

EUROPEAN STANDARD

**EN 14477**

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2004

ICS 55.040

English version

## Packaging - Flexible packaging material - Determination of puncture resistance - Test methods

Emballage - Matériaux d'emballage souples -  
Détermination de la résistance à la perforation - Méthodes  
d'essai

Verpackung, Flexible Packstoffe - Bestimmung der  
Durchstoßfestigkeit - Prüfverfahren

This European Standard was approved by CEN on 16 January 2004.

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

**Management Centre: rue de Stassart, 36 B-1050 Brussels**

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## **Foreword**

This document (EN 14477:2004) has been prepared by Technical Committee CEN/TC 261 "Packaging", 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of an identical text or by endorsement, at the latest by October 2004 and conflicting national standards shall be withdrawn at the latest by October 2004.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

## EN 14477:2004 (E)

### 1 Scope

This standard describes a test method of determining the puncture resistance of a flexible packaging material. The method is applicable to multilayer flexible packaging materials.

### 2 Principle

A specimen of the flexible packaging material is fastened in a sample holder. A probe penetrates the specimen with a constant speed. The force and the elongation needed to penetrate the specimen are recorded.

### 3 Apparatus

**3.1 Universal testing apparatus**, with means of measuring elongation.

**3.2 Compression load cell**

**3.3 Penetration probe** made of hardened steel as shown in Figure 1

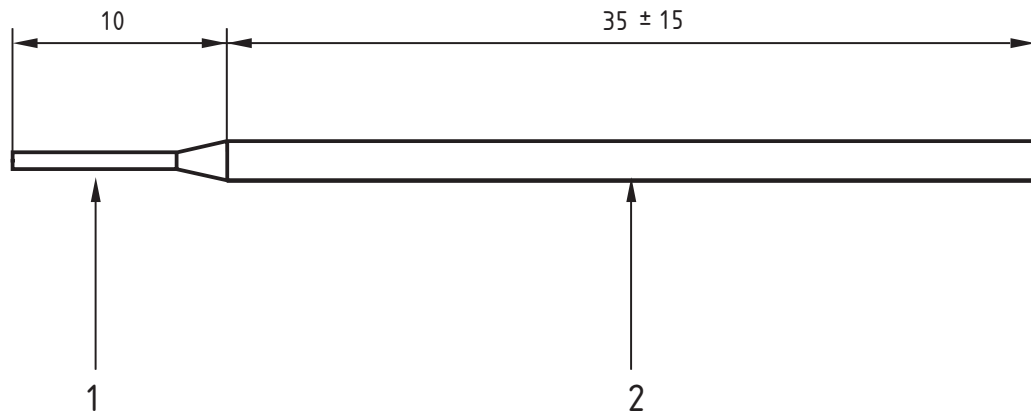
A 0,8 mm diameter probe with a rounded tip is used. The rounded tip of the probe shall have a radius of 0,4 mm.

