SLOVENSKI STANDARD
SIST-TS CEN/TS 15731:2009

01-januar-2009

Žito in žitni proizvodi - Skupna pšenica (Triticum aestivum L.) - Ugotavljanje lastnosti testa z alveografom s prilagojeno hidratacijo za javno uporabo ali preskušanje moke in preskušanje po metodologiji valjanja

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

Getreide und Getreideerzeugnisse - Weizen (Triticum aestivum L.) - Bestimmung der Eigenschaften von Teig bei adaptierter Flüssigkeitszufuhr zu handelsüblichen Mehlen oder Versuchsmehlen bei gleichen Versuchsmahlverfahren mittels Alveograph

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

Ta slovenski standard je istoveten z: **CEN/TS 15731:2008**

ICS:

67.060	Ģita, stroļ nice in proizvodi iz njih	Cereals, pulses and derived products

SIST-TS CEN/TS 15731:2009 **en,fr,de**

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CEN/TS 15731

August 2008

ICS 67.060

English Version

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Ref. No. CEN/TS 15731:2008: E

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Foreword

This document (CEN/TS 15731:2008) has been prepared by Technical Committee CEN/TC 338 “Cereals and cereal products”, the secretariat of which is held by AFNOR.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN 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, biscuits, etc.

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) at adapted hydration 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:

— resistance of the dough to deformation, or its strength (stiffness). It is expressed by the maximum pressure parameter "P";

— extensibility or the possibility of inflating the dough to form a bubble. It is expressed by the parameters of extensibility "A" or swelling "Ex";

— elasticity of the dough during biaxial extension. It is expressed by the elasticity index "Iec";

— 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 "Fb".

It is generally accepted that the tenacity "P" and the extensibility "A" shall exceed a minimum level which can be varied, depending on the particular end use to which the flour is to be put. The T/A 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).

1 Scope

This document specifies a method that uses an alveograph to determine the rheological properties of different types of dough at adapted hydration 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 712, *Cereals and cereal products - Determination of moisture content - Routine reference method*

ISO 7700-1, *Check of the calibration of moisture meters -- Part 1: Moisture meters for cereals*

3 Principle

The principle of measurement involves the evaluation, during deformation, of the behaviour of dough obtained from a mixture of different types of flour and salt water. A dough disk is subjected to a constant air flow; at first it withstands the pressure, then 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 recognised analytical quality, and distilled or demineralised water, or water of equivalent purity.

4.1 Sodium chloride solution, obtained by dissolving (25 ± 0,2) g of sodium chloride in distilled water and then making it 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 EN ISO 660). Store in a dark place in a closed container and replace regularly (every 3 months).

Alternatively, **liquid paraffin** (also known as “vaseline oil”), 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

Common laboratory equipment, including 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 50 ml glass burette graduated in 0,1 ml increments, stand-mounted.

5.5 Rotary blender[2)] for grain conditioning and flour homogenisation. It includes the following devices:

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 homogenisation).

5.5.3 Several wide-necked 2-litre plastic flasks.

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 Technical Specification and does not constitute an endorsement by CEN of this this product.

2) The Chopin MR 2-litre rotary mixer is an example of a suitable product available commercially. This information is given for the convenience of users of this Technical Specification and does not constitute an endorsement by CEN of this 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 Technical Specification and does not constitute an endorsement by CEN of this this product.

5.7 Complete alveograph system (the specifications and characteristics for some of the accessories are given in Table 1) and include the following devices:

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

5.7.2 Hydraulic Manometeror Alveolink (See Figure 1 b) for models MA 82, MA 87 and MA 95 and Figures 2 b and 3 b for model NG, for recording the pressure curve.

5.7.3 Alveograph[4] (see Figure 1 c) for models MA 82, MA 87 and MA 95 and Figures 2 c and 3 c)for the NG model, 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, capacity 160 ml, graduated in percentages of 0,1% of moisture content[5].

5.9 Timer[6].

5.10 Set of planimetric scales [7].

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

5.12 Class A 1000 ml volumetric flask (Grade A).

5.13 Pipette (25ml) graduated in 0,1 ml increments.

4) This part of ISO 5530 was based on the CHOPIN alveograph, which is the only device of this type that is currently available. It considers models MA 82, MA 87, MA 95 and the current Alveograph NG model.

5) This burette is supplied with the apparatus.

6) Only for MA82.

7) The set of planimetric scales is supplied with the apparatus where an Alveolink is not included.

