SLOVENSKI STANDARD
SIST EN 13036-4:2011

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Značilnosti cestnih in letaliških 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-Prüfverfahren - Teil 4: Methode zur Messung der Griffigkeit von Oberflächen: Der Pendeltest

Caractéristiques de surface - Methode d'essai - Partie 4 : Methode d'essai pour mesurer l'adherence d'une surface : L'essai au pendule

Ta slovenski standard je istoveten z: **EN 13036-4:2011**

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 13036-4:2011 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13036-4

October 2011

ICS 17.040.20; 93.080.10; 93.120

Supersedes EN 13036-4:2003

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 aérodromes - Méthode d'essai - Partie 4: Méthode d'essai pour mesurer l'adhérence d'une surface: L'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 29 July 2011.

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 CEN-CENELEC 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 CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 13036-4:2011) 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 2012, and conflicting national standards shall be withdrawn at the latest by February 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13036-4:2003.

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*

— CEN/TS 13036-2, *Road and airfield surface characteristics — Test methods — Part 2: Assessment of the skid resistance of a road pavement surface by the use of dynamic measuring systems*

— 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 13036-5, *Road longitudinal evenness — Definition (and calculation methods) of the longitudinal evenness indices*

— EN 13036-6, *Road and airfield surface characteristics — Test methods — Part 6: Measurement of transverse and longitudinal profiles in the evenness and megatexture wavelength ranges*

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

— EN 13036-8, *Road and airfield surface characteristics — Test methods — Part 8: Determination of transverse unevenness indices*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, 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 slider mounted at the end 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 mean texture depth).

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 slip/skid resistance over a long length of a surface.

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 1097-8, *Tests for mechanical and physical properties of aggregates — Part 8: Determination of the polished stone value*

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

ISO 4662, *Rubber, vulcanized or thermoplastic — Determination of rebound resilience*

ISO 7619-1, *Rubber, vulcanized or thermoplastic — Determination of indentation hardness — Part 1: Durometer method (Shore hardness)*

ISO 7619-2, *Rubber, vulcanized or thermoplastic — Determination of indentation hardness — Part 2: IRHD pocket meter method*

3 Terms and definitions

For the purposes of this document, 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 or a vehicle tyre 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 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, i.e. wet/dry and presence of surface contamination.

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 skid resistance

3.4
test
procedure to determine the Pendulum Test Value at a single location or for a single sample in the laboratory. In the field a number of tests will be required to determine the slip/skid resistance of an area

4 Safety

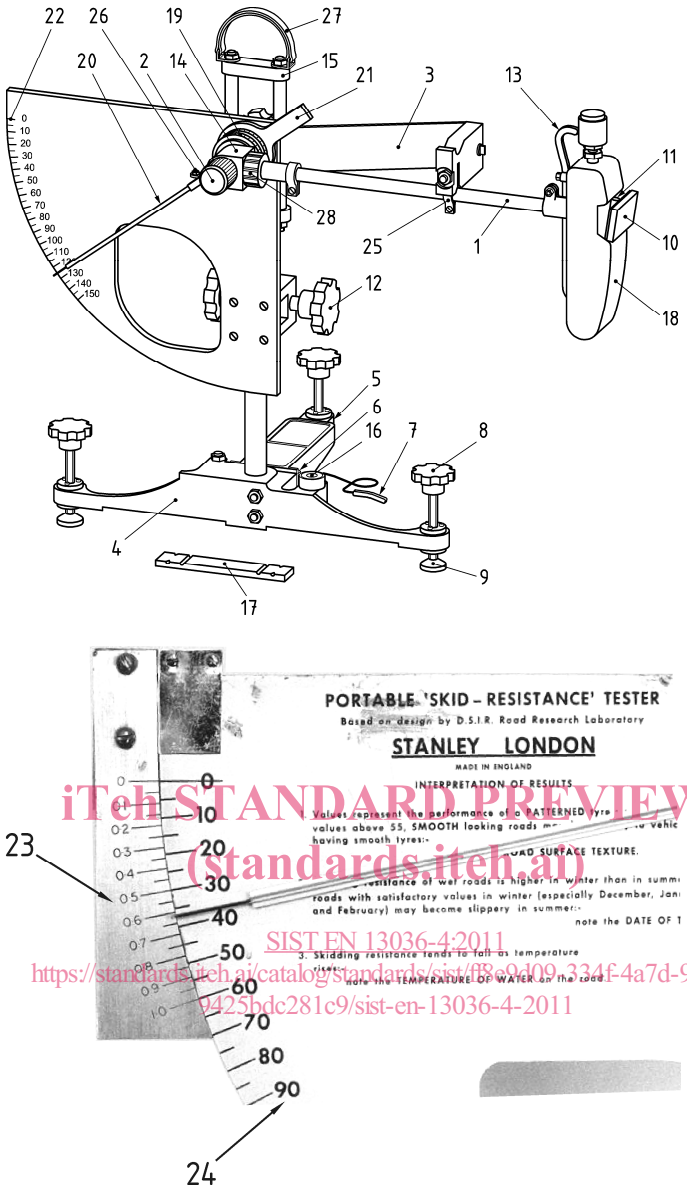
When carrying out the test in the field, the equipment and operator will form a stationary obstruction. Adequate safety measures shall be in place to maintain a safe working area in accordance with regulations.

