

Mechanical vibration — Laboratory method for evaluating vehicle seat vibration —

Part 1: Basic requirements

ICS 17.160



National foreword

This British Standard is the UK implementation of EN 30326-1:1994+A2:2011. It is identical with ISO 10326-1:1992, incorporating amendments 1:2007 and 2:2011. It supersedes BS EN 30326-1:1994+A1:2007 (ISO 10326-1:1992), which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to ISO text carry the number of the ISO amendment. For example, text altered by ISO amendment 1 is indicated by **A1** **A1**.

The UK participation in its preparation was entrusted by Technical Committee GME/21, Mechanical vibration, shock and condition monitoring, to Subcommittee GME/21/6, Mechanical vibration, shock and condition monitoring - Human exposure to mechanical vibration and shock.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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English version

Mechanical vibration — Laboratory method for evaluating vehicle seat vibration — Part 1: Basic requirements

(ISO 10326-1:1992)

Vibrations mécaniques — Méthode en
laboratoire pour l'évaluation des vibrations du
siège de véhicule — Partie 1: Exigences de base
(ISO 10326-1:1992)

Mechanische Schwingungen —
Laborverfahren zur Bewertung der
Schwingungen von Fahrzeugsitzen —
Grundlegende Anforderungen
(ISO 10326-1:1992)

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CEN

European Committee for Standardization
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Foreword

This European Standard was taken over by the Technical Committee CEN/TC 231, *Mechanical vibration and shock*, from the work of ISO/TC 108, *Mechanical vibration and shock*, of the International Standards Organization (ISO).

CEN/TC 231 had decided to submit the final draft for Unique Acceptance Procedure. The result was positive.

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of an identical text or by endorsement, at the latest by November 1994, and conflicting national standards shall be withdrawn at the latest by November 1994.

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NOTE Normative references to international publications are listed in Annex ZA (normative).

Foreword to amendment A1

This document (EN 30326-1:1994/A1:2007) has been prepared by Technical Committee CEN/TC 231 “Mechanical vibration and shock”, the secretariat of which is held by DIN, in collaboration with Technical Committee ISO/TC 108 “Mechanical vibration and shock”.

This Amendment to the European Standard EN ISO 30326:1994 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2008, and conflicting national standards shall be withdrawn at the latest by March 2008.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EC Directive(s).

For relationship with EC Directive(s), see normative Annex ZA, informative ZB and ZC, which is an integral part of this document.

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Foreword to amendment A2

This document (EN 30326-1:1994/A2:2011) has been prepared by Technical Committee CEN/TC 231 “Mechanical vibration and shock”, the secretariat of which is held by DIN, in collaboration with Technical Committee ISO/TC 108 “Mechanical vibration, shock and condition monitoring”.

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Annex ZA (informative)

Relationship between this European Standard and the Essential Requirements of EU Directive EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC on machinery.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

WARNING — Other requirements and other EU Directives may be applicable to the products falling within the scope of this Standard.

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Introduction

A1 Drivers, staff and passengers of vehicles (land, air or water) and mobile machinery are exposed to mechanical vibration which interferes with their comfort, working efficiency and, in some circumstances, safety and health. Such vehicles and mobile machines are often fitted with seats that are designed and made in accordance with current state-of-the-art with regard to their capacity to control or reduce transmitted whole-body vibration.

To assist in the development of such seats, specific test codes have been, or are being, produced to evaluate the performance of seats. The following basic requirements have therefore been developed to give guidance for the specification of laboratory testing of vibration transmission through a vehicle seat to the occupant, and for the evaluation of the ability of a seat to control the shock arising from over-travel of the suspension. **A1**

A2 The seat constitutes the last stage of suspension before the driver. To be efficient at attenuating the vibration, the suspension seat should be chosen according to the dynamic characteristics of the vehicle. Any performance criteria provided should be set in accordance with what is attainable using best design practice. Such criteria do not necessarily ensure the complete protection of the operator against risks associated with exposure to vibration and shock which are generally believed to be risk of spinal injury. **A2**

1 Scope

This part of ISO 10326 specifies basic requirements for the laboratory testing of vibration transmission through a vehicle seat to the occupant. **A1** These methods for measurement and analysis make it possible to compare test results from different laboratories for equivalent seats. **A1**

It specifies the test method, the instrumentation requirements, the measuring assessment method and the way to report the test result.

