PUBLICLY AVAILABLE SPECIFICATION

ISO/PAS 13473-6

First edition
2021-11

Characterization of pavement texture by use of surface profiles —

Part 6: Verification of the performance of laser profilometers used for pavement texture measurements

Caractérisation de la texture d'un revêtement de chaussée à partir de relevés de profils de la surface —

Partie 6: Vérification de la performance des profilomètres lasers utilisés pour les mesurages de la texture d'un revêtement

Reference number
ISO/PAS 13473-6:2021(E)

© ISO 2021



COPYRIGHT PROTECTED DOCUMENT

© ISO 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

© ISO 2021 – All rights reserved

Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Symbols and abbreviated terms **2**
5 Methodology and its use **3**
6 Identification and evaluation of design and performance parameters **3**
7 Test methods and instruments **4**
7.1 General conditions 4
7.2 Laser power 4
7.2.1 Test method 4
7.2.2 Instruments 4
7.3 Laser spot size 5
7.3.1 Test method 5
7.3.2 Instruments 5
7.4 Accuracy of the calibration (scale) factor 5
7.4.1 General 5
7.4.2 Method and instruments 6
7.5 Nonlinearity 6
7.5.1 General 6
7.5.2 Test method 6
7.5.3 Instruments 6
7.6 Background noise 6
7.6.1 Method 6
7.6.2 Evaluation of the result 7
7.7 Horizontal position measurement accuracy 7
7.7.1 Test method for mobile (continuous) systems 7
7.7.2 Test method for stationary (spot) systems 7
7.8 Sensitivity to abrupt change in surface reflectivity 7
7.8.1 Method 7
7.8.2 Instruments 8
7.9 Spike content of measured signal 8
7.10 Effect of ambient light 8
7.10.1 Method 8
7.10.2 Instruments 8
7.11 Dropout rate 9
7.11.1 Method 9
7.11.2 Instruments 9
7.12 Validation of dropout detection system 9
7.12.1 Method 9
7.12.2 Instruments 10
7.13 Synchronization between invalid parts of the profile and dropout indications 10
7.13.1 Method 10
7.13.2 Instruments 10
8 Ambient testing conditions **11**
9 Frequency of testing **11**
10 Test report **11**
Annex A (informative) **Testing the calculation procedure (software)** **13**

© ISO 2021 – All rights reserved

Bibliography **14**

© ISO 2021 – All rights reserved

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

A list of all parts in the ISO 13473 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

© ISO 2021 – All rights reserved

Introduction

Pavement texture data are often used in research and surveys of pavement surface properties, such as tyre/road noise, rolling resistance, skid resistance, as well as splash and spray. Measurements of pavement texture are used in several other ISO standards; mostly to characterize test or reference surfaces.

For the measurement of pavement surface texture, laser profilometers are most frequently used. In recent years, it has appeared that, despite the use of standard methods (such as those in other parts of ISO 13473), there can be differences between results measured by various equipment, exceeding normal uncertainty estimations. One of the reasons for this can be that the equipment does not fully meet the intentions of the standards; for example ISO 13473-3[3].

To deal with this problem, this document specifies how one can verify that a particular device meets the intended characteristics of laser profilometer systems used for pavement texture measurements.

WARNING — Emitted laser beams could be hazardous for the eye and all tests done according to this standard shall be done with the appropriate safety precautions for the specific sensor.

© ISO 2021 – All rights reserved

Characterization of pavement texture by use of surface profiles —

Part 6: Verification of the performance of laser profilometers used for pavement texture measurements

1 Scope

This document describes methods for checking laser profilometer performance with respect to the capability of such equipment in measuring pavement texture.

The objective of this document is to make available an internationally accepted procedure by which performance of various laser-based equipment for pavement texture measurements can be evaluated. The document includes guidelines and recommendations intended to assist users of laser profilometers in verification of their equipment. This document is not intended as the basis for qualifying or approving laser profilometers. The procedure aims at providing tools for verifying that such systems perform satisfactory in all respects important for the correct measurements of texture, as well as to detect when and in what way the performance is unsatisfactory. This document also provides some general information about the limitations and trade-offs of laser profilometer systems.

Modern profilometers in use for measurements on pavements are almost entirely of the contactless type (such as laser point or line triangulation) designed for two- or three-dimensional measurements, and this document is intended for evaluating the performance of this type of profilometers. However, some other contactless types of profilometer can use applicable parts of ISO 13473.

This document has been prepared as a result of a need identified to correct for unacceptable differences in results measured by various equipment, even if the operators of these claim that they meet the applicable part of ISO 13473. It is not intended for other applications than pavement texture measurement. To be able to exclude errors influenced by programming mistakes or wrong interpretation of ISO 13473-1 a reference program code, digital profiles and calculated reference MPD-values can be reached via Annex A. This document is a complement to other parts of ISO 13473 in which some specifications are given but methods to check them are not included.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 13473-1, *Characterization of pavement texture by use of surface profiles — Part 1: Determination of mean profile depth*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13473-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

© ISO 2021 – All rights reserved

— IEC Electropedia: available at https://www.electropedia.org/

3.1
laser profilometer
equipment for contactless pavement texture measurement using a laser spot or line projected on the surface captured by a device that accurately digitizes and records texture profiles when the system is moved over the pavement surface

3.2
background noise
variation of the signal when the measurement system is at rest

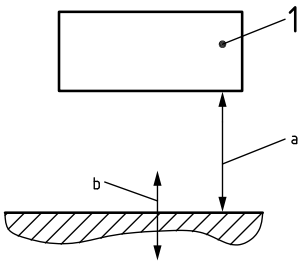
Note 1 to entry: Such noise often is of the type that is called white noise.

3.3
measurement range
range of values of vertical distance covered by the sensor,

Note 1 to entry: See Figure 1.

3.4
standoff
distance between middle of the *measurement range* (3.3) and pavement

Note 1 to entry: See Figure 1.



Key

1 sensor
a Standoff.
b Measurement range.

Figure 1 — Illustration of the terms measurement range and standoff

4 Symbols and abbreviated terms

A list of symbols and abbreviations used in this document is given in Table 1.

Table 1 — The meaning of symbols and abbreviations

Symbol or term	Reference document	Meaning
DAC	EN 13108-1	Dense Asphalt Concrete (pavement)
MPD	ISO 13473-1	Mean Profile Depth
MSD	ISO 13473-1	Mean Segment Depth
PA	EN 13108-7	Porous Asphalt (pavement)
RMS	ISO 13473-1	Root Mean Square
SMA	EN 13108-5	Stone Mastic Asphalt (pavement)

© ISO 2021 – All rights reserved