

SLOVENSKI STANDARD
SIST EN 12980:2001
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Materiali in predmeti v stiku z živili - Nekovinski predmeti za uporabo v gostinstvu in industriji - Preskusna metoda za ugotavljanje odpornosti proti udaru

Materials and articles in contact with foodstuffs - Non-metallic articles for catering and industrial use - Method of test for the determination of impact resistance

Werkstoffe und Gegenstände in Kontakt mit Lebensmitteln - Nichtmetallische Gegenstände für gastronomische und gewerbliche Zwecke - Verfahren zur Bestimmung des Schlagwiderstandes

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Matériaux et articles en contact avec les denrées alimentaires - Objets non métalliques à usage industriel pour la cuisine et le transport de nourriture - Méthode d'essai permettant de déterminer la résistance au choc

Ta slovenski standard je istoveten z: EN 12980:2000

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67.250 Materiali in predmeti v stiku z živili Materials and articles in contact with foodstuffs

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 12980

March 2000

ICS 67.250

English version

Materials and articles in contact with foodstuffs - Non-metallic
articles for catering and industrial use - Method of test for the
determination of impact resistance

Matériaux et articles en contact avec les denrées
alimentaires - Objets non métalliques à usage industriel
pour la cuisine et le transport de nourriture - Méthode
d'essai permettant de déterminer la résistance au choc

Werkstoffe und Gegenstände in Kontakt mit Lebensmitteln
- Nichtmetallische Gegenstände für gastronomische und
gewerbliche Zwecke - Verfahren zur Bestimmung des
Schlagwiderstandes

This European Standard was approved by CEN on 18 February 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 194 "Utensils in contact with food", the secretariat of which is held by BSI.

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 September 2000, and conflicting national standards shall be withdrawn at the latest by September 2000.

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

1 Scope

This standard gives a method of test for determination of the resistance to mechanical shocks of articles used in catering and industrial services where they are subjected to substantial and frequent shocks.

It is well known that the results of this test procedure depend upon the details of the test conditions ¹⁾. The results therefore cannot be generalized for other utensils made of the same material, nor to other test conditions. The results are only valid for the article and test conditions specified in the test report.

¹⁾ See paper by R O Heckroodt and V Frith, Impact strength and chipping resistance of dinner plates, Interceram 39, No 2 pp 32-34 1990

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies including amendments.

EN 10109-1 Metallic materials - Hardness test - Part 1: Rockwell test (scales A, B, C, D, E, F, G, H, K) and Rockwell superficial test (scales 15N, 30N, 45N, 15T, 30T and 45T)

3 Principle

The method uses an impact testing machine that subjects the article to be tested to a blow from a hammer of mass m , on the end of a pendulum of negligible mass and length l raised to an angle α from the vertical and let fall from a height h at a velocity v .

The relationships between m , l , h , α and v are given by the equations:

$$h = l(1 - \cos \alpha) \quad (1)$$

$$v = \sqrt{2gh} = \sqrt{2gl(1 - \cos \alpha)} \quad (2)$$

The kinetic energy of the shock (the impact energy, E) is expressed by the relationships:

$$E = mgh \quad (3)$$

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and

$$E = \frac{1}{2}mv^2 \quad (4)$$

and represents a measure of the resistance of the article under test to the shock administered.

Where

h is the height of fall of the hammer, in metres;

l is the length of the pendulum arm, in metres

α is the angular displacement of the arm from the vertical, in degrees

v is the velocity of fall of the hammer, in metres per second;

g is the acceleration due to gravity (= 9,81 m.s⁻²);

m is the mass of the pendulum hammer including the arm, in kilograms;

E is the impact energy, in joules.

NOTE: The velocity of fall is usually not less than $0,2 \text{ m.s}^{-1}$.

4 Sampling

The sample size shall be a minimum of ten test specimens.

NOTE: The sampling plan should be agreed by the purchaser and/or supplier and recorded in the test report (see 7 c)).

5 Apparatus

Pendulum impact testing machine, consisting of the following components, all of which are metal, assembled as shown diagrammatically in figure 1.

5. 1 A pendulum swinging on a horizontal pivot, comprising a rigid lightweight metal arm with a radius of swing of 0,2 m to 0,7 m and a hammer of mass 0,1 kg to 1,0 kg which constitutes the major part of the combined mass of the pendulum and hammer. The centre of gravity of the pendulum may therefore be considered to be coincident with that of the hammer

The hammer has an interchangeable striking head made from a steel of hardness 55 to 65 HRC (conforming to EN 10109-1). The striking face of the head is normally spherical in shape but other profiles may be used.

NOTE: The type of the head is chosen according to the shape of the article to be tested

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5. 2 A mechanism (optional) to raise the pendulum to the desired height and to trigger its fall.

5. 3 A dial to measure the angular displacement of the pendulum from the vertical and/or the corresponding height of fall h and impact energy E .

5. 4 A column to support the pendulum and the dial.