5 Principle

The Pendulum Tester incorporates a spring-loaded slider made of a standard rubber mounted to the end of a pendulum arm. Upon releasing the pendulum arm 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 tester shall consist of the essential features given below and as illustrated in Figure 1.



Key

1 pendulum arm
2 mark (in the centre of rotation)
3 release mechanism (knob)
4 frame
5 rear support foot
6 screw for rear support foot
7 spacer of rough adjustment of the sliding length (optional)
8 levelling screw
9 bottom plate (hinged, optional)
10 slider assembly
11 slider support rod
12 vertical screw (for vertical adjustment)
13 slider lifting handle
14 pendulum head
15 clamp for vertical adjustment
16 spirit level
17 gauge (see Figure 2)
18 pendulum foot
19 friction ring (including locking ring)
20 pointer
21 pointer counterbalance
22 unit scale
23 unit scale F
24 unit scale C
25 release catch
26 pointer cam (calibration purpose: pointer adjustment screw)
27 handle
28 lock nut

Individual testers might have a slightly different configuration or appearance.

Figure 1 — Pendulum Tester

6.1.1 A spring-loaded slider assembly as specified in 6.3 (wide slider assembly) and 6.4 (narrow slider assembly). 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.

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

NOTE The three leveling screws are normally used, together with the bubble sprit level accurate to within 4' of arc (0,06º) or 1 in 1 000 however a magnetic 90º engineer's spirit level with a nominal sensitivity of 62'' of arc may be used on the vertical central pillar.

6.1.3 A frame of sufficient mass to ensure the equipment remains stable during the test.

NOTE A mass of the frame of 3,5 kg has been found suitable.

6.1.4 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 with this distance marked is required as shown in Figure 2.

NOTE The sliding length may be measured on the surface using tapered gauge 126. Alternatively, gauge 124 of thickness (8 ± 0,2) mm may be used to set the sliding length, which has appropriate marks, aligning the marks with the aluminium backing as shown in Figure 2.

Dimensions in millimetres

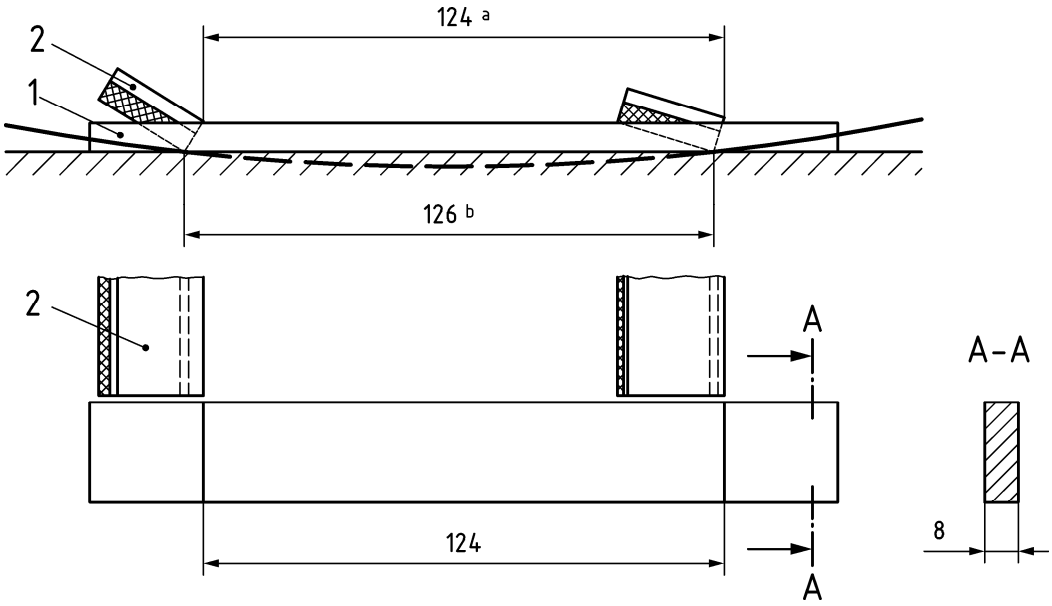


Figure 2a

Figure 2b

Key

1 gauge
2 slider
a measured sliding length
b actual sliding length

Figure 2 — Sliding length gauges

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

6.1.6 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 (unit scale). The mass of the pointer shall be not more than 85 g.

