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Pšenična moka - Fizikalne značilnosti testa - 2. del: Ugotavljanje reoloških lastnosti z ekstenzografom (ISO 5530-2:2025)

Wheat flour - Physical characteristics of doughs - Part 2: Determination of rheological properties using an extensograph (ISO 5530-2:2025)

Weizenmehl - Physikalische Eigenschaften von Teigen - Teil 2: Bestimmung der rheologischen Eigenschaften mittels Extensograph (ISO 5530-2:2025)

Farines de blé tendre - Caractéristiques physiques des pâtes - Partie 2: Détermination des caractéristiques rhéologiques au moyen de l'extensographe (ISO 5530-2:2025)

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Wheat flour - Physical characteristics of doughs - Part 2: Determination of rheological properties using an extensograph (ISO 5530-2:2025)

Farines de blé tendre - Caractéristiques physiques des pâtes - Partie 2: Détermination des caractéristiques rhéologiques au moyen de l'extensographe (ISO 5530-2:2025)

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This European Standard was approved by CEN on 27 September 2021.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN ISO 5530-2:2025) has been prepared by Technical Committee ISO/TC 34 "Food products" in collaboration with Technical Committee CEN/TC 338 “Cereal and cereal products” the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by July 2025, and conflicting national standards shall be withdrawn at the latest by July 2025.

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.

This document supersedes EN ISO 5530-2:2014.

Any feedback and questions on this document should be directed to the users’ national standards body/national committee. A complete listing of these bodies can be found on the CEN website.

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Endorsement notice

The text of ISO 5530-2:2025 has been approved by CEN as EN ISO 5530-2:2025 without any modification.

International Standard

ISO 5530-2

Wheat flour — Physical characteristics of doughs —

Part 2: Determination of rheological properties using an extensograph

Farines de blé tendre — Caractéristiques physiques des pâtes —

Partie 2: Détermination des caractéristiques rhéologiques au moyen de l'extensographe

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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.

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 document 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).

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For an explanation of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 4, *Cereals and pulses*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 338, *Cereal and cereal products,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This fourth edition cancels and replaces the third edition (ISO 5530-2:2012), which has been technically revised.

The main changes are as follows:

— a wheat flour interlaboratory test was performed in 2016 to evaluate the repeatability and reproducibility of the test method specified in this document, and the results have been added as Annex B;

— more detailed procedure for electronic devices has been added.

A list of all parts in the ISO 5530 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Wheat flour — Physical characteristics of doughs —

Part 2: Determination of rheological properties using an extensograph

1 Scope

This document specifies a method using an extensograph for the determination of the rheological properties of wheat flour doughs in an extension test. The recorded load–extension curve is used to assess the general quality of flour and its response to improving agents.

The method is applicable to experimental and commercial flours from wheat (*Triticum aestivum* L.).

NOTE 1 This document is related to ICC 114[5] and AACC Method 54-10[6].

NOTE 2 For dough preparation, a farinograph is used (see 6.2)

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 712-1, *Cereals and cereal products — Determination of moisture content — Part 1: Reference method*

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 5530-1, *Wheat flour — Physical characteristics of doughs — Part 1: Determination of water absorption and rheological properties using a farinograph*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
energy
capacity to do work

Note 1 to entry: For the purposes of this document, energy is determined as the area under a recorded curve. The energy describes the work applied when *stretching* (3.6) a dough sample.

Note 2 to entry: When using a mechanical device, the area is measured by a planimeter and reported in square centimetres. In electronic devices, this area is calculated automatically by the software.

3.2
extensibility
E
distance travelled by the recorder paper from the moment that the hook touches the test piece until rupture of (one of the strings of) the test piece

Note 1 to entry: In electronic devices, this is calculated automatically by the software.

Note 2 to entry: See 9.4 and Figure 1.

3.3
extensograph water absorption
volume of water required to produce a dough with a consistency of 500 farinograph unit (FU) after 5 min mixing, under specified operating conditions

Note 1 to entry: Extensograph water absorption is expressed in millilitres per 100 g of flour at 14,0 % mass fraction moisture content.

3.4
maximum resistance
R_m
mean of the maximum heights of the extensograph curves from two test pieces, provided that the difference between them does not exceed 15 % of their mean value

Note 1 to entry: See 9.3.1 and Figure 1.

3.5
ratio
R/E
quotient of the *maximum resistance*, R_m, (3.4) and the *extensibility* (3.2) or the resistance after 50 mm transposition of the recorder paper, R_{50}, and the extensibility

Note 1 to entry: In electronic devices, this is calculated automatically by the software.

Note 2 to entry: The ratio is an additional factor in the review of the dough behaviour.

3.6
resistance at constant deformation
R_{50}
mean of the heights of the extensograph curves after 50 mm transposition of the recorder paper from two test pieces, provided that the difference between them does not exceed 15 % of their mean value

Note 1 to entry: In electronic devices, this is calculated automatically by the software.

Note 2 to entry: See 9.3.2 and Figure 1.