5. 5 A support which permits a test specimen to be held on the apparatus in a defined position.

NOTE The support should be designed to adjust the specimen vertically, horizontally and/or tilted,

5. 6 A supporting fixture, which permits a test specimen to be held on the apparatus by a minimum restraining force when it is necessary to prevent movement of the specimen on impact.

NOTE The supporting fixture may have the shape of a V with an angle of 120°

5. 7 A protective screen to protect personnel against splinters.

5.8 A heavy level base, on which the components of the testing machine are mounted.

NOTE The most effective way to provide for an absolutely rigid base is to fix it to the floor.

6 Procedure

Use tables 1, 2 and 3 to choose the appropriate conditions to perform the test.

Place the test specimen on the apparatus so that the hammer in the resting position touches it at the desired point of impact, making sure that the specimen is against the supporting fixture (5.6) if applicable.

Close the protective screen; lift the pendulum to the height corresponding to the chosen energy of impact.

Release the pendulum.

Examine the article under test.

Record the result of the test as positive if the article has not broken and does not show any visible signs of chipping, cracking or fissuring.

According to the objectives of the test and the test programme either:

a) for testing by attributes: Place another test specimen on the support and repeat the procedure;

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b) for testing by variables: Repeat the procedure on the same test specimen, progressively increasing the energy level until the article chips or cracks or until a predetermined energy level is reached. Alternatively repeat the procedure, without changing the energy level, on the same article, one or several times, hitting the article in the same or in different places.

Record the experimental conditions and the results.

7 Test report

The test report shall include the following information.

- a) description of the articles under test;
- b) the number of articles in the lot to be tested;
- c) the sampling plan and the procedure for selecting test specimens from the lot.
- d) the number of articles tested;
- e) the test conditions in detail (temperature, mass and type of hammer head, height of fall, impact energy, zone and angle of impact, specimen unrestrained or fixed to the support etc.);
- f) for testing by attributes: the number of articles broken or damaged at the selected energy level;
- g) for testing by variables: initial energy level and the successive higher energy levels, where applicable, and the energy values and height of fall at which the articles are broken or damaged; alternatively the number and location of impacts.
- h) mean value and scatter of the results for testing by variables.
- j) any other relevant details of the test procedure.

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Table 1 — Relationship between angular displacement α and height of fall h for different lengths of pendulum l

Angular displacement	Length of pendulum, l (in m)					
	0,2	0,3	0,4	0,5	0,6	0,7
α degrees	Height of fall h (in m)					
0	0,000	0,000	0,000	0,000	0,000	0,000
5	0,001	0,001	0,002	0,002	0,002	0,003
10	0,003	0,005	0,006	0,008	0,009	0,011
15	0,007	0,010	0,014	0,017	0,020	0,024
20	0,012	0,018	0,024	0,030	0,036	0,042
25	0,019	0,028	0,038	0,047	0,056	0,066
30	0,027	0,040	0,054	0,067	0,080	0,094
35	0,036	0,054	0,072	0,091	0,109	0,127
40	0,047	0,070	0,094	0,117	0,140	0,164
45	0,059	0,088	0,117	0,147	0,176	0,205
50	0,071	0,107	0,143	0,179	0,214	0,250
55	0,085	0,128	0,170	0,213	0,256	0,298
60	0,100	0,150	0,200	0,250	0,300	0,350
65	0,115	0,173	0,231	0,289	0,346	0,404
70	0,132	0,197	0,263	0,329	0,395	0,461
75	0,148	0,222	0,296	0,371	0,445	0,519
80	0,165	0,248	0,330	0,413	0,496	0,578
85	0,183	0,274	0,365	0,457	0,548	0,639
90	0,200	0,300	0,400	0,500	0,600	0,700
95	0,217	0,326	0,435	0,544	0,652	0,761
100	0,235	0,352	0,470	0,587	0,704	0,822
105	0,252	0,378	0,504	0,630	0,755	0,881
110	0,268	0,403	0,537	0,671	0,805	0,939
115	0,285	0,427	0,569	0,712	0,854	0,996
120	0,300	0,450	0,600	0,750	0,900	1,050
125	0,315	0,472	0,630	0,787	0,944	1,102
130	0,329	0,493	0,657	0,822	0,986	1,150
135	0,341	0,512	0,683	0,854	1,024	1,195
140	0,353	0,530	0,706	0,883	1,060	1,236
145	0,364	0,546	0,728	0,910	1,091	1,273
150	0,373	0,560	0,746	0,933	1,120	1,306
155	0,381	0,572	0,762	0,953	1,144	1,334
160	0,388	0,582	0,776	0,970	1,164	1,358
165	0,393	0,590	0,786	0,983	1,180	1,376
170	0,397	0,596	0,794	0,993	1,191	1,390
175	0,399	0,599	0,798	0,998	1,198	1,397
180	0,400	0,600	0,800	1,000	1,200	1,400