This part of ISO 10326 applies to specific laboratory seat tests which evaluate vibration transmission to the occupants of any type of seat used in vehicles and mobile off-road machinery.

Application standards for specific vehicles should refer to this part of ISO 10326 when defining the test input vibration that is typical for the vibration characteristics of the type or class of vehicle or machinery in which the seat is to be fitted.

2 Normative references

A1 The following referenced documents are indispensable for the application 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 2631-1, *Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration — Part 1: General requirements*

ISO 5347 (all parts), *Methods for the calibration of vibration and shock pick-ups*

ISO 8041, *Human response to vibration — Measuring instrumentation*

ISO 16063 (all parts), *Methods for the calibration of vibration and shock transducers* **A1**

A2 ISO 13090-1, *Mechanical vibration and shock — Guidance on safety aspects of tests and experiments with people — Part 1: Exposure to whole-body mechanical vibration and repeated shock* **A2**

3 General

The measurement and assessment methods given in this part of ISO 10326 comply with the present practice standardized in ISO 2631-1. The measuring equipment and the frequency weightings shall be in accordance with ISO 8041.

A1 The primary test for the vibration characteristics of the seat involves measurements under conditions which simulate the range of actual uses of a vehicle or machine. For applications where occasional severe shocks or transient vibration can be expected (and in particular for seats whose suspension travel is short, such as those intended for use on industrial trucks or off-road vehicles), in addition to the damping test, a secondary test is required to ensure that the seat responds acceptably. Machinery-specific standards shall give guidance on the need for this secondary test which comprises a method for assessing the accelerations associated with impact with the suspension end-stops when over-travel occurs. The test is described in Annex A. **A1**

NOTE 1 In order to make tests in both horizontal directions, x and y , the seat may be turned 90° on the platform.

4 Instrumentation

4.1 Acceleration transducers

The measuring systems selected for the evaluation of vibration at the seat mounting base or platform of the vibration simulator and that selected for the evaluation of vibration transmitted to the seat occupant, or to an inert mass when used, shall have similar characteristics.

The characteristics of the vibration measuring system, accelerometers, signal conditioning and data acquisition equipment, including recording devices, shall be specified in the relevant application standard, especially the dynamic range, sensitivity, accuracy, linearity and overload capacity.

4.2 Transducer mounting

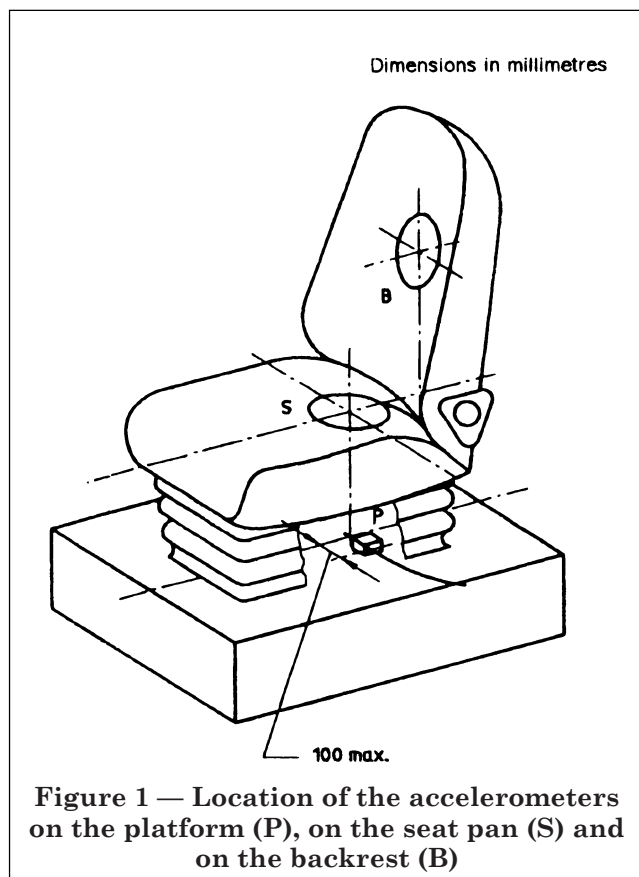
One accelerometer shall be located on the platform (P) at the place of the vibration transmission to the seat. The other accelerometer(s) shall be located at the interface between the human body and the seat, at either the seat pan (S) and/or the backrest (B) (see Figure 1).