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

Rotational frequency of the kneading machine blade in seconds to the power of minus one (s^{-1}) …..	60 ± 2
Height of sheeting guides, in millimetres (mm)………………………………………………………………..	12,0 ± 0,1
Large diameter of the sheeting roller, in millimetres (mm)………………………………………………………..	40,0 ± 0,1
Small diameter of the sheeting roller, in millimetres (mm)………………………………………………………..	33,3 ± 0,1
Inside diameter of the dough cutter, in millimetres (mm)………………………………………………………	46,0 ± 0,5
Diameter of the aperture created when the moving plate opens (which determines the effective diameter of the specimen to be tested), in millimetres (mm) …………………………………………….........	55,0 ± 0,1
Theoretical distance between the fixed and moving plates after clamping (equal to the thickness of the test piece before inflation) in millimetres (mm) …………………………………………………………	2,67 ± 0,01
Volume of air automatically injected to detach the test piece prior to inflating the bubble, in millilitres (ml)[a]……	18 ± 2
Linear speed of the periphery of the recording drum, in millimetres per second (mm/s)……	5,5 ± 0,1
Air flow[b] ensuring inflation in litres per hour (l/h)………………………………………………………………..	96 ± 2
Rotation of the Manometer drum (from stop to stop) (s)………………………………………………	55 ± 1

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

[b] To adjust the flow rate of the air generator used to inflate the bubble, fit the 12C nozzle to create a specified pressure drop (and obtain a pressure corresponding to a height of 92 mm on the Manometer chart). The air flow rate is set with the standardised pressure drop to obtain a pressure corresponding to a height of 60 mm on the Manometer chart, i.e. 96 l/h ± 2 l/h (see Figure 4 and Figure 5).

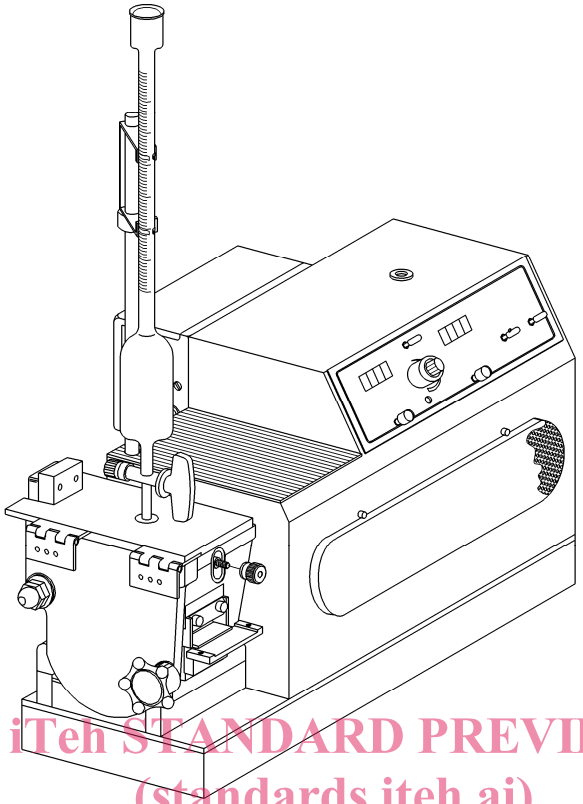


Figure 1 a) — Kneading machine for Alveograph types MA-82, MA 87 and MA 95

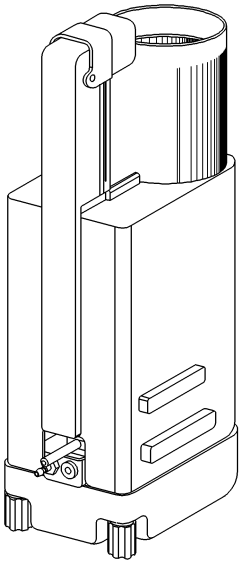
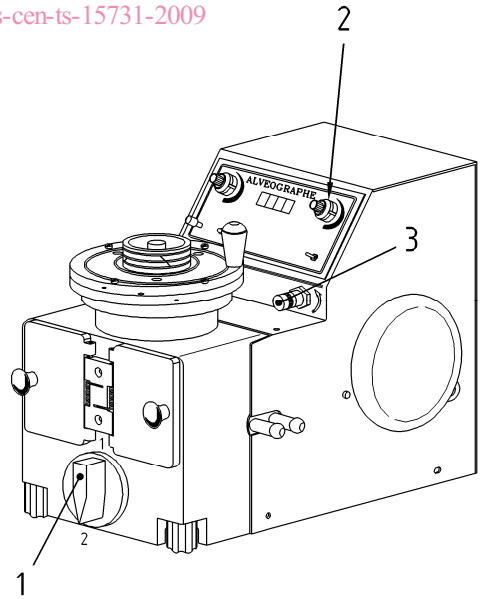


