SLOVENSKI STANDARD
SIST EN 13036-4:2004

01-junij-2004

Značilnosti cestnih in vzletnih površin – Preskusne metode – 4. del: Metoda merjenja odpornosti površine proti drsenju/zdrsu – Preskus z nihalom

Road and airfield surface characteristics - Test methods - Part 4: Method for measurement of slip/skid resistance of a surface - The pendulum test

Oberflächeneigenschaften von Straßen und Flugplätzen - Prüfverfahren - Teil 4: Verfahren zur Messung der Griffigkeit von Oberflächen: Der Pendeltest

Caractéristiques de surface des routes et aérodromes - Méthodes d'essai - Partie 4: Méthode de mesurage de l'adhérence d'une surface - Essai au pendule

Ta slovenski standard je istoveten z: **EN 13036-4:2003**

ICS:

17.040.20	Lastnosti površin	Properties of surfaces
93.080.10	Gradnja cest	Road construction
93.120	Gradnja letališč	Construction of airports

SIST EN 13036-4:2004 **en**

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English version

Road and airfield surface characteristics - Test methods - Part 4: Method for measurement of slip/skid resistance of a surface - The pendulum test

Caractéristiques de surface des routes et aéroports - Méthodes d'essai - Partie 4: Méthode de mesurage de l'adhérence d'une surface: Essai au pendule

Oberflächeneigenschaften von Straßen und Flugplätzen - Prüfverfahren - Teil 4: Verfahren zur Messung der Griffigkeit von Oberflächen: Der Pendeltest

This European Standard was approved by CEN on 28 November 2002.

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 Management Centre 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

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

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Foreword

This document EN 13036-4:2003 has been prepared by Technical Committee CEN/TC 227 "Road materials", the secretariat of which is held by DIN.

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 February 2004, and conflicting national standards shall be withdrawn at the latest by February 2004.

This European Standard is one of a series of standards as listed below:

EN 13036-1, *Road and airfield surface characteristics — Test methods — Part 1: Measurement of pavement surface macrotexture depth using a volumetric patch technique.*

prEN 13036-2, *Road and airfield surface characteristics — Test methods — Part 2: Procedure for determination of skid resistance of a pavement surface.*

EN 13036-3, *Road and airfield surface characteristics — Test methods — Part 3: Measurement of pavement surface horizontal drainability.*

EN 13036-4, *Road and airfield surface characteristics — Test methods — Part 4: Method for measurement of slip/skid resistance of a surface — The pendulum test.*

prEN (WI 00227131)-5, *Road longitudinal evenness — Definition (and calculation methods) of the longitudinal evenness indices.*

prEN (WI 00227132)-6, *Road longitudinal evenness — Profilometric test methods.*

EN 13036-7, *Road and airfield surface characteristics — Test methods — Part 7: Irregularity measurement of pavement courses — the straightedge test.*

Annex A is normative. Annexes B, C and D are informative.

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard describes a method for determining the slip/skid resistance of a surface using a device which remains stationary at the test location. The slip/skid resistance is measured by means of a pendulum arm.

The method provides a measure of the slip/skid resistance properties of a surface either in the field or in the laboratory.

This method measures the slip/skid resistance of a small area of a surface (approximately 0,01 m^2). This should be considered when deciding its applicability to a surface which may have non-homogeneous surface characteristics, e.g. containing ridges or grooves, or is rough textured (exceeding 1,2 mm patch test).

NOTE As the results from this test are taken at one small location, the results cannot be compared with results from devices e.g. mobile devices, that measure the skid resistance over a long length of a surface.

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).

ISO 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD).*

ISO 7619, *Rubber — Determination of indentation hardness by means of pocket hardness meters.*

ISO 4662, *Rubber — Determination of rebound resilience of vulcanizates.*

3 Terms and definitions

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

3.1
slip/skid resistance
property of the trafficked surface which limits the relative movement between the contact patch of pedestrian footwear (slip) or a vehicle tyre (skid) and the surface

NOTE 1 Loss of slip/skid resistance leads to loss of control by the pedestrian/driver with consequent increase in the risk of falling/crashes.