6.1.7 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.

6.1.8 A circular scale (unit scale C) as described in Table B.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 Pendulum Test Value directly.

6.1.9 A circular scale (unit scale F) as described in Table B.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 Pendulum Test Value may be estimated by calculation.

NOTE In EN 10978-8, the narrow slider and the sliding length of (76±1) mm is used.

6.1.10 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.

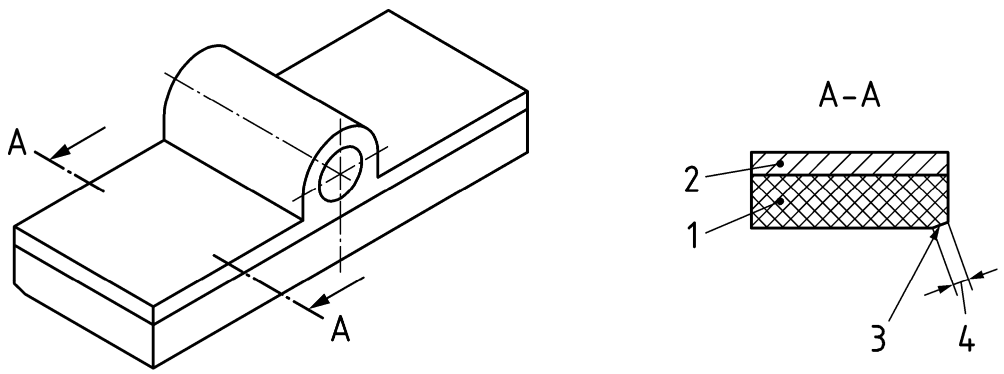
6.3 The wide slider assembly (see Figure 3) shall consist of a rubber pad (76,2 ±0,5) mm wide, (25,4 ±1,0) mm long (in the direction of swing) and (6,35 ±0,50) mm thick and an aluminium backing. The combined mass of slider assembly shall be (32 ±5) g.

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

6.5 The rubber pad shall be attached to the aluminium backing by vulcanisation or using adhesive which does not affect the rubber properties. The thickness of the rubber slider including the aluminium backing shall be in between 9,5 mm and 10,0 mm.

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 assembly shall be spring-loaded against the test surface. The static force on the slider as set by the equipment calibration procedure shall be (22,2 ± 0,5) N when deflected 4,5 mm measured upside down (see A.3.5). The change in the static force on the slider shall be not greater than 0,2 N/mm deflection of the slider (see A.3.6).



Key

1 rubber pad
2 aluminium backing
3 striking edge
4 worn edge width

Figure 3 — Slider assembly (3D and profile), also illustrating the worn width of the striking edge

6.8 Two different types of slider rubber can be used regarding to the kind of testing. The sliders are named according to the hardness of rubber, slider 57 and slider 96. The initial resilience of the rubber pad shall be measured in accordance with ISO 4662 [using the Lüpke Rebound Hammer]; the hardness of the rubber

pad(compound) shall be measured by the International Hardness Rubber Degrees (IRHD) in accordance with ISO 48 and ISO 7619-2 and the hardness of the rubber on the aluminium backing (complete pad) shall be measured by the Durometer-method (Shore A Hardness) in accordance with ISO 7619-1. The tests on the rubber pad shall be carried out on specimens made up of the same batch of rubber as the relevant pad. The results shall comply with Table 1 for slider 57 and Table 2 for slider 96. The manufacturer shall declare the measured resilience of the rubber pad, the measured IRHD values and the values of the Shore A hardness on the pad.

6.9 The hardness of the slider shall be checked after receiving from the manufacturer and at least once a year using a Shore A durometer according to ISO 7619-1. The shore A hardness of a new slider shall not differ more than 3 units from the value of shore A hardness of the slider declared by the manufacturer. A slider shall be discarded when the value of the shore A hardness differs by more than two units from the value of shore A hardness measured on the new slider after receiving from the manufacturer.

NOTE 1 Slider 57 is normally used for surfaces subject to vehicular traffic. For surfaces subject to shoe or foot usage, as detailed in the relevant standards, slider 96 may be required; this is a harder rubber.