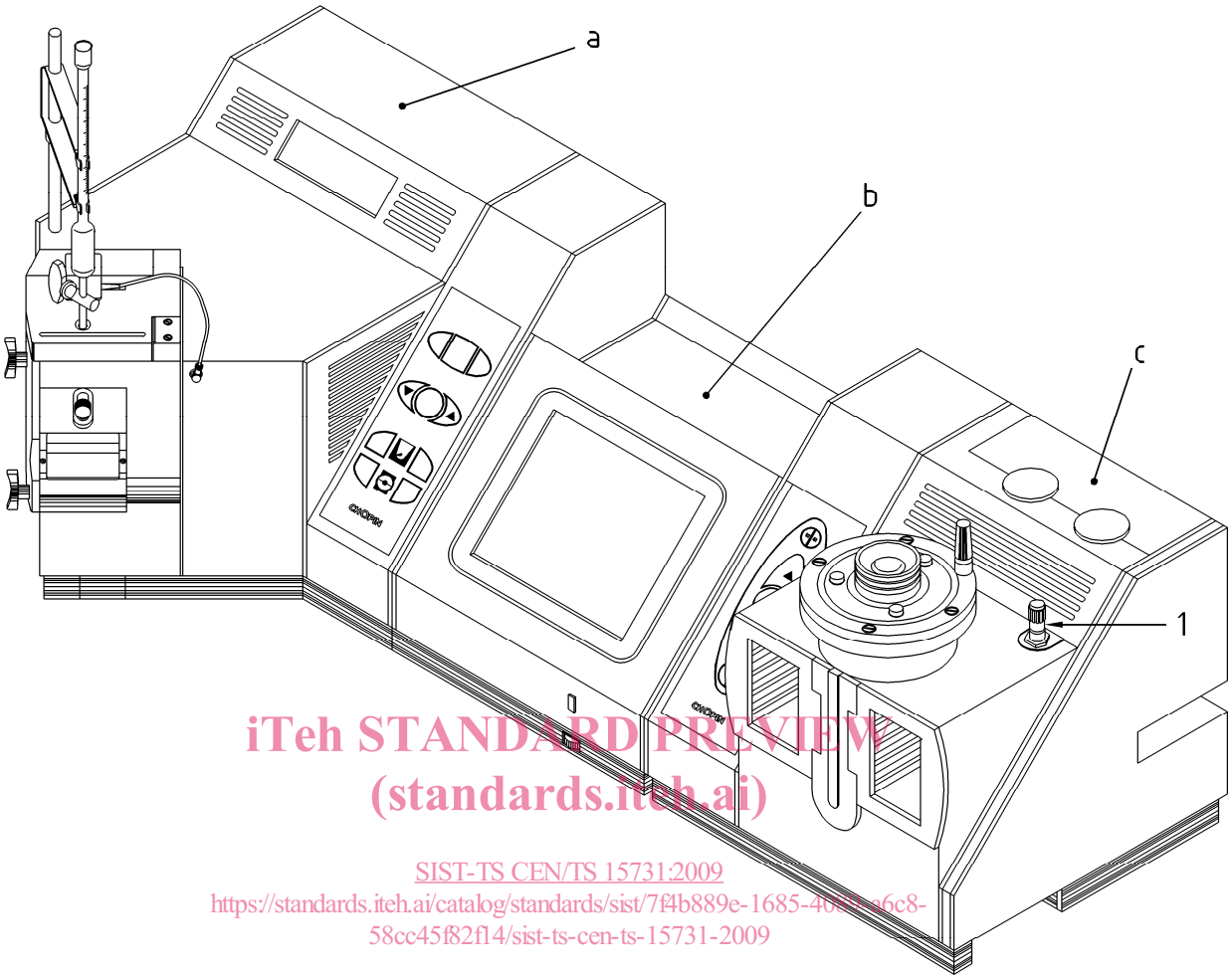
Figure 1 b) — Manometer for Alveographs types MA-82, MA 87 and MA 95



Key

1 Handle A in position 2 2 Pump potentiometer
3 Air flow adjusting micrometric valve

Figure 1 c) — Alveograph type MA-82, MA 87 and MA 95



Key

a NG type kneading machine
b NG type integrator-recorder
c NG type alveograph (with NG type integrator-recorder)
1 Air flow adjusting micrometric valve

Figure 2 — NG type Alveograph assembly with an “Alveolink” integrator-recorder