



National Standards Authority of Ireland

IRISH STANDARD

I.S. EN 13490:2002

ICS 13.160
53.060

**MECHANICAL VIBRATION - INDUSTRIAL
TRUCKS - LABORATORY EVALUATION AND
SPECIFICATION OF OPERATOR SEAT
VIBRATION**

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EUROPEAN STANDARD
NORME EUROPÉENNE
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English version

Mechanical vibration - Industrial trucks - Laboratory evaluation and specification of operator seat vibration

Vibrations mécaniques - Chariots industriels - Evaluation
en laboratoire et spécification des vibrations transmises à
l'opérateur par le siège

Mechanische Schwingungen - Flurförderzeuge -
Laborverfahren zur Bewertung sowie Spezifikation der
Schwingungen des Maschinenführersitzes

This European Standard was approved by CEN on 20 August 2001.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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EN 13490:2001 (E)

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 231 "Mechanical vibration and shock", 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of an identical text or by endorsement, at the latest by April 2002, and conflicting national standards shall be withdrawn at the latest by April 2002.

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 informative annex ZA, which is an integral part of this standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

The operators of industrial trucks are often exposed to a low-frequency vibration environment mainly caused by the movement of the vehicles over uneven ground. 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. The performance criteria provided in this European Standard have been set in accordance with what is attainable using what is at present the best design practice. They do not necessarily ensure the complete protection of the operator against effects of vibration and shock. They may be revised in the light of future developments and improvements in suspension design.

Performance criteria obtained in accordance with this European Standard may be useful to manufacturers of industrial trucks when selecting seats for possible use in their products. However, to satisfy fully the requirements of the EC Machinery Directive it is important for suppliers of mobile machinery to demonstrate that the seat supplied reduces the vibration in the specified machine to the lowest level that can be reasonably achieved.

The test inputs included in this European Standard are based on a very large number of measurements taken in situ on industrial trucks while they were used under severe but typical operating conditions. The test method is based on EN 30326-1, which is a general method applicable to seats for different types of vehicles.

1 Scope

1.1 This European Standard is applicable to operator seats used on industrial trucks as defined in ISO 5053:1987 irrespective of power supply, type of equipment, lifting mechanism and tyres. It also applies to seats for other trucks not covered by ISO 5053:1987, e.g. variable-reach trucks and low-lift order picking trucks.

1.2 This European Standard specifies, in accordance with EN 30326-1, a laboratory method for measuring and evaluating the effectiveness of the seat suspension in reducing the vertical whole-body vibration transmitted to the operator of industrial trucks at frequencies between 1 Hz and 20 Hz.

1.3 This European Standard defines the input spectral classes required for the following industrial trucks. Each class defines a group of machines having similar vibration characteristics:

- Platform trucks, trucks rider-controlled, etc. with wheel mean diameter below 200 mm and high-load non-rubber solid tyres (category 1)¹⁾
- Reach trucks, articulated trucks, etc. with wheel mean diameter below 450 mm and high-load non-rubber solid tyres or cylindrical/conical base rubber solid tyres (category 2)¹⁾
- Straddle trucks, trucks with wheel mean diameter below 645 mm and rubber solid or pneumatic tyres (category 3)¹⁾
- Straddle trucks, trucks with wheel mean diameter between 645 mm and 900 mm and rubber solid or pneumatic tyres (category 4a)¹⁾
- Straddle trucks, trucks with wheel mean diameter between 900 mm and 1200 mm and rubber solid or pneumatic tyres (category 4b)¹⁾
- Trucks with wheel mean diameter between 1200 mm and 2000 mm and rubber solid or pneumatic tyres (category 5)¹⁾
- All-terrain trucks (category 6)¹⁾.

1.4 This European Standard specifies performance criteria to be achieved by seats intended for each of the above-mentioned groups of machines.

1.5 The tests and criteria defined in this European Standard are intended for operator seats used in industrial trucks of conventional design.

NOTE Other tests may be appropriate for machines with design features that result in significantly different vibration characteristics.

1.6 This European Standard is only concerned with the vertical component of whole-body vibration. Vibration which reaches the operator other than through his seat, for example that sensed by his feet on the platform or control pedals or by his hands on the steering-wheel, is not covered.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

ENV 28041, Human response to vibration – Measuring instrumentation (ISO 8041:1990)

EN 30326-1:1994, Mechanical vibration – Laboratory method for evaluating vehicle seat vibration – Part 1: Basic requirements (ISO 10326-1:1992)

EN 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 (ISO 13090-1:1998)

1) See prEN 13059:1997.

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ISO 2631-1:1997, Mechanical vibration and shock – Evaluation of human exposure to whole-body vibration – Part 1: General requirements

ISO 5053:1987, Powered industrial trucks – Terminology

ISO 5805:1997, Mechanical vibration and shock – Human exposure – Vocabulary

ISO 8041:1990/Amd. 1:1999, Human response to vibration – Measuring instrumentation – Amendment 1

3 Terms and definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in ISO 5805:1997 and the following apply.

3.1.1

whole-body vibration

vibration transmitted to the body as a whole through the buttocks of a seated operator

3.1.2

input spectral class

machines having similar ride vibration characteristics at the seat attachment point, grouped by virtue of various mechanical characteristics

3.1.3

operator seat

that portion of the machine provided for the purpose of supporting the buttocks and back of the seated operator, including any suspension system and other mechanisms provided (for example, for adjusting the seat position)

3.1.4

frequency analysis

process of arriving at a quantitative description of a vibration amplitude as a function of frequency

3.1.5

measuring period

time duration in which vibration data for analysis is obtained

3.2 Symbols and abbreviations

For the purposes of this European Standard, the following symbols and abbreviations apply:

$a_p(f_r)$	unweighted r.m.s. value of the measured vertical acceleration at the platform at the resonance frequency
a_{p12}^*, a_{p34}^*	unweighted r.m.s. value of the target vertical acceleration at the platform under the seat (see Figure 1) between frequencies f_1 and f_2 , or f_3 and f_4
a_{p12}, a_{p34}	unweighted r.m.s. value of the measured vertical acceleration at the platform between frequencies f_1 and f_2 , or f_3 and f_4
$a_s(f_r)$	unweighted r.m.s. value of the measured vertical acceleration at the seat disc at the resonance frequency

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