



**SLOVENSKI STANDARD**  
**SIST EN 12235:2005**

**01-januar-2005**

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Surfaces for sports areas - Determination of vertical ball behaviour

Sportböden - Bestimmung der Ballreflexion

Sols sportifs - Détermination du comportement vertical de la balle/du ballon

**STANDARD PREVIEW**  
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**Ta slovenski standard je istoveten z: EN 12235:2004**

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**ICS:**

97.220.10	Športni objekti	Sports facilities
97.220.20	Oprema za zimske športe	Winter sports equipment

**SIST EN 12235:2005**

**en,fr,de**

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EUROPEAN STANDARD

EN 12235

NORME EUROPÉENNE

EUROPÄISCHE NORM

July 2004

ICS 97.220.20

English version

## Surfaces for sports areas - Determination of vertical ball behaviour

Sols sportifs - Détermination du comportement vertical de la balle/du ballon

Sportböden - Bestimmung der Ballreflexion

This European Standard was approved by CEN on 13 May 2004.

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.

CEN members are the national standards bodies of 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.

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## Contents

	Page
Foreword.....	3
1 Scope .....	4
2 Normative references .....	4
3 Principle.....	4
4 Apparatus .....	4
5 Sports surface for testing .....	5
6 Conditioning.....	6
7 Procedure .....	6
7.1 Determination of the rebound height of the ball from concrete .....	6
7.2 Determination of the rebound height of the ball from the sports surface .....	7
8 Expression of results .....	7
9 Test report .....	7

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## Foreword

This document (EN 12235:2004) has been prepared by Technical Committee CEN/TC 217 "Surfaces for sports areas", 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 January 2005, and conflicting national standards shall be withdrawn at the latest by January 2005.

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.

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**EN 12235:2004 (E)****1 Scope**

This European Standard specifies a method for determination of the rebound height of a ball from a surface, when dropped vertically.

It gives two alternative recording procedures for measuring the rebound height, visual and acoustic.

**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.

EN 12229, *Surfaces for sports areas - Procedure for the preparation of synthetic turf and textile test pieces*

**3 Principle**

A ball is allowed to fall vertically onto a surface and the height to which it rebounds is measured and calculated as the percentage rebound height.

**4 Apparatus**

**4.1 Ball**, conforming to the regulations of the governing body of the relevant sport and with any additional requirements given in Table 1.

NOTE These requirements have been found to be acceptable in use, and it has not been found necessary to specify additional requirements such as circumference or mass of the ball.

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Table 1 — Properties of balls

Type of ball	Drop height (m)	Rebound height from concrete (m)	$K_1$ (s)	Additional requirements
Basketball	1,80	$1,300 \pm 0,025$	0,025	Use a men's nylon wound basketball
Association football	2,00	$1,350 \pm 0,05$	-	Inflate the ball to a pressure to reach the rebound height according the manufacturer's instruction
Tennis ball	2,54	$1,400 \pm 0,025$	0,005	-
Hockey ball	2,00	$0,575 \pm 0,025$	0,038	-

NOTE 1  $K_1$  is an empirically determined correction factor.

NOTE 2 The precision of the test using footballs is  $\pm 10$  % absolute.

NOTE 3 The rebound height from concrete is measured as described in 7.1 to determine if the ball is suitable for tests on the test piece.

**4.2 Ball release device**, which operates smoothly without imparting any impulse or spin to the ball and which allows the ball to be dropped vertically from the specified height.

NOTE Examples of suitable devices include vacuum and mechanical arrangements or an electromagnetic release device with a very small thin metal plate attached to the test ball.

### 4.3 Recording apparatus

**4.3.1 Visual recording apparatus**, comprising the following:

- a vertical scale, positioned so that the height of the underside of the ball above the surface can be measured;
- means of determining the maximum height to which the ball rebounds, with a resolution better than 1 % of the drop height, e.g. video recorder or direct observation.

**4.3.2 Acoustic recording apparatus**, comprising a microphone and timing device, activated acoustically, and giving a reading accurate to within 1 ms.

NOTE The device is activated by the sound from the first bounce of the ball and deactivated by the sound from the second bounce, the time between these events being denoted  $T$ , in seconds.

## 5 Sports surface for testing

The test may be carried out on site, on indoor or outdoor sports surfaces, or on a test piece assembled for test purposes.

**EN 12235:2004 (E)**

If a test piece is to be used, prepare this from a representative sample of the sports surface, in combination with the supporting layers used with the surface in service. Assemble the surface and supporting layers in accordance with the method recommended by the manufacturer so that the test piece is of minimum size 0,5 m x 0,5 m. Test pieces shall be prepared in accordance with EN 12229.

NOTE For certain constructions, such as unbound bases and area-elastic floors, a larger specimen might be necessary to be representative.

**6 Conditioning**

Condition the test pieces for a minimum of 3 h at the test temperature, except when the material is known to be very sensitive to humidity, in which case condition them for a minimum of 88 h at a relative humidity of  $(50 \pm 5) \%$  at the test temperature. Unless otherwise specified, condition and test the test pieces at a temperature of  $(23 \pm 2) ^\circ\text{C}$ .

For tests on site, condition the ball for a minimum of 1 h at the prevailing temperature and humidity.

**7 Procedure****7.1 Determination of the rebound height of the ball from concrete**

Set the ball release device at the appropriate drop height for the ball, as given in Table 1. Drop the ball onto a stable concrete test surface of minimum size 0,5 m x 0,5 m and minimum thickness 0,05 m, ensuring that the ball does not hit the surface within 100 mm of the edge of the surface.

Record the information necessary to determine the rebound height using one of the following methods:

## a) Visual method

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Record the maximum height to which the ball rebounds, measured from the underside of the ball. Repeat the procedure to obtain a total of five readings, ensuring that the ball hits the surface at different points for each drop.

Calculate and record the median of the five readings as the rebound height,  $H$ , of the ball from concrete.

## b) Acoustic method

Record from the timing device the time,  $T$ , in seconds, between the first and second bounces of the ball. Calculate the height,  $H$ , in metres to which the ball rebounds using the following equation:

$$H = 1,23(T - K_1)^2$$

where

$T$  is the time in seconds, between the first and the second bounces of the ball; and

$K_1$  is the correction factor, in seconds, given in Table 1.

Repeat the procedure to obtain a total of five readings, ensuring that the ball hits the surface at different points for each drop. Calculate and record the median of the five values of  $H$  as the rebound height of the ball from concrete. If the rebound height differs from the value given in Table 1, either discard the ball and repeat the procedure using another ball(s) until the value is met, or, if applicable, adjust the ball inflation pressure and repeat the procedure until the value is met.