**3.4 Fixture** for securing the probe to the load cell or to a solid base.

**3.5 Sample Holder** as shown in Figure 2 or equivalent.

**3.6 Blanking punch** with an outer diameter matching the diameter of the sample holder shall be used.

Dimensions in mm

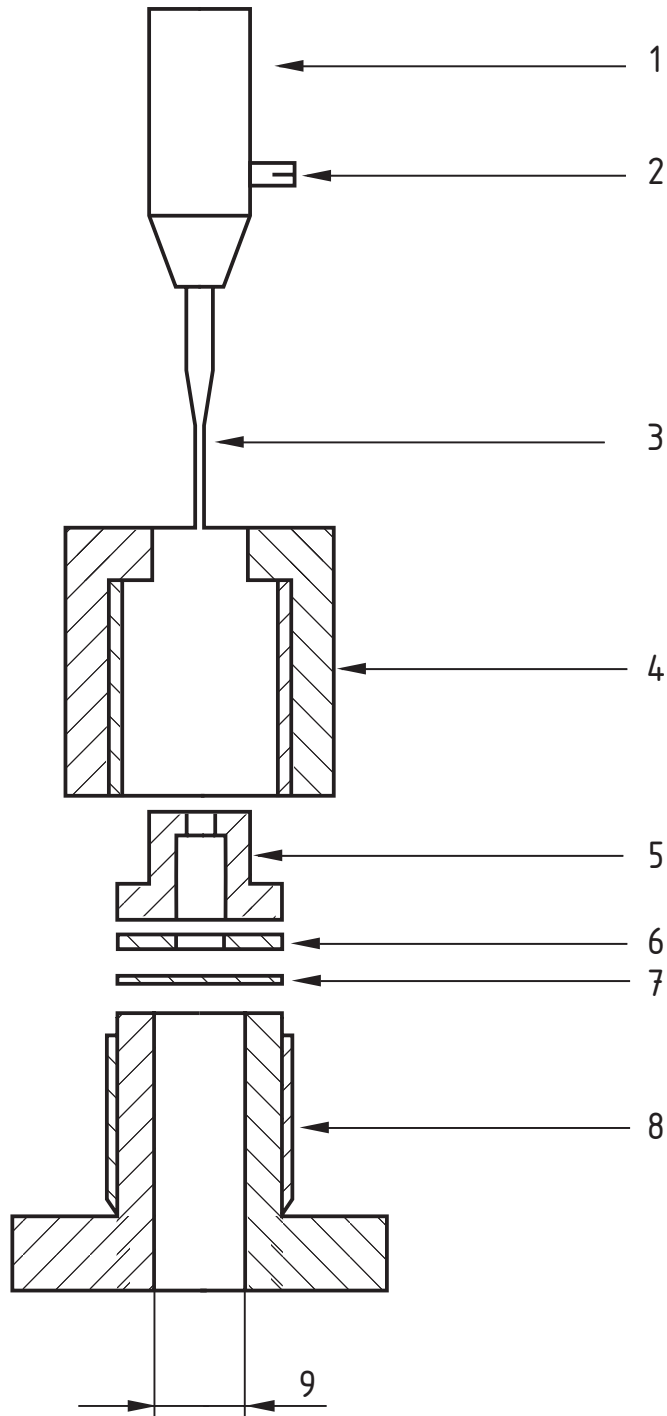


**Key**

- 1 Probe tip  $\varnothing 0,8 \text{ mm} \pm 0,005 \text{ mm}$
- 2 Probe base  $\varnothing 2,0 \text{ mm} \pm 0,010 \text{ mm}$

**Figure 1 — Penetration probe**

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**Key**

- 1 Probe fixture
- 2 Screw
- 3 Probe tip
- 4 Nut
- 5 Probe guide
- 6 Friction rubber
- 7 Specimen
- 8 Main body
- 9 Diameter  $\varnothing 10 \text{ mm} \pm 0,1 \text{ mm}$

**Figure 2 — Example of a sample holder**

## 4 Calibration

The probe should be calibrated after at least 1000 measurements using a standard calibrating film made of biaxially oriented PET. The tip of the probe shall at the same time be checked for wear or damage using a suitable microscope. The friction rubber shall be replaced at frequent intervals or at signs of wear.