NOTE 2 There are numerous factors which contribute to slip/skid resistance, including the tyre pressure, contact area, tread pattern and rubber composition of the tyre or sole; the alignment, texture and frictional characteristics of the surface; the vehicle speed; the weather conditions prior to testing, i.e. wet/dry.

NOTE 3 Slip/skid resistance is not a constant but varies with climate and traffic and the effect of these on the characteristics of the surface material itself.

3.2
friction
resistance to relative motion between two bodies in contact. The frictional force is the force acting tangentially in the contact area

3.3
Pendulum Test Value (PTV)
loss of energy as the standard rubber coated slider assembly slides across the test surface and provides a standardised value of slip/skid resistance

4 Safety

When carrying out the test in the field, the equipment and operator will form a stationary obstruction. Adequate safety measures shall be in place to maintain a safe working area in accordance with regulations.

5 Principle

The Pendulum Tester incorporates a spring loaded slider made of a standard rubber attached to the end of a pendulum. On releasing the pendulum from a horizontal position, the loss of energy as the slider assembly passes over the test surface is measured by the reduction in length of the upswing using a calibrated scale.

6 Test equipment

6.1 The pendulum test shall incorporate the essential features given below and as illustrated in Figure 1:

— A spring-loaded slider assembly as specified in 6.3. It shall be mounted on the end of a pendulum arm so that the sliding edge is (514 ± 6) mm from the axis of rotation.

— Means for setting the support column of the equipment vertical.

— A base of sufficient mass to ensure the equipment remains stable during the test.

— Means of raising and lowering the axis of suspension of the pendulum arm so that the slider can

  — swing clear of the surface of the specimen, and

  — be set to traverse a surface over a fixed length of (126 ± 1) mm. A gauge as shown in Figure 2 has been found suitable.

— Means of holding and releasing the pendulum arm so that it falls freely from a horizontal position.

— A pointer of nominal length 300 mm, balanced about the axis of suspension, indicating the position of the pendulum arm throughout its forward swing and moving over the circular scale. The mass of the pointer shall be not more than 85 g.

— The friction in the pointer mechanism shall be adjustable so that, with the pendulum arm swinging freely from a horizontal position, the outward tip of the pointer may be brought to rest on the forward swing of the arm at a point (10 ± 1) mm below the horizontal. This is the 0 reading.

— A circular scale (C scale) as described in Table A.1, calibrated for a nominal sliding length of 126 mm on a flat surface marked from 0 to 150 at intervals of five. Tests in this mode of operation give the PTV directly.

