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

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



PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

This document is a preview generated by EVS



COPYRIGHT PROTECTED DOCUMENT

© ISO 2007

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword.....	iv
Introduction	v
1 Scope	1
2 Symbols and abbreviated terms	1
2.1 Symbols	1
2.2 Subscripts	2
3 Parameters at man-machine interface.....	2
3.1 Pressure exerted on skin	2
3.2 Push/pull force	3
3.3 Guiding force	4
3.4 Lifting force	5
3.5 Gripping force	5
3.6 Feed force	6
3.7 Contact forces	6
3.8 Coupling force	7
3.9 Torque and friction force	8
Annex A (informative) Biodynamic effects on machine contact forces	9
Annex B (informative) Calculation of gripping force and push/pull force from measurement of pressure	11
Annex C (informative) Measuring procedure and processing of measurement results	14
Annex D (informative) Recommended parameters for measuring instrumentation	18
Annex E (informative) Calibration and reference method	22
Bibliography	25

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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.

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 15230 was prepared by Technical Committee ISO/TC 108, *Mechanical vibration, shock and condition monitoring*, Subcommittee SC 4, *Human exposure to mechanical vibration and shock*.

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 International Standard 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 International Standard. 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.

- 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.
- 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 numerous basic physiological studies investigating the effect of vibration on the human body, which use push force and gripping force to describe the coupling force between the hand and the machine handle.

This International Standard can assist in the reporting of coupling data in epidemiological or laboratory research.

In the future, the measurements taken at the workplace for the determination and evaluation of mechanical vibration affecting human beings could need to take into account the influence of the contact of the hand-arm system in the vibrating surface. The measurements of relevant coupling forces and the vibration acceleration will need to be taken simultaneously to account for the potential interactions.

This document is a preview generated by EVS

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

1 Scope

This International Standard 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, informative annexes 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 International Standard does not deal with forces which act tangentially to the hand.

2 Symbols and abbreviated terms

2.1 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
t	time
T	duration of operation
α	hand-oriented angle of the dividing plane
β	machine-oriented angle of the dividing plane
δ	coefficient of the proportionality for the gripping force
γ	coefficient of the proportionality for the push force