## 5 Test specimens

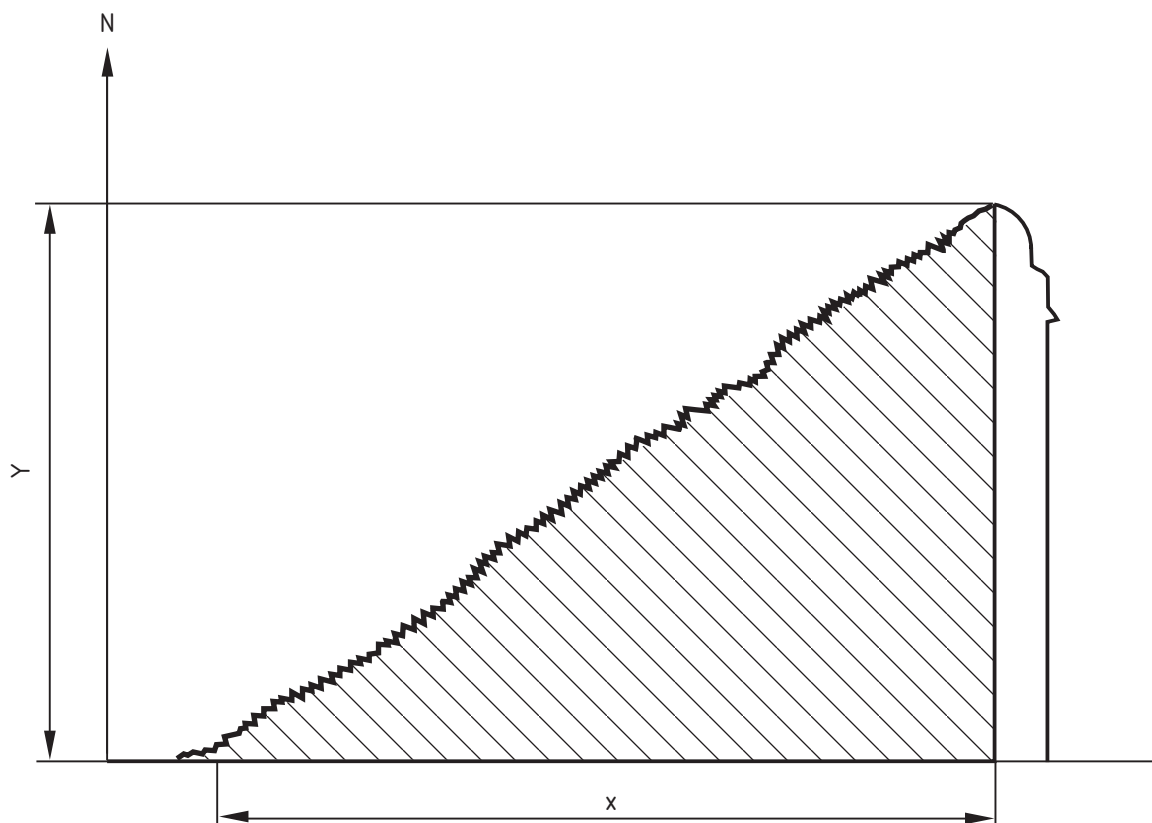
A minimum of 10 specimens shall be cut out evenly spaced across the reel or sheet being tested. The specimens shall be conditioned at  $(23 \pm 2)^\circ\text{C}$  and  $(50 \pm 5)\%$  RH for 48 hours before testing. The test shall be carried out at the same conditions.

## 6 Probe speed

The test can be carried out at one of the following speeds expressed in mm/min: 1 - 5 - 10 - 50 - 100.

## 7 Expression and calculation of results

The force is expressed in N and the elongation in mm. For the determination of the energy the integral below the graph showing the force and elongation shall be calculated. Calculate the mean value and standard deviation. A typical graph showing the force and elongation is shown in Figure 3.



### Key

Y Force in N  
X Elongation in mm

Figure 3 — Graph showing Force and Elongation (Schematic)

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### 8 Precision data

NOTE Precision is not known because interlaboratory data is not available. Repeatability and reproducibility should be determined according to ISO 5725-2, within each laboratory.

### 9 Test report

The test report shall include the following information:

- a) reference to this method;
- b) date and place of the test;
- c) description of the material being tested;
- d) indication of which side of the specimen is being penetrated;
- e) speed of the probe;
- f) force at break in N, elongation at break in mm and energy in mJ;
- g) any unusual features noted during the measurements;
- h) any deviation from the method.



## **Bibliography**

- ISO 5725-2 *Accuracy (trueness and precision) of measurement methods and results - Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*