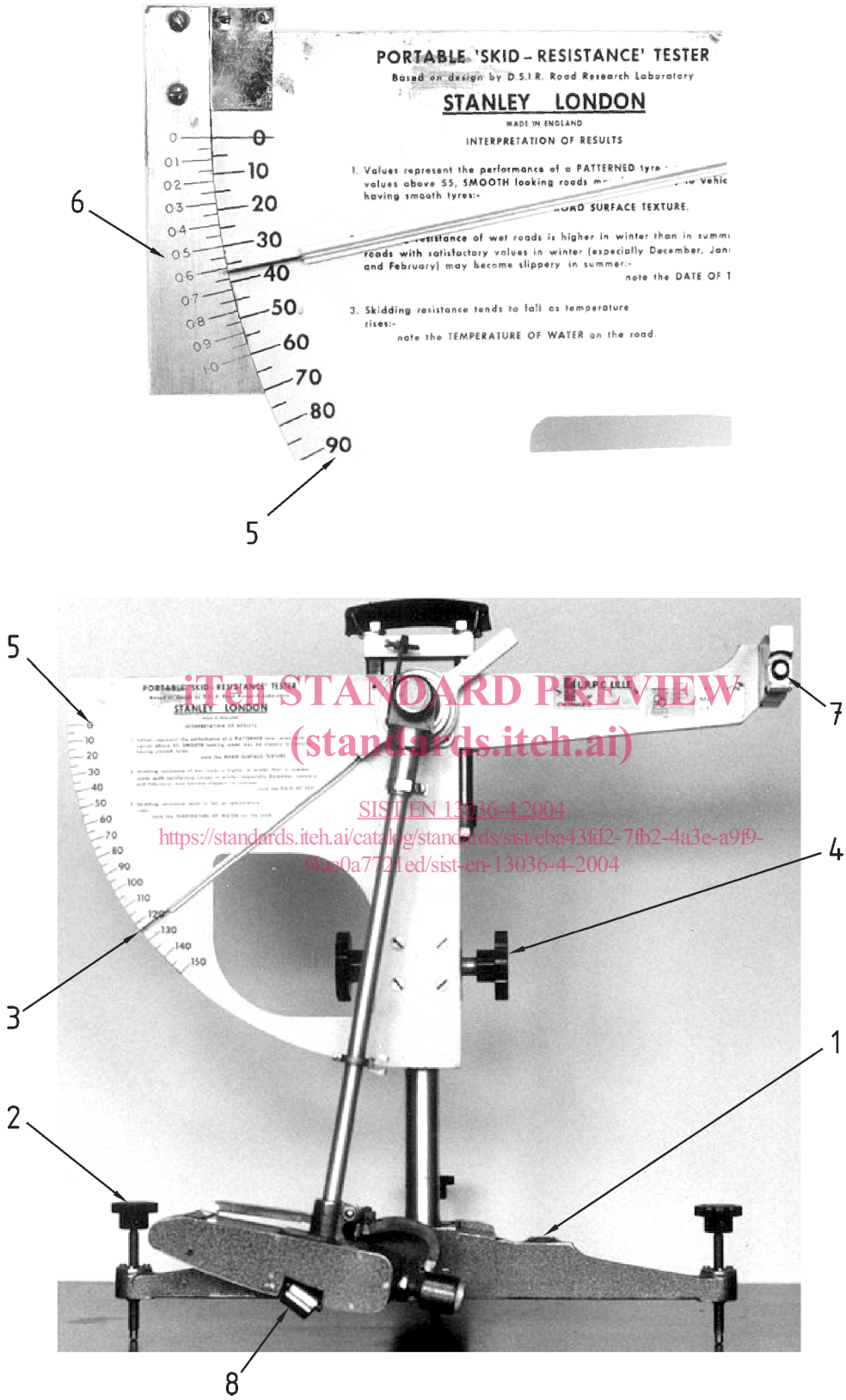
— A circular scale (F scale) as described in Table A.2, calibrated for a nominal sliding length of 76 mm sliding length on a flat surface marked from 0 to 1 at intervals of 0,05 units, may also be present. This is used for a number of laboratory tests as described in the relevant Standards. The PTV may be estimated by calculation.

— All bearings and working parts shall be enclosed as far as possible, and all materials used shall be treated to prevent corrosion under wet conditions.

6.2 The mass of the pendulum arm, including the slider assembly, shall be (1,50 ± 0,03) kg. The centre of gravity shall be on the axis of the arm at a distance of (410 ± 5) mm from the axis of rotation.

6.3 The wide slider assembly (see Figure 3) shall consist of a slider rubber (76,2 ± 0,5) mm wide, (25,4 ± 1,0) mm long (in the direction of swing) and (6,35 ± 0,5) mm thick and an aluminium backing. The combined mass of slider assembly shall be (32 ± 5) g.

