN ISO 27971:2008

Fastställd/Approved: 2008-05-26
Publicerad/Published: 2008-11-03
Utgåva/Edition: 1
Språk/Language: engelska/English
ICS: 67.060

Cereals and cereal products – Common wheat (Triticum aestivum L.) – Determination of alveographic properties of dough at constant hydration from commercial or test flours and test milling methodology (ISO 27971:2008)

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The European Standard EN ISO 27971:2008 has the status of a Swedish Standard. This document contains the official English version of EN ISO 27971:2008.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 27971

May 2008

ICS 67.060

English Version

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 27971:2008)

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 27971:2008)

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 27971:2008)

This European Standard was approved by CEN on 4 February 2008.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN ISO 27971:2008: E

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Foreword

This document (EN ISO 27971:2008) has been prepared by Technical Committee CEN/TC 338 "Cereal and cereal products", the secretariat of which is held by AFNOR, in collaboration with Technical Committee ISO/TC 34 "Agricultural food products".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2008, and conflicting national standards shall be withdrawn at the latest by November 2008.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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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 rupture provides information on:

— the resistance of the dough to deformation, or its strength (stiffness). 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 energy required to deform the dough bubble until it bursts, 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 tenacity 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 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 using an alveograph to determine the rheological properties of different types of dough obtained from “soft” to “hard” wheat flour (*Triticum aestivum* L.) produced by industrial milling or laboratory test 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 itself, including the break system involving 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 — Routine reference method*

ISO 835, *Laboratory glassware — Graduated pipettes*

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

ISO 7700-1, *Check of the calibration of moisture meters — 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; which at first it withstands. Subsequently, it swells 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 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 index 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 index 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[1)].

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 requirements.

5.2 Conical or riffle sample divider.

5.3 Analytical balance, accurate to 0,01 g.

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

5.5 Rotary blender[2)], 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**, of capacity 2 l.

5.6 Test mill[3)] (laboratory mill) manually operated (see Annex A).

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

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

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

5.7.3 Alveograph[5] [for models MA 82, MA 87 and MA 95, see Figure 1 c); for model NG, see labels c in Figures 2 and Figure 3] with accurate temperature control, for test piece biaxial deformation of the dough 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, supplied with the apparatus, of capacity 160 ml, graduated in divisions of 0,1 % of moisture content[6] .

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

5.13 Pipette, of capacity 25 ml, 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 2170[1], ISO 6644[6], and ISO 13690[7].

7 Preparation of the wheat for test 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 can also be used to remove ferrous metal fragments.

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4) 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 ISO 80000-9:—[8], 12), i.e. the ratio of the mass of substance in a mixture to the mass of the mixture.