



SLOVENSKI STANDARD

SIST ISO 5903:1995

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Gimnastična oprema - Blazine za doskok in podlage za parterni podij - Določevanje trdote in doskočne amortizacije

Gymnastic equipment -- Landing mats and surfaces for floor exercises -- Determination of hardness and impact damping

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Engins de gymnastique -- Tapis de chute et surfaces pour exercices au sol --
Détermination de la dureté et de l'amortissement

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International Standard



5903

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Gymnastic equipment — Landing mats and surfaces for floor exercises — Determination of hardness and impact damping

Engins de gymnastique — Tapis de chute et surfaces pour exercices au sol — Détermination de la dureté et de l'amortissement

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Descriptors : sport equipment, gymnastic equipment, mats.

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 5903 was developed by Technical Committee ISO/TC 83, *Sports and recreational equipment*, and was circulated to the member bodies in April 1980.

It has been approved by the member bodies of the following countries :

Australia	India	South Africa, Rep. of
Austria	Netherlands	Spain
Egypt, Arab Rep. of	Poland	Switzerland
Germany, F. R.	Romania	USSR

The member body of the following country expressed disapproval of the document on technical grounds :

France

This International Standard was drawn up in co-operation with the International Gymnastic Federation (IGF).

Gymnastic equipment — Landing mats and surfaces for floor exercises — Determination of hardness and impact damping

1 Scope and field of application

This International Standard specifies a method for the determination of the hardness and impact damping of gymnastic landing mats and surfaces (mats and boards) for floor exercises for use in competitions and training, in order to

- a) ensure that, for competitions and training, mats and surfaces for floor exercises are used, the hardness and impact damping of which lie in a specified range;
- b) reduce the risk of injury to the gymnasts.

NOTE — These properties shall be considered as being the essential characteristics for the use of these products.

2 References

ISO 5905, *Gymnastic equipment — Landing mat.*

ISO 5906, *Gymnastic equipment — Surface for floor exercises — Mat.*

ISO 5907, *Gymnastic equipment — Surface for floor exercises — Boards.*

3 Principle

Dropping, from a specified height, a test piece on to the horizontally placed landing surface of the gymnastic landing mat or surface for floor exercises. Recording of the positions of the test piece after sinking in and rebounding.

4 Apparatus

4.1 Test device, the design of which is at the option of the tester, however, the frame of the device shall not influence the test result.

4.2 A cylindrical test piece made of steel, having a mass of 10 kg and a diameter of 100 mm, positioned at a height $h = 400$ mm above the landing surface of the gymnastic landing mat or surface for floor exercises. The external edge of the rebound surface of the cylindrical test piece being rounded with a radius $R = 6 \pm 1$ mm.

4.3 Registering device, mechanical or electrical, for recording the greatest depth of penetration P and the greatest height of rebound R .

The field of fluctuation of the six individual values at one measuring point shall not exceed 3 mm for the depth of penetration P and shall not exceed 10 mm for the height of rebound R .

4.4. Levelling indicator.

5 Procedure

Carry out the tests at an ambient temperature of 20 ± 3 °C.

Place the parts to be tested on a solid, flat and horizontal floor, such as a concrete floor at least 80 mm thick.

Place the test device (4.1), by means of a levelling indicator (4.4), on the parts to be tested in such a way that the guide tube for the test piece (4.2) is vertical.

Record, by means of registering device (4.3), P and R .

Carry out eight measurements for each measuring point. The position and number of the measuring points are indicated in ISO 5905, ISO 5906 and ISO 5907.

The first two measurements at each measuring point shall not be used.

Take the mean values of the other six measurements and base the total mean value on them.

Record P on the measuring diagram to the nearest 0,5 mm and R to the nearest 1 mm.

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6 Expression of results

The following values shall be recorded and calculated respectively :

P the greatest depth of penetration in millimetres of the test piece into the landing mat and on the surface for floor exercises respectively, taken as the value for hardness;

R the greatest height of rebound, in millimetres, of the test piece taken as the value for impact damping;

N the number of rebounds of the test piece after first rebound on the mat, also taken as a value for impact damping.

NOTE — In determining the number N of rebounds, only those with a height of at least 10 mm should be counted.

Instead of direct measuring, N may be given by the formula

$$N = \left[\frac{\ln \frac{h}{M}}{\ln \frac{h}{R}} \right]$$

where

$h = 400$ mm;

R is the largest height of rebound, in millimetres;

M is the minimum height of rebound, in millimetres.

NOTE — The square brackets indicate that when the value for the expression in brackets lies between two integral numbers, the smaller integral number shall be taken for N .

With $h = 400$ mm and $M = 10$ mm the result is :

$$N = \left[\frac{3,69}{5,99 - \ln R} \right]$$

In the case of different results for N between the measured and calculated value, the measured value shall be taken.

The coefficient of impact damping, ε , as an additional measure for impact damping, is given by the formula

$$\varepsilon = \frac{1}{2\pi} \times \ln \frac{h}{R}$$

where $h = 400$ mm.

7 Notes on procedure

7.1 On the basis of extensive practical experiments on gymnastic landing mats and surfaces for floor exercises (mats and boards) the criteria for the characteristics of these products and the appropriate test methods have been drawn up. These are described in this International Standard.

7.2 It was found that, above all, hardness (or softness) and impact damping are the decisive characteristic qualities for gymnastic landing mats and surfaces for floor exercises. The test method is based on the analysis of movement during landing and the evaluation of the energy level. The test piece having a mass of 10 kg and falling from a height h of 400 mm, causes about the same transfer of energy into the landing surface as the gymnast.

7.3 As a function of, for example the thickness of the gymnastic landing mat, the greatest depth of penetration P is a measure of the time which is at the disposal of the gymnast for landing. On the other hand, the greatest height of rebound R depends on the design of the gymnastic landing mat and measures the deformation hollow which increases with the decrease in R . This is important for ensuring a safe landing for the gymnast and enables him to avoid incorrect landing on the surface, directly before the phase of highest consumption of energy and enables him to avoid injury.

8 Test report

The test report shall include the following particulars :

- reference to this International Standard;
- description of the object tested;
- individual values and mean values of R and P for each measuring point;
- total mean values of R and P ;
- fields of fluctuation of the mean values of R and P of the individual measuring points;
- any deviation from this International Standard and reasons for this deviation;
- date of test.

If desired :

- number N of rebounds of the test piece;
- coefficient of impact damping, ε .