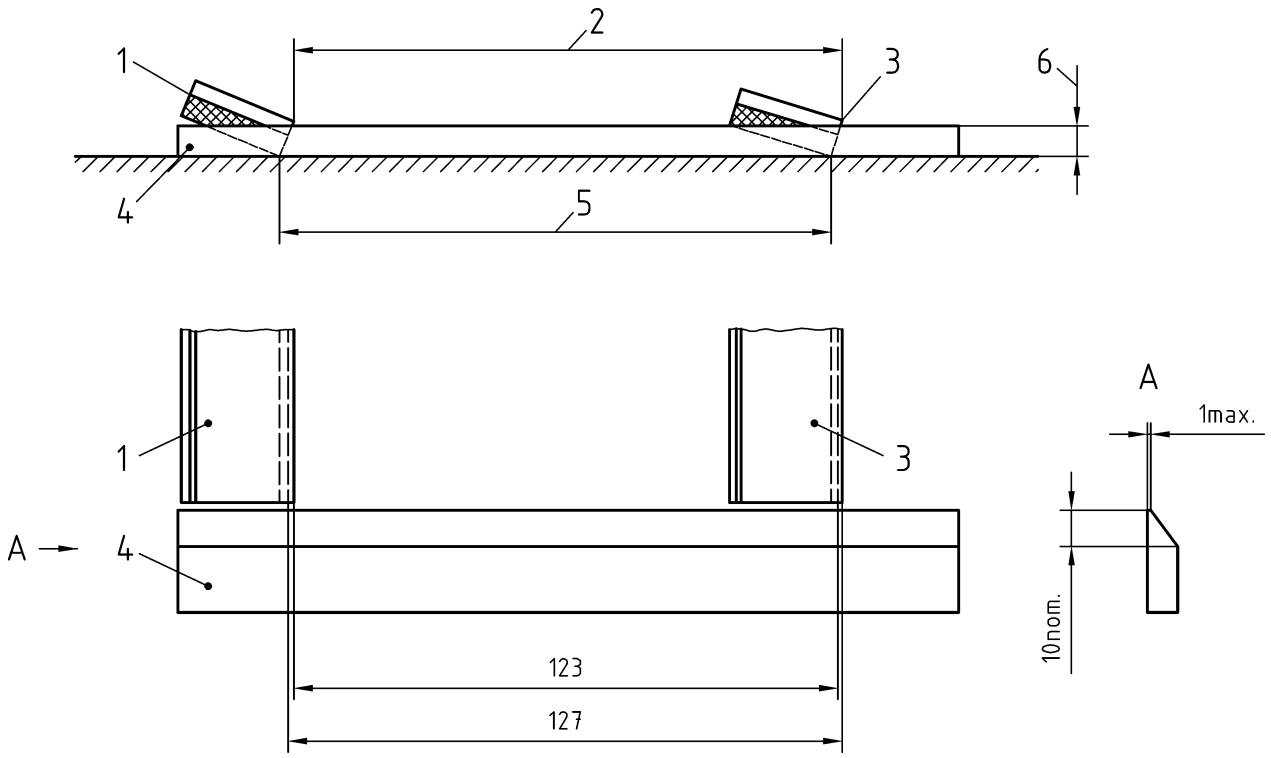
6.4 The narrow slider assembly (see Figure 3) shall consist of a slider rubber (31,75 ± 0,5) mm wide, (25,4 ± 1,0) mm long and (6,35 ± 0,50) mm thick and an aluminium backing. The combined mass of slider assembly shall be (20 ± 5) g.



Key

1 spirit level
2 levelling screw
3 pointer
4 vertical adjustment screw
5 C unit scale (126 mm sliding length)
6 F unit scale (76 mm sliding length)
7 starting bottom
8 rubber slider

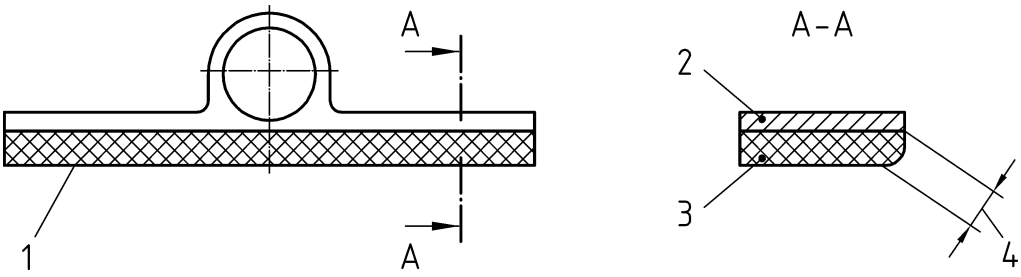
Figure 1 — The pendulum tester



Key

A	side view	3	reference edge
B	view in plan	4	gauge
C	gauge side view	5	actual sliding length
1	slider	6	gauge thickness
2	sliding length measured		

Figure 2 — Sliding length gauge



Key

1 striking edge
2 aluminium backing
3 rubber slider
4 worn between 1 mm and 3 mm

Figure 3 — Slider assembly illustrating the maximum wear on striking edge

6.5 The slider rubber shall be vulcanised onto the backing

6.6 The slider assembly shall be provided with a central pivoting axis which shall be mounted on the end of the pendulum arm in such a way that, when the arm is at the lowest point of its swing with the trailing edge of the slider rubber in contact with the test surface, the plane of the slider is angled at (26 ± 3) ° to the horizontal. In this configuration the slider can turn about its axis without obstruction to follow unevenness of the surface of the test surface as the pendulum swings.

