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Tyre sound emission test — Methods of drum

Essai d'émissions acoustiques de pneumatique — Méthode avec un tambour

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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).

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 31, *Tyres, rims and valves*.

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.

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Introduction

The external sound emission of a tyre is one out of a multitude of requirements that need to be considered by manufacturers during design and development of tyres. For health and environmental protection reasons, the sound emission should be reduced under all relevant driving conditions. To meet all these demands, an efficient test site is needed that can be operated the whole year round independent of weather conditions or other outside factors. In many countries, the meteorological conditions are so adverse that outdoor testing on a classical proving ground is only possible in a very limited timeframe. Furthermore, performing sound emission tests on various test tracks highly increases the uncertainty and multiplies the workload for a manufacturer.

This document gives specifications for an indoor noise test bench and a test procedure that delivers precise results for indoor testing, comparable to a certified type approval test track. The results are intended to be within the run-to-run variation of the actual valid exterior noise test described in ISO 13325, which is the test standard used for type approval of tyres. An indoor test bench requires tight specifications for the equipment and set up, such as the acoustical treatment of the walls and the ceiling, the microphone array, the roller bench, the adjustment of the tyre load on the roller bench. Special treatment needs to ensure that all rolling sound components of the tyre are comparable to the rolling sound on a road surface as specified in ISO 10844 and as applied in type approvals. This document provides all necessary specifications and procedures to ensure comparability between todays common and well accepted testing on outdoor test tracks with future indoor facilities. It incorporates all relevant International Standards for equipment, measurement uncertainty and test procedures.

The current outdoor method (described in ISO 13325) requests the vehicle to move at various speeds in between two microphones. This imposes to the tyre a high rotation speed which is at the source of sound emission, by creating tyre parts movements, slip and shocks against the track surface. As a vehicle, movement is not possible in a semi-anechoic room, the rotation of a drum is used to create tyre rotation similar to the one observed on track. In order to create excitation similar to the one created on the track, the drum is coated with a surface similar to the one of the tracks. Finally, the vehicle trajectory between the microphones is simulated by a line of microphones, signals of each microphone being used to estimate the noise level of the car moving between microphones.

The results are intended to be within the run-to-run variation of the actual valid exterior noise test described in ISO 13325.

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Tyre sound emission test — Methods of drum

1 Scope

This document specifies methods for measuring tyre-to-road sound emissions from tyres fitted on rig that applies the tyre on a rotating drum under coast-by conditions (i.e. when the tyre is in free-rolling, non-powered operation).

The specifications are intended to achieve a correlation between results of testing the exterior noise of tyres in a semi anechoic chamber and outdoor testing as described in ISO 13325.

This document is applicable to passenger cars and light commercial vehicles tyres as defined in 3.1. It is not intended to be used to determine the sound contribution of tyres applying a torque, nor for the determination of traffic sound nuisance at a given location.

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

ISO 3745:2012/Amd 1:2017, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Precision methods for anechoic rooms and hemi-anechoic rooms*

ISO 4000-1, *Passenger car tyres and rims — Part 1: Tyres (metric series)*

ISO 4209-1, *Truck and bus tyres and rims (metric series) — Part 1: Tyres*

ISO 4223-1:2017, *Definitions of some terms used in the tyre industry — Part 1: Pneumatic tyres*

ISO 10844, *Acoustics — Specification of test tracks for measuring sound emitted by road vehicles and their tyres*

ISO 13325:2019, *Tyres — Coast-by methods for measurement of tyre-to-road sound emission*

ISO 26101-1, *Acoustics — Test methods for the qualification of the acoustic environment — Part 1: Qualification of free-field environments*

IEC 60942, *Electroacoustics — Sound calibrators*

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

IEC 61672-3, *Electroacoustics — Sound level meters — Part 3: Periodic tests*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4223-1 and the following apply.

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

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

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