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**Mechanical vibration and shock —  
Measurement and evaluation of single  
shocks transmitted from hand-held and  
hand-guided machines to the hand-arm  
system**

*Vibrations et chocs mécaniques — Mesurage et évaluation des chocs  
simples transmis par les machines portatives et guidées à la main au  
système main bras*



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## Foreword

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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.

ISO/TS 15694 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 108, *Mechanical vibration and shock*, Subcommittee SC 4, *Human exposure to mechanical vibration and shock*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read "...this European pre-Standard..." to mean "...this Technical Specification...".

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## Foreword

This document (CEN ISO/TS 15694:2004) 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".

Annexes A, D and E are normative, Annexes B and C are informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this CEN Technical Specification: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom

## Introduction

The effects of repeated shock-type excitations on the hand-arm system are not fully understood. A literature review ([5], [9] and [11]) shows that there is insufficient knowledge to establish whether the methods from EN ISO 5349-1 can be used for the assessment of health risks from shock-type loading of the hand and arm.

In spite of the lack of knowledge in this field, it is desirable to standardise methods for describing shock-type excitation from hand-held and hand-guided machinery. The purpose of this Technical Specification is to define methods

- for gathering consistent data on hand-transmitted single shocks under closely defined conditions and according to uniform criteria and
- for providing information on the shock emission of a given power tool, allowing an objective comparison of different power tools.

Power tools causing shock-type exposure are, for example, nailers, tackers, staplers and setting tools. Impact wrenches and nut runners are not included because it is not usually possible to trigger a single shock for these power tools.

Methods for the interpretation of the potential human effects of single shocks would be desirable but the lack of knowledge does not, at present, allow for the inclusion of such methods in a standard; in the future it is expected that these areas will be included.

The specification for instrumentation in ENV 28041 does not adequately describe the phase response, or the flat frequency response, for measurement of single shocks.

## 1 Scope

This Technical Specification specifies methods for measuring single shocks at the handle(s) of hand-held and hand-guided machinery characterised by a maximum strike rate below 5 Hz.

NOTE In order to describe the characteristics of single shocks, this Technical Specification defines quantities for the evaluation which go beyond those defined for hand-transmitted vibration in EN ISO 5349-1.

This Technical Specification also defines additional requirements for the measuring instrumentation which is necessary for the evaluation of shocks (see Annexes A, B, D and E).

The aim is to facilitate the gathering of emission and human exposure data in order to provide a basis for emission declaration and for the future development of exposure risk criteria. However, this Technical Specification does not provide methods for the interpretation of the potential human effects of single shocks.

This Technical Specification therefore is a basis for measurement and evaluation of emission of single shocks from hand-held and hand-guided machinery but does not cover the evaluation of human exposure.

## 2 Normative references

This Technical Specification 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 Technical Specification only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 1033, *Hand-arm vibration — Laboratory measurement of vibration at the grip surface of hand-guided machinery — General*

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

EN ISO 5349-1:2001, *Mechanical vibration — Measurement and evaluation of human exposure to hand-transmitted vibration — Part 1: General requirements (ISO 5349-1:2001)*

EN ISO 5349-2, *Mechanical vibration — Measurement and evaluation of human exposure to hand-transmitted vibration — Part 2: Practical guidance for measurement at the workplace (ISO 5349-2:2001)*

CEN ISO/TS 8662-11, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 11: Fastener driving tools (nailers) (ISO 8662-11:1999 + Amd. 1:2001)*

ISO 5348, *Mechanical vibration and shock — Mechanical mounting of accelerometers*

## 3 Terms and definitions

For the purposes of this Technical Specification, the symbols given in EN ISO 5349-1 and the terms and definitions given in EN ISO 5349-2 and the following apply.

### 3.1

#### **single shock**

short burst of acceleration

NOTE 1 The acceleration time history of a single shock includes a rise to a peak value (see 4.7), followed by a decay of the acceleration envelope.

NOTE 2 In principle a single shock could also be defined by other physical quantities, for example force or mechanical power transmitted to the hand-arm system. Due to practical measurement considerations, however, the restricted definition in terms of acceleration is used (see also Annex C).