3.7
stretching
resistance of dough to extension and the extent to which it can be stretched until breaking, under specified operating conditions

Note 1 to entry: The resistance is expressed in arbitrary units (extensograph unit, EU).

Note 2 to entry: The extent of stretching is expressed in millimetres.

4 Principle

Dough is prepared from flour, water and salt in a farinograph under specified conditions. A test piece is then moulded on the balling unit and moulder of the extensograph into a standard shape. After a fixed period of time, the test piece is stretched and the force required recorded. Immediately after these operations, the same test piece is subjected to two further cycles of moulding, rest period and stretching.

The size and shape of the curves obtained are a guide to the physical properties of the dough. These physical properties influence the end-use quality of the flour.

5 Reagents

Use only reagents of recognized analytical grade, unless otherwise specified, and distilled or demineralized water conforming to grade 3 in accordance with ISO 3696.

5.1 Sodium chloride of recognized analytical grade.

5.2 Optional release material.

Rice flour or starch (to avoid that the dough is sticking to the moulder and roller)

6 Apparatus

The usual laboratory apparatus and, in particular, the following shall be used.

6.1 Extensograph,[1] with a thermostat consisting of a constant temperature water bath (see Annex A), with the following operating characteristics:

— rotational frequency of the balling unit: (83 ± 3) min^{-1} (r/min);

— rotational frequency of the moulder: (15 ± 1) min^{-1} (r/min);

— hook speed: (1,45 ± 0,05) cm/s;

— chart speed: (0,65 ± 0,01) cm/s; in electronic devices, this is recorded automatically by the device;

— force exerted per extensograph unit: (12,3 ± 0,3) mN/EU [(1,25 ± 0,03) gf/EU].

Some older instruments have a different calibration for force/unit deflection. The procedure specified can be used with such instruments, but it is necessary for the different calibration to be taken into account when comparing the results with instruments calibrated as above.

NOTE An electronic extensograph can be used, see Clause A.5.

6.2 Farinograph,[2] connected to a thermostat with the operating characteristics specified in ISO 5530-1.

6.3 Balance, capable of weighing to the nearest ±0,1 g.

6.4 Spatula, made of a non-metallic material.

6.5 Conical flask, of 250 ml capacity.

1) This document has been drawn up on the basis of the Brabender Extensograph, which is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product. Equivalent products may be used if they can be shown to lead to the same results.

2) This document has been drawn up on the basis of the Brabender Farinograph, which is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

7 Sampling

Sampling is not part of the method specified in this document. A recommended sampling method is given in ISO 24333[4].

It is important that the laboratory receives a sample that is truly representative and that has not been damaged or changed during transport and storage.

8 Procedure

8.1 Determination of the moisture content of the flour

Determine the moisture content of the flour using the method specified in ISO 712-1 or by near infrared spectroscopy. The performances of the NIR should be demonstrated in accordance with ISO 12099 and reach at least one standard error of prediction (SEP) ≤ 0,15 % determined over the entire scope of this document.

NOTE In comparison with ISO 712-1, the error of prediction for ISO 12099 is higher.

8.2 Preparation of apparatus

8.2.1 Turn on the thermostat (6.2) of the farinograph and circulate the water until the required temperature is reached, prior to using the instrument. Before and during use, check the temperatures of:

— the thermostat;

— the mixing bowl of the farinograph, in the hole provided for this purpose;

— the extensograph cabinet.

All temperatures shall be (30 ± 0,2) °C.

8.2.2 For mechanical devices, adjust the arm of the pen of the extensograph so as to obtain a zero reading when a cradle with both its clamps plus 150 g is placed in position. For electronic devices, the zero adjustment is programmed to be done automatically at the start of the measurement.

8.2.3 Pour some water into the trough of each cradle support, so that the bottom is fully covered in order to get a constant humidity, and place the supports, cradles and clamps in the cabinet at least 15 min before use.

8.2.4 For mechanical devices, uncouple the mixer of the farinograph from the driving shaft and adjust the position of the counterweight(s) so as to obtain zero deflection of the pointer with the motor running at the specified rotational frequency (see ISO 5530-1:2025, 6.1). Switch off the motor and then couple the mixer. For electronic devices, the zero adjustment is programmed to be done automatically at the start of the measurement.

For mechanical devices, lubricate the mixer with a drop of water between the back-plate and each of the blades. Check that the deflection of the pointer is within the range (0 ± 5) FU with the mixing blades operating at the specified rotational frequency in the empty, clean bowl. If the deflection exceeds 5 FU, clean the mixer more thoroughly or eliminate other causes of friction. For electronic devices, the lubrication of the blades is done with silicon fat.

For mechanical devices, adjust the arm of the pen so as to obtain identical readings from the pointer and the recording pen.

For mechanical devices, adjust the damper so that, with the motor running, the time required for the pointer to go from 1 000 FU to 100 FU is (1,0 ± 0,2) s.

8.2.5 The water added to the flour should have a temperature of (30 ± 0,5) °C.