
Akustika - Merjenje vpliva cestnih površin na prometni hrup - 2. del: Metoda merjenja v neposredni bližini (ISO 11819-2:2017)

Acoustics - Measurement of the influence of road surfaces on traffic noise - Part 2: The close-proximity method (ISO 11819-2:2017)

Akustik - Messung des Einflusses von Straßenoberflächen auf Verkehrsgeräusche - Teil 1: Nahfeldmessmethode (ISO 11819-2:2017)

Acoustique - Méthode de mesurage de l'influence des revêtements de chaussées sur le bruit émis par la circulation - Partie 2: Méthode de proximité immédiate (ISO 11819-2:2017)

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**Acoustics - Measurement of the influence of road surfaces
on traffic noise - Part 2: The close-proximity method (ISO
11819-2:2017)**

Acoustique - Méthode de mesurage de l'influence des
revêtements de chaussées sur le bruit émis par la
circulation - Partie 2: Méthode de proximité immédiate
(ISO 11819-2:2017)

Akustik - Messung des Einflusses von
Straßenoberflächen auf Verkehrsgeräusche - Teil 2:
Nahfeldmessverfahren (ISO 11819-2:2017)

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European foreword

This document (EN ISO 11819-2:2017) has been prepared by Technical Committee ISO/TC 43 “Acoustics” in collaboration with 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of an identical text or by endorsement, at the latest by October 2017, and conflicting national standards shall be withdrawn at the latest by October 2017.

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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).

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For an explanation on 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 the following URL: 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 11819 series can be found on the ISO website.

ISO 11819-2:2017(E)

Introduction

The emission and propagation of road traffic noise greatly depends on road surface characteristics, notably on texture, flow resistivity and acoustic absorption. All these characteristics influence the generation of tyre/road noise and, in addition, the acoustic absorption can influence the propagation of sound, particularly when the propagation takes place close to the surface. Power unit noise, which is usually generated at a greater height above the road surface than tyre/road noise, may also be affected during propagation by the porosity characteristics of the road surface. These effects lead to differences in sound pressure levels, associated with a given traffic flow and composition, from different road surfaces of up to 15 dB, which can have a substantial impact on the environmental quality alongside a road.

It is therefore important to be able to measure the influence of surface characteristics on tyre/road noise by a standardized method. Within the constraints of this method, this document offers an objective rating of the road characteristics to satisfy a need expressed by road planners, road administrators, contractors, manufacturers of so-called “low-noise surfaces” and other parties concerned with the control of road traffic noise.

A method satisfying the needs expressed in the foregoing, but having serious practical constraints, appears in ISO 11819-1. That method, called the statistical pass-by (SPB) method, is intended for use essentially for two main purposes. It can be used: first, to classify surfaces in typical and good condition as a type according to their influence on traffic noise (surface classification); and second, to evaluate the influence on traffic noise of different surfaces at particular sites irrespective of condition and age. However, due to severe requirements on the acoustical environment at the measurement site, the method cannot generally be used for approval of new or rebuilt surfaces at any arbitrary location. In addition, the SPB method has a number of other practical limitations, which are outlined in [Annex D](#).

The method specified in this document, together with ISO/TS 11819-3, complements the SPB method in applications where the latter has limitations.

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Acoustics — Measurement of the influence of road surfaces on traffic noise —

Part 2: The close-proximity method

1 Scope

This document specifies a method of evaluating different road surfaces with respect to their influence on traffic noise, under conditions when tyre/road noise dominates. The interpretation of the results applies to free-flowing traffic travelling on essentially level roads at constant speeds of 40 km/h and upwards, in which cases tyre/road noise is assumed to dominate (although in some countries it is possible that tyre/road noise does not dominate at 40 km/h when the proportion of heavy vehicles is high). For other driving conditions where traffic is not free-flowing, such as at junctions or under heavy acceleration, and where the traffic is congested, the influence of the road surface on noise emission is more complex. This is also the case for roads with high longitudinal gradients and a high proportion of heavy vehicles.

A standard method for comparing noise characteristics of road surfaces gives road and environment authorities a tool for establishing common practices or limits as to the use of surfacings meeting certain noise criteria. However, it is not within the scope of this document to suggest such criteria.

ISO 11819-1 defines another method: the statistical pass-by (SPB) method. The close-proximity (CPX) method specified in the present document has the same main objectives as the SPB method, but is intended to be used specifically in applications that are complementary to it, such as:

- noise characterization of road surfaces at almost any arbitrary site, with the main purpose of checking compliance with a surface specification (an example for conformity of production is suggested in Reference [1]);
- checking the acoustic effect of maintenance and condition, e.g. wear of and damage to surfaces, as well as clogging and the effect of cleaning of porous surfaces;
- checking the longitudinal and lateral homogeneity of a road section;
- the development of quieter road surfaces and research on tyre/road interaction.