4.2.1 Transducer mounting on the platform

The accelerometer on the platform shall be located within a circle with a diameter of 200 mm centred directly below the seat accelerometer. The measuring directions shall be aligned parallel to the movement of the platform.

4.2.2 Transducer mounting on the seat pan and/or backrest

The accelerometers on the seat pan shall be attached in the centre of a mounting disc with a total diameter of $250 \text{ mm} \pm 50 \text{ mm}$. The disc shall be as thin as possible (see Figure 2). The height shall not be more than 12 mm. This semi-rigid mounting disc of approximately 80 to 90 durometer units (A-scale) moulded rubber or plastics material shall have a centre cavity in which to place the accelerometers. The accelerometers shall be attached to a thin metal disc with a thickness of $1,5 \text{ mm} \pm 0,2 \text{ mm}$ and a diameter of $75 \text{ mm} \pm 5 \text{ mm}$.



The mounting disc shall be placed on the surface of the seat pan and taped to the cushion in such a way that the accelerometers are located midway between the ischial tuberosities of the seat occupant with a tolerance to be defined in the relevant application standards. Alternative positioning of the disc may be recommended for certain applications. Any variation from the position here defined shall be specified in application standards.

When tests are performed without a person sitting on the seat, e.g. during damping tests, the disc shall be placed in the same position as if a person were seated in the seat.

If measurements are made on the backrest, the accelerometers shall be (horizontally) located in the vertical longitudinal plane through the centre-line of the seat. The relevant application standards shall specify the vertical position of the accelerometers. The measurement axes shall be aligned parallel to the basicentric coordinate system.

NOTE 2 Besides the semi-rigid mounting disc recommended for soft or highly countoured cushions, a rigid disc with a generally flat surface or an individual-form design may be used. Such discs may be, for instance, required for testing rail vehicle passenger seats. The transducer mounting should be made of low-mass materials, so that the resonant frequency of the mounting is at least four times the highest frequency specified for the test.

NOTE 3 For practical reasons, it is usually not possible to align perfectly the accelerometers in the disc with the axes of motion of the platform. In a tolerance range within 15° of the appropriate axes, the accelerometers may be considered as aligned parallel to the axes of interest. For deviations greater than 15° , acceleration should be measured along two axes and the acceleration vector sum along the axis of interest should be calculated.

4.3 Frequency weighting

Frequency weighting shall be in accordance with ISO 8041.

4.4 Calibration

Ⓐ The instrumentation shall be calibrated in accordance with ISO 16063-1 and, depending on the type of measuring system used, to the relevant part of ISO 5347 or ISO 16063. Ⓐ

It is recommended to check the whole measuring chain following the specifications given in ISO 8041. Calibration shall be made before and after each test series.

Where necessary, the output from each accelerometer amplifier shall be zeroed after mounting the accelerometers in the test position.

5 Vibration equipment

5.1 Physical characteristics

The minimum equipment required is a vibrator capable of driving the platform in the vertical and/or horizontal directions. The dynamic response of the exciter shall be capable of exciting the seat with the seated test person and additional equipment, in accordance with the specified test input vibration