SLOVENSKI STANDARD
kSIST-TS FprCEN/TS 15901-15:2014

01-januar-2014

Značilnosti cestnih in letaliških površin - 15. del: Postopek določanja torne sposobnosti vozne površine z mehanizmom za kontroliran zdrs v vzdolžni smeri (LFCI): IMAG

Road and airfield surface characteristics - Part 15: Procedure for determining the skid resistance of a pavement surface using a device with longitudinal controlled slip (LFCI): The IMAG

Oberflächeneigenschaften von Straßen und Flugplätzen - Teil 15: Verfahren zur Bestimmung der Griffigkeit von Fahrbahndecken durch Verwendung eines Geräts mit geregeltem Schlupf in Längsrichtung (LFCE): Das IMAG-Gerät

Caractéristiques de surface des routes et aéroports - Partie 15: Mode opératoire de détermination de l'adhérence d'un revêtement de chaussée à l'aide d'un dispositif à glissement longitudinal contrôlé (CFLI): IMAG

Ta slovenski standard je istoveten z: **FprCEN/TS 15901-15**

ICS:

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

kSIST-TS FprCEN/TS 15901-15:2014 **en,fr,de**

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

FINAL DRAFT FprCEN/TS 15901-15

October 2013

ICS 93.080.20; 93.120

English Version

Road and airfield surface characteristics - Part 15: Procedure for determining the skid resistance of a pavement surface using a device with longitudinal controlled slip (LFCI): The IMAG

Caractéristiques de surface des routes et aéroports - Partie 15: Mode opératoire de détermination de l'adhérence d'un revêtement de chaussée à l'aide d'un dispositif à glissement longitudinal contrôlé (CFLI): IMAG

Oberflächeneigenschaften von Straßen und Flugplätzen - Teil 15: Verfahren zur Bestimmung der Griffigkeit von Fahrbahndecken durch Verwendung eines Geräts mit geregeltem Schlupf in Längsrichtung (LFCE): Das IMAG-Gerät

This draft Technical Specification is submitted to CEN members for formal vote. It has been drawn up by the Technical Committee CEN/TC 227.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a Technical Specification. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a Technical Specification.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword

This document (FprCEN/TS 15901-15:2013) has been prepared by Technical Committee CEN/TC 227 “Road materials”, the secretariat of which is held by DIN.

This document is currently submitted to the Formal Vote.

1 Scope

This Technical Specification describes a method only used on airports for determining the skid resistance of pavements by measurement of the longitudinal friction coefficient LFCI.

The method provides a measure of the wet skid resistance properties of a bound surface by measurement of the longitudinal friction coefficient using a trailer with a standard slip ratio of 15 %. The slip ratio can be chosen between 0 % and 100 % for research application.

The test tyre is dragged over a pre-wetted pavement under vertical force and constant speed conditions while the test tyre is parallel to the direction of motion.

This Technical Specification covers the operation of the IMAG device.

The skid resistance of a pavement is determined by friction measurements at different speeds. Tests can be performed between 40 km/h and 120 km/h but standard test speeds are 40 km/h, 65 km/h and 95 km/h. Low speed measurements asses the microtexture while high speed measurements asses the macrotexture. The skid resistance is reported as friction measurements at these speeds and by comparison with the minimum friction level.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

PIARC Technical Document. *Specification for a standard test tyre for friction coefficient measurement of a pavement surface: Smooth test tyre (2004-03))*

ISO 5725-2:1994, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*

3 Recommended uses

The IMAG is used in the following fields of application:

— monitoring of airport pavements (Pavement Management) according to ICAO Annex 14 Attachment A 7,

— approval of new surfacing according to ICAO Annex 14 Attachment A 7,

— investigation of surface skid resistance,

— measurements on project-level compliance,

— comparative measurements among different devices,

— measurements on contaminated (ice or snow covered) airport pavements (not covered by this Technical Specification) according to ICAO Annex 14 Attachment A 6,

— research measurements.

4 Terms and definitions

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

4.1
contact area
overall area of the road surface instantaneously in contact with a tyre

Note 1 to entry: This term describes the overall area generally covered by the tyre. Due to the effects of surface texture or any tyre tread pattern, not all of the tyre or road surface in the contact area may be in contact at any instant.

4.2
friction
resistance to relative motion between two bodies in contact, the frictional force being the force which acts tangentially in the contact area

4.3
vertical force (load)
force applied by the wheel assembly on the contact area

Note 1 to entry: Some devices use an assumed load based on the static load.

4.4
horizontal force (drag)
horizontal force acting tangentially on the test wheel in line with the direction of travel

4.5
slip ratio
slip speed divided by the operating speed

4.6
longitudinal friction coefficient
LFC
ratio between horizontal force (drag) and vertical force (load) for a braked wheel in controlled conditions, which is normally a decimal number quoted to two significant figures

Note 1 to entry: LFC varies depending on the slip ratio of the device and the operational speed.

4.7
skid resistance
characterisation of the friction of a road surface when measured in accordance with a standardised method

4.8
wet 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 1 to entry: Factors that contribute to skid resistance include the tyre pressure, contact area, tread pattern, and rubber composition; the alignment, texture, surface pollution, and characteristics of the road surface; the vehicle speed; and the weather conditions.

The change in skid resistance of a surface in service is affected by the volume of traffic and the composition of the traffic, as the tyres of these vehicles polish and/or wear away the surfacing material in different ways. Rubber debris especially affects wet skid resistance.