NOTE This document does not describe the conditions of application for formal purposes of the measurement with the CPX method. Such conditions may be defined in other standards or legal texts. However, suggestions for the applicability of ISO 11819-1 and this document are provided in [Annex D](#).

Measurements with the CPX method are faster and more practical than with the SPB method, but are more limited in the sense that it is relevant only in cases where tyre/road noise dominates and power unit noise can be neglected. Furthermore, it cannot take heavy vehicle tyre/road noise into account as fully as the SPB method can, since it uses a light truck tyre as a proxy for heavy vehicle tyres and does not take power unit noise into account.

The CPX method specified in this document is intended to measure the properties of road surfaces, not the properties of tyres. If the method is used for research purposes, to provide an indication of differences between tyres, the loads and inflations would normally be adjusted to other values than specified in this document.

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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 5725-2, *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*

ISO 11819-1, *Acoustics — Measurement of the influence of road surfaces on traffic noise — Part 1: Statistical Pass-By method*

ISO/TS 11819-3, *Acoustics — Measurement of the influence of road surfaces on traffic noise — Part 3: Reference tyres*

ISO/TS 13471-1, *Acoustics — Temperature influence on tyre/road noise measurement — Part 1: Correction for temperature when testing with the CPX method*

IEC 60942, *Electroacoustics — Sound calibrators*

IEC 61260-1, *Electroacoustics — Octave-band and fractional-octave-band filters — Part 1: Specifications*

IEC 61672-1, *Electroacoustics — Sound level meters — Part 1: Specifications*

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11819-1 and the following apply.

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 Road and pavement related definitions

3.1.1

road section

total stretch of the road lane subject to testing

3.1.2

road segment

part of a road section, being 20 m long and intended for normalization of sound pressure levels from the actual speed on that segment to a certain reference speed

3.2 Measurement methods and equipment

3.2.1

statistical pass-by method

SPB method

measurement procedure designed to evaluate vehicle and traffic noise generated on different sections of road surface under specific traffic conditions

Note 1 to entry: The measurements are taken from a great number of vehicles operating normally on the road. Results obtained using this procedure are normalized to standard speeds according to the category or type of road being considered. The method is specified in ISO 11819-1.

3.2.2

reference tyres

test tyres specified for the purpose of representing certain features in tyre/road sound emission, designed and constructed for use in this method with specified and reproducible standard properties

Note 1 to entry: The reference tyres are specified in ISO/TS 11819-3.

3.3 Acoustic quantities and symbols

3.3.1

close-proximity level

CPX level

L_{CPX}

time-averaged A-weighted sound pressure level (SPL) of the tyre/road noise as determined by the CPX method, either broadband or spectral bands, as required

Note 1 to entry: The CPX level is expressed in decibels. In order to provide more information, additional suffixes are used; see [Table 1](#).

3.3.2

CPX level for passenger cars and other light vehicles

$L_{CPX:P}$

A-weighted sound pressure level characterizing the road surface under test, which is based on the tyre/road sound pressure levels of one or more tyres representative of passenger car tyres

Note 1 to entry: The $L_{CPX:P}$ is expressed in decibels. Passenger car tyres are denoted P1, P2

3.3.3

CPX level for heavy vehicles

$L_{CPX:H}$

A-weighted sound pressure level characterizing the road surface under test, which is based on the tyre/road sound pressure levels of one or more tyres representative of heavy vehicle tyres

Note 1 to entry: The $L_{CPX:H}$ is expressed in decibels. Heavy vehicle tyres are denoted H1, H2

3.3.4

CPX index

$L_{CPX:I}$

index composed of the weighted average of the CPX level for passenger cars and other light vehicles ($L_{CPX:P}$) and CPX level for heavy vehicles ($L_{CPX:H}$)

Note 1 to entry: The $L_{CPX:I}$ is expressed in decibels. The method is intended to describe performance of road surfaces for a certain traffic composition in a similar way to the SPB method in ISO 11819-1, although the numerical values for a given speed are higher. More information on the calculation of CPX indices is given in [Annex M](#).

3.3.5

acoustic variability due to road surface inhomogeneities

s_t

standard deviation of the A-weighted sound pressure levels over all segments, when using reference tyre t

Note 1 to entry: The acoustic variability is expressed in decibels. This variability is normally dominated by road surface variations, although random uncertainties could add a little. Measurement speed and wheel tracks normally do not influence this value significantly. This measure is, therefore, considered to be an indication of road surface homogeneity as far as noise properties are concerned.