SLOVENSKI STANDARD
SIST-TS CEN/TS 15901-11:2011

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Značilnosti cestnih in letaliških površin - 11. del: Postopek določanja torne sposobnosti vozne površine z mehanizmom za kontrolirano blokiranje v vzdolžni smeri (LFCSR): SRM

Road and airfield surface characteristics - Part 11: Procedure for determining the skid resistance of a pavement surface using a device with longitudinal block measurement (LFCSR): the SRM

Oberflächeneigenschaften von Straßen und Flugplätzen - Teil 11: Verfahren zur Bestimmung der Griffigkeit von Fahrbahndecken durch Messung des Gleitbeiwertes am blockierten Schlepprad: das SRM-Messgerät

Caractéristiques de surface des revêtements de chaussée des routes et des aérodromes - Partie 11: Mode opératoire de détermination de l'adhérence de la surface d'un revêtement de chaussée à l'aide d'un dispositif de mesure longitudinale, roue bloquée (CFLSR): le SRM

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ICS:

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

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TECHNICAL SPECIFICATION

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English Version

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Contents

Foreword

This document (CEN/TS 15901-11:2011) has been prepared by Technical Committee CEN/TC 227 “Road materials”, the secretariat of which is held by DIN.

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1 Scope

This Technical Specification describes a method for determining the skid resistance of paved surface by measurement of the longitudinal friction coefficient μ_{SRM}

The method provides a measure of the wet skid resistance properties of a bound surface by measurement of the longitudinal friction coefficient using a locked wheel with a slip ratio of 0 % (locked wheel: standard), or a slip ratio of (15 ± 1) % or ABS and a controlled speed. The test tyre is dragged over a pre-wetted pavement under controlled load and constant speed conditions while the test tyre is parallel to the direction of motion and to the pavement.

This document covers the operation of the Stuttgarter Reibungsmesser (SRM) of the IVT ETH Zürich.

2 Recommended uses

This method provides a means for the evaluation of the skid resistance of a road surface. It is suitable for use in the following situations:

— For measurement of road in service, either network monitoring for pavement management, or measurements on project-level;

— approval of new or renewed pavements;

— research measurements;

— special measurements with separately defined measuring method in winter conditions (ice, snow, frost).

3 Terms and definitions

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

3.1
friction
resistance to relative motion between two bodies in contact

NOTE The frictional force is the force which acts tangentially in the contact area.

3.2
skid resistance
characterisation of the friction of a road surface when measured in accordance with a standardised method

3.3
wet road skid resistance
property of a trafficked surface that limits relative movement between the surface and the part of a vehicle tyre in contact with the surface, when lubricated with a film of water

NOTE Factors that contribute to skid resistance include the tyre pressure, contact area, tread pattern, and rubber composition; the alignment, texture, surface contamination, and characteristics of the road surface; the vehicle speed; and the weather conditions.

The skid resistance of a road surface in Europe varies seasonally. Generally, wet skid resistance is higher in winter as a result of the effects of wet detritus and the effects of frost and wear by tyres on microtexture and macrotexture. Wet skid resistance is lower in summer as a result of dry polishing by tyres in the presence of fine detritus.

The change in skid resistance of a surface in service is affected by the volume of traffic and the composition of the traffic, i.e. cars, buses, commercial vehicles of different sizes, as the tyres of these vehicles polish and/or wear away the surfacing material in different ways. The geometry of the road will affect the change in skid resistance. Generally, tyres polish less on straight roads than on bends.

Where the surface contains aggregate with a coating of binder, e.g. bitumen, resin of Portland cement, the skid resistance will change as the coating is worn away by tyres.

3.4
longitudinal friction coefficient
LFC
ratio between horizontal force (drag) and vertical load (load) for a braked wheel in controlled conditions

NOTE 1 This is normally a decimal number quoted to two significant figures.

NOTE 2 LFC varies depending on the slip ratio of the device and the operational speed.

3.5
Longitudinal friction coefficient
SRM μ_{SRM}
ratio under controlled slipping conditions between the horizontal force (that can be activated between the test wheel and the wet surface) and the vertical wheel load of the Skiddometer

3.6
calibration
periodic adjustment of the offset, the gain and the linearity of the output of a measurement method so that all the calibrated devices of a particular type deliver the same value within a known and accepted range of uncertainty, when measuring under identical conditions within given boundaries or parameters

NOTE The method of calibration of the reference device is given in Clause 6.

3.7
SRM

acronym SRM applies to a device developed by Forschungsinstitut für Kraftfahrwesen und Fahrzeugmotoren Stuttgart (FKFS) to perform routine measurements of friction for long road-sections or punctual measurements at different speeds to characterise a particular section

3.8
operating speed
speed at which the device traverses the surface

3.9
slip speed
relative speed between the test tyre and the travelled surface in the contact area

3.10
slip ratio
quotient of the slip speed divided by the operating speed

3.11
wheel path
parts of the pavement surface where the majority of vehicle wheel passes are concentrated

NOTE The wheel path is not a fixed location on a pavement surface. On a worn pavement, the wheel path is usually easily identified visually. On a newly laid surface, the position of the wheel path has to be estimated by experienced operators.

For special circumstances such as acceptance tests, a particular path may be defined, for example, (700 ± 150) mm from the edge of the running lane of a road.

3.12
theoretical water film thickness
theoretical thickness of a water film deposited on the surface in front of the measuring tyre, assuming the surface has zero texture depth

3.13
repeatability
maximum difference expected between two measurements made by the same machine, with the same tyre, operated by the same crew on the same section of road in a short space of time, with a probability of 95 %

3.14
reproducibility
maximum difference expected between two measurements made by different machines, with different tyres, operated by different crews on the same section of road in a short space of time, with a probability of 95 %

4 Safety

Safety measures shall be in place to maintain safe working practice in accordance with current regulations, and to ensure the safety of other road users, including measures to control traffic as necessary.

NOTE The wetting of surfaces can have an effect on other users of the site and every effort should be made to ensure that they do not have to make any sudden changes in speed or direction.

When measuring skid resistance on trafficked roads the SRM may operate at speeds different to normal road speeds and as a result can create a hazard to other road users. The test speed specified when calling for tests in accordance with this standard should take this into account.

Testing should not be carried out if there is a risk of water freezing on the pavement.

5 Principle

5.1 Principle of measurements

The SRM operate on the principle that the measuring wheel allows the simulation and investigation of a locked braking situation. The system supports measurements in the right and the left wheel path. The braking sequences consist of blocked-wheel sections and free-wheeling sections on specific test speeds.

Figure 1 — Test truck with test equipment

5.2 Operating principle

The measuring wheel at the rear of the vehicle is mounted in the wheel path and is applied to the road surface under a known vertical load. The pneumatic load unit provides a constant and accurate control of the wheel load. A controlled flow of water pre-wets the road surface immediately in front of the test wheel, so that when it moves forward, the test wheel slides in the forward direction along the surface. Different water film thicknesses (0 mm to 3 mm, usual is 0,5 mm) and measuring speeds of 40 km/h, 60 km/h, 80 km/h and 100 km/h can be selected. Section lengths of up to 50 km can be measured with one water tank filling.

Due to the construction of the measurement vehicle (20 ton truck) the measuring speed, limits for the curve radius and the width of the lane (road with oncoming traffic) are given.

6 Key characteristics

6.1 General

The minimum requirements to ensure a good repeatability and reproducibility of the devices results are listed below.

6.2 Test equipment

The test equipment includes the following features:

a) test wheel assembly;

b) water supply and flow control mechanism;

c) PC controlled electronic measurement unit.