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Acoustics — Measurement of interior vehicle noise

Acoustique — Mesurage du bruit intérieur des véhicules

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Foreword

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

This second edition cancels and replaces the first edition (ISO 5128:1980), which has been technically revised.

The main changes are as follows:

— new technology neutral test method;

— updated test equipment;

— updated facility descriptions;

— new evaluation principle (instead $L_{\max}$ to $L_{A,eq}$)

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.

Introduction

This measurement procedure for interior vehicle noise as presented by this document has been completely revised to better match the application needs.

The interior noise of modern vehicles has such improved, that hearing damages even under high engine speeds and loads are unlikely. Assessments on the application of the document reveal a changed focus on protection of drivers and passenger in a direction of long-term exposure in a sense of working place protection.

In most countries provisions exist, which regulate the noise burden on workers on a basis of a noise exposure over a period of 8 hours per day, a full working week over a work life of 35 years. In addition, aspects of driver distraction and fatigue have become a stronger emphasis. In order to match this application, it is no longer given to determine the maximum sound level from a set of measurements, as was provided by the previous release.

The target of this edition is to determine a time average interior sound level, which is representative for the typical driving and use of a vehicle. Therefore, in-use driving statistics were reviewed and new in-use driving data generated by the group members. A strong focus was put on the WLTP, WHVC and VECTO statistics [1][2][3] which so far provides the biggest source of statistical information.

However, it should be kept in mind that the sound inside a vehicle is strongly influenced by external factors. These factors are different for various vehicle categories. During normal driving for passenger cars at low engine speeds and loads, the sound inside the cabin comes mainly from tyre rolling sound transferred via structure- and air paths. The excitation of the tyre is dependent on the structure of the surface and the characteristics of the tyre, such as the hardness of the rubber and the tyre dimension. This standard cannot cover all eventual excitation models for smooth and rough roads or soft and hard tyres. For reproducibility a road texture has been chosen, which is commonly used in test centre.

For heavy commercial vehicles with large cabin, wind noise can become very dominant at speeds beyond 60 km/h. The wind direction, especially as lateral wind, can be very changeable.

The driving cycles differ strongly with regard to vehicle categories, the used speeds and accelerations dependent on the area, where the vehicles are used. The document provides individual cycles for urban, suburban, rural and motorway conditions, all four applicable to light duty vehicles and three of them for heavy duty vehicles. In urban and suburban areas, the interior sound of a vehicle is a mixture of powertrain and tyre rolling sound components. For rural and motorway conditions the influence of powertrain is reduced but wind noise provides a stronger contribution, especially for large trucks and buses.

The combination of the cycles is very much dependent on the typical use of a vehicle. A large variation may exist for the same product. This document focuses on a typical use for vehicle categories, but it has to be kept in mind, that a substantially different use, may lead to other results. A standardized data processing for a given vehicle category will allow benchmarking of products. The availability of the individual cycle results enables as well an estimation of the interior sound for other conditions of use.

Another important factor is the total driving time within the concept of a working day. While it appears obvious that long haulage trucks are driven many hours per day, a delivery service in a town will have a mix between driving and loading/unloading work. Where test results of this document are used with regard to occupational noise exposure standards, it is essential to consider the time contribution according to the typical use of a vehicle. Again, a large variability should be kept in mind. The test results of this document allow as well the calculation for conditions, other than selected by this document.

All definitions in this document are based on design neutral parameters – as far as practically possible – to enable an application for all kind of vehicle technologies, inclusive of hybrid vehicles and pure electric vehicles.

The test procedures and calculation schemes are engineering methods and compromise between precision, repeatability, feasibility and simplicity.