

First edition
2007-04-01

AMENDMENT 1
2022-07

Ergonomics — Manual handling —
Part 2:
Pushing and pulling
AMENDMENT 1

Ergonomie — Manutention manuelle —
Partie 2: Actions de pousser et de tirer

AMENDEMENT 1

ISO 11228-2:2007/Amd 1:2022

<https://standards.iteh.ai/catalog/standards/sist/7e046305-0b0d-496d-95c9-f2c0351a44c8/iso-11228-2-2007-amd-1-2022>



Reference number
ISO 11228-2:2007/Amd.1:2022(E)

© ISO 2022

iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO 11228-2:2007/Amd 1:2022
<https://standards.iteh.ai/catalog/standards/sist/7e046305-0b0d-496d-95c9-f2c0351a44c8/iso-11228-2-2007-amd-1-2022>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2022

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

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 159, *Ergonomics*, Subcommittee SC 3, *Anthropometry and biomechanics*.

A list of all parts in the ISO 11228 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.

Ergonomics — Manual handling —

Part 2: Pushing and pulling

AMENDMENT 1

3.2.1.1

Replace the last sentence with the following:

Smooth continuous force exertions should be applied to the object, avoiding jerky movements and long duration. Sustained forces should be avoided if possible, as they increase the risk of muscle or whole-body fatigue.

A.2.2

Replace list item d) with the following:

- d) worker population, i.e. if all male, use male limits; if all female or if the population is mixed, use female limits;

Table B.12

Replace the last row with the following:

| | |
|--------------------------|------|
| 1/360 min (0,000 046 Hz) | 0,04 |
|--------------------------|------|

Table B.13

Add the unit symbol kN under the header "Compressive force limits of lumbar spine".

Table B.14

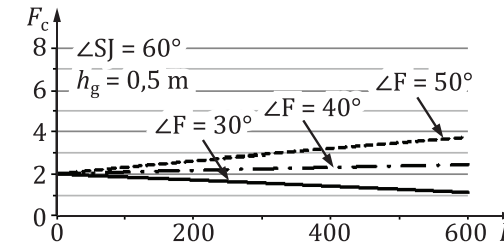
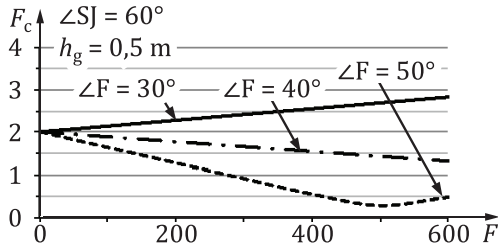
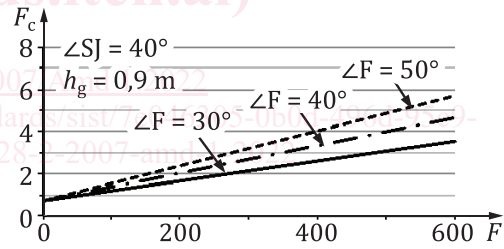
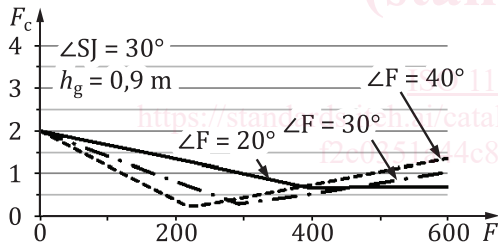
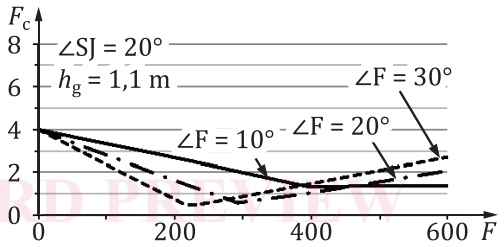
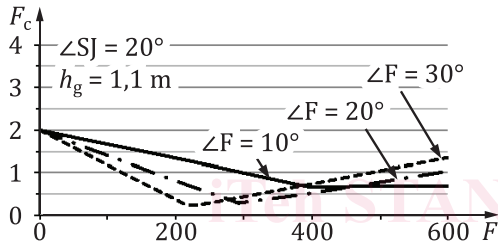
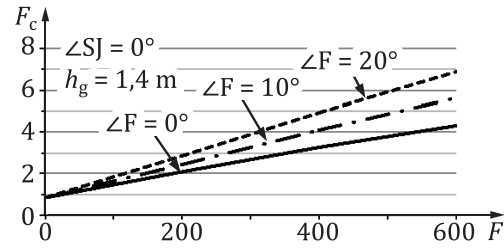
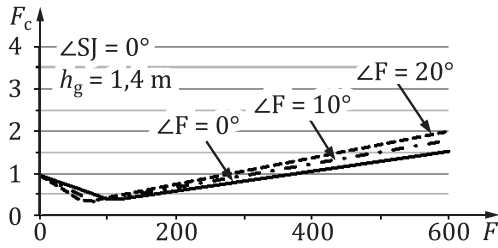
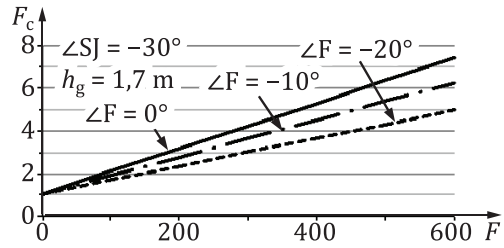
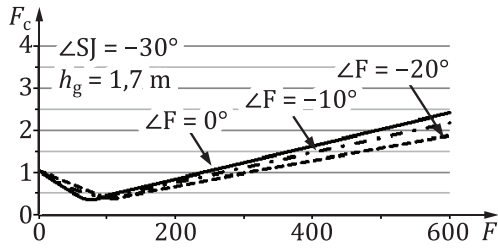
In the second row, replace the text in the first column with "Select or measure the absolute working height, i.e. grip height, h_g ."

In the formula in the sixth row, change F_{LS}^{15} to F_{LS}^5 .

In the footer, remove the entry " h_w " and change "compressive load" to "compressive force".

Figure B.4

Replace Figure B.4 with the following:



a) Pushing

b) Pulling

Add the following items to the key:

$\angle F$ force angle, degrees

$\angle SJ$ shoulder joint angle, degrees

h_g grip height, m

Annex C

Change the title to “General risk reduction systems”.

Annex D

