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Mechanical vibration and shock — Coupling forces at the man-machine interface for hand-transmitted vibration —

Part 1: Measurement and evaluation

Vibrations et chocs mécaniques — Forces de couplage à l'interface homme-machine en cas de vibrations transmises par les mains —

Partie 1: Mesurage et évaluation

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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 108, *Mechanical vibration, shock and condition monitoring*, Subcommittee SC 4, *Human exposure to mechanical vibration and shock*.

This second edition cancels and replaces the first edition (ISO 15230:2007), of which it constitutes a minor revision. The changes compared to the previous edition are as follows:

— The document number is now ISO 15230-1.

— The introduction has been changed to explain the publication of ISO 15230 as standards series, now comprising two parts, ISO 15230-1 (the former ISO 15230) and new ISO/TR 15230-2.

A list of all parts in the ISO 15230 series can be found on the ISO website.

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 coupling forces between the hand-arm system and a hand-held or hand-guided machine during its use are very important factors. Although these forces are of interest for both vibrating and non-vibrating machines, the primary focus of this document is to provide a set of descriptions of the forces at the man-machine interface that are primarily for the hand-arm system in contact with a vibrating surface of a machine.

The coupling forces involved in the operation of a vibrating machine generally consist of two different components. The first component is the force applied by the hand-arm system, which is used to provide necessary control and guidance of the machine and to achieve desired productivity. This quasi-static force (frequency below 5 Hz) is the focus of this document. The second component is the biodynamic force which results from the biodynamic response of the hand-arm system to a vibration.

Different couplings of the hand to a vibrating surface can affect the human body in two different ways:

a) The relationship between the measured handle vibration and the resultant transmission of vibration to the hand-arm system might be altered. This alteration modifies the exposure and the vibration effect to the hand-arm system.

b) The coupling can result in a synergistic effect with vibration exposure which affects anatomical structures, such as the vascular system, nerves, joints, tendons.

Currently, many machine situations have been modelled by many basic physiological studies investigating the effect of vibration on the human body which use pushing force and gripping force to describe the coupling force between the hand and the machine handle.

This document can assist in the reporting of coupling data in epidemiological or laboratory research. It is expected that in the future, measurements of the coupling forces will be made in addition to measurements at the workplace for the determination and evaluation of human exposure to mechanical vibration.

ISO 15230 consists of two parts:

— ISO 15230-1, *Mechanical vibration and shock — Coupling forces at the man-machine interface for hand-transmitted vibration — Part 1: Measurement and evaluation*, has the status of an ISO standard, defining measurement parameters and evaluation procedures.

— ISO/TR 15230-2, *Mechanical vibration and shock — Coupling forces at the man-machine interface for hand-transmitted vibration — Part 2: Guidelines for the evaluation of coupling forces*, is a technical report, aimed primarily at researchers. In ISO/TR 15230-2, the relationship between magnitude of the coupling force and the transfer of damaging vibrational energy into the hand-arm system is considered. This part provides a method for adjusting evaluations of exposures to hand-arm vibration according to the measured coupling force.

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Mechanical vibration and shock — Coupling forces at the man-machine interface for hand-transmitted vibration —

Part 1: Measurement and evaluation

1 Scope

This document describes the coupling parameters between the hands of a machine operator and a vibrating surface of the machine.

The coupling between the hand and the vibrating surface can be described using different parameters and component parts of these parameters:

— force parameters, such as push, pull and grip;

— parameters such as pressure exerted on skin.

In addition, Annexes A, B, C, D and E provide guidelines for measuring procedures, the measurement of the force and pressure parameters, and information on the requirements for measuring instrumentation, as well as a calibration method.

This document does not deal with forces which act tangentially to the hand.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

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

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

— IEC Electropedia: available at https://www.electropedia.org/

4 Symbols and abbreviated terms

4.1 Symbols

F	force
i	integer for summation
n	total number of elements to be summed
p_i	local pressure at surface element i
S	surface

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