6.7 The slider rubber shall be spring-loaded against the test surface. The nominal static force on the slider assembly as set by the equipment calibration procedure, defined in annex A, shall be (22,2 ± 0,5) N in its median position. The change in the static force on the slider shall be not greater than 0,2 N/mm deflection of the slider.

6.8 The initial resilience measured by the Lübke Rebound Test in accordance with ISO 4662, and hardness of the slider rubber, measured by the International Hardness Rubber Degrees (IRHD) in accordance with ISO 48, shall comply with Table 1 (CEN rubber). It shall have a certificate of conformity including the name of the manufacturer and date of manufacture.

6.9 A slider shall be discarded when the IRHD value measured using the portable hardness tester in accordance with ISO 7619 falls below the minimum tolerance given in Table one or not later than one year after manufacture.

NOTE For certain applications relating to pedestrian usage of a surface, as detailed in the relevant standards, a slider rubber known as 4S rubber can be required. It should have an initial resilience and hardness as given Table 2.

6.10 The edges of the slider rubber shall be square and clean-cut and the rubber free from contamination by, for example, abrasive or oil.

Table 1 — Properties of the slider rubber (CEN rubber)

Property	Temperature °C				
	0	10	20	30	40
Lübke Resilience, %	43 to 49	58 to 65	66 to 73	71 to 77	74 to 79
Hardness (IRHD)	53 to 65				
NOTE The rubber composition presented in annex B has been found to be satisfactory					

Table 2 — Properties of the slider rubber (4S rubber)

Property	Temperature °C		
	5	23	40
Lübke Resilience, %	19 to 23	21 to 26	26 to 30
Hardness (IRHD)	94 to 98		

6.11 Before using a new slider rubber it shall be conditioned to achieve a minimum width of sliding edge of 1 mm as shown in Figure 3.

NOTE This can be achieved by setting up the tester and carrying out sufficient swings wet or dry as described in clause 12, to achieve the minimum width, using as a test specimen waterproof abrasive paper 400 grade, or lapping film 3 micron aluminium oxide, mounted on a glass plate.

6.12 The slider rubber shall be discarded when the width of the sliding edge, as shown in Figure 3, exceeds 3 mm or when it becomes excessively scored or burred. The slider assembly can be reversed to expose a new sliding edge, which will need to be conditioned.

6.13 The slider assembly shall be stored in a dry watertight bag in the dark at a temperature of (15 ± 10) °C. The cooler the storage temperature, the longer the properties in Table 1 will be retained. Should the temperature of the rubber fall below 15 °C for a period in excess of one day during storage or during a series of tests, the slider assembly shall be raised to a temperature of (30 ± 2) °C for a period of (18 ± 6) h before use on a subsequent occasion. The slider assembly shall be at ambient temperature when used.

7 Calibration

7.1 The apparatus shall be recalibrated at least annually by a competent calibration centre.

7.2 Calibration of the tester is described in annex A.

7.3 The calibration procedure shall include reference surfaces covering the working range of the tester.

7.4 In addition the validation procedure described in annex A shall be carried out prior to and following its use for testing.

8 Apparatus

8.1 Clean water, for wetting the surface in a container suitable to permit dispensing copiously onto the test surface.

8.2 Radiation thermometer (pyrometer), or electronic thermometer with a surface probe, accurate to 1 °C.

8.3 Spirit level, at least 1 m long and steel tape accurate to 1mm or other device for measuring gradient.

8.4 A stiff non-metal hand brush, for cleaning the surface.

8.5 A portable anemometer, accurate to 2 m/s field use (optional).