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

4.9
fixed slip
condition in which a braking system forces the test wheel to roll at a fixed reduction of its operating speed

4.10
fixed slip friction
friction between a test tyre and a airfield surface when the wheel is controlled to move at a fixed proportion of its natural speed

4.11
longitudinal friction coefficient IMAG (LFCI)
ratio between the horizontal force in the direction of the motion that can be activated between the test wheel and the wet pavement and the vertical wheel force accomplished under controlled slipping conditions

Note 1 to entry: The controlled slipping condition of the test wheel is achieved by a hydraulic pump and a hydraulic servo-valve enslaved by the sensors of the IMAG.

4.12
sampling length or sampling interval
distance over which responses of the sensors are sampled to determine a single measurement of the recorded variables

Note 1 to entry: The sampling length depends upon the detailed operation of device and its recording system; a number of samples may be combined to determine a measurement for a subsection.

Note 2 to entry: This should not be confused with horizontal resolution which is the shortest distance over which a change in the measured parameter can be detected.

4.13
microtexture
deviation of a pavement from a true planar pavement with characteristic dimensions along the pavement of less than 0,5 mm, corresponding to texture wavelengths with one-third-octave bands and up to 0,5 mm centre wavelengths

Note 1 to entry: Peak to peak amplitudes normally vary in the range 0,001 mm to 0,5 mm.

Note 2 to entry: Microtexture is a primary component in skid resistance at low speeds. Those devices that utilise a relatively low slip speed primarily measure the component of friction affected by microtexture.

4.14
macrotexture
deviation of a pavement from a true planar pavement with characteristic dimensions along the pavement of 0,5 mm to 50 mm, corresponding to texture wavelengths with one-third-octave bands including the range 0,63 mm to 50 mm centre wavelengths

Note 1 to entry: Peak to peak amplitudes normally vary in the range 0,1 mm to 20 mm.

Note 2 to entry: Macrotexture is a major factor influencing skid resistance at high speeds but it also has an effect at low speeds.

4.15
mean profile depth
descriptor of macrotexture, obtained from a texture profile measurement as defined in EN ISO 13473-1 and ISO 13473-2

4.16
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 1 to entry: The calibration method for IMAG is given in Clause 10.

4.17
repeatability
r
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 %

4.18
reproducibility
R
maximum difference expected between two measurements made by different machines with different tyres using different crews on the same section of road in a short space of time, with a probability of 95 %

4.19
IMAG
acronym applying to a device, developed by the “Service Technique des Bases Aériennes” in France in cooperation with the “Aéroports de Paris”, to perform routine, continuous measurements of friction for airport pavement

Note 1 to entry: A device conforming to the general characteristics of the IMAG and the specific provisions of this Technical Specification should be used for the tests.

4.20
operating speed
speed at which the device traverses the test surface, with the IMAG normally working to test speeds between 40 km/h to 120 km/h

4.21
slip speed
relative speed between the tyre and the travelled surface in the contact area

4.22
wheel path
parts of the pavement surface where the majority of wheel passes are concentrated

Note 1 to entry: The wheel path is not a fixed location on a pavement surface. It should correspond to the most circulated area and is usually comprised between 3 m and 7 m from the centre line of the runway.

For special circumstances such as acceptance tests, a particular path may be defined.

4.23
water delivery system
system for depositing a given amount of water in front of the test tyre so that it then passes between the tyre and the surface being measured

4.24
water flow rate
rate (litres/second) at which water is deposited on the surface to be measured in front of the test tyre

4.25
theoretical water film thickness
theoretical thickness of a water film deposited on the surface in front of the test tyre, assuming the surface has zero texture depth

4.26
subsection
defined length of surface for which one set of the measured variables is reported by the device

Note 1 to entry: Different subsections can be used, but skid resistance parameters are generally reported each 100 m, each third of the runway, and for the whole runway.

4.27
test section
length of runway between defined points (e.g. location references, specific features or measured distances) comprising a number of subsections over which a continuous sequence of measurements is made

4.28
reference device
the reference device is a particular measurement device selected as a reference for the correlation of other friction measuring device. This device is described in ASTM E2100-04

5 Safety

Safety measures shall maintain safe working conditions in accordance with current regulations, to ensure the safety of test operators and other users (including measures to control traffic).

When measuring skid resistance on runways, test operator shall ensure traffic is stopped and start measures against the direction of traffic movement.

Tests that involve water deposition should not be carried out if there is a risk of water freezing on the pavement.

6 Essential characteristics

6.1 Principle of measurements

Devices complying with this Technical Specification operate on the principle that the test wheel allows the simulation and investigation of a real braking situation. The test wheel is loaded and towed at a constant speed and then brake at a fix slip ratio. Friction at tyre/pavement interface is created through partial slipping of the test tyre.

The runway is pre-wetted with a theoretical defined water film thickness of 1 mm in front of the test wheel.

6.2 Description of IMAG

The device is a trailer and consists of a principal frame with two wheels fitted on articulated arms. This frame supports an articulated measuring frame equipped with loaded test wheel and a hydraulically controlled braking system (ASTM E2100-04). A typical device is illustrated in Figure 1. The IMAG is equipped with:

- two distance transducers (CO1 and CO2) for distance and speed measurement,
- three force transducers (T1, T2 and Fv) for horizontal and vertical force measurements,
- one torque transducer (CC, not used for maintenance purpose but for winter measurements and research), and
- one speed transducer (GT) for measurement of test wheel speed.

The vertical force is set at a nominal level and applied to test tyre by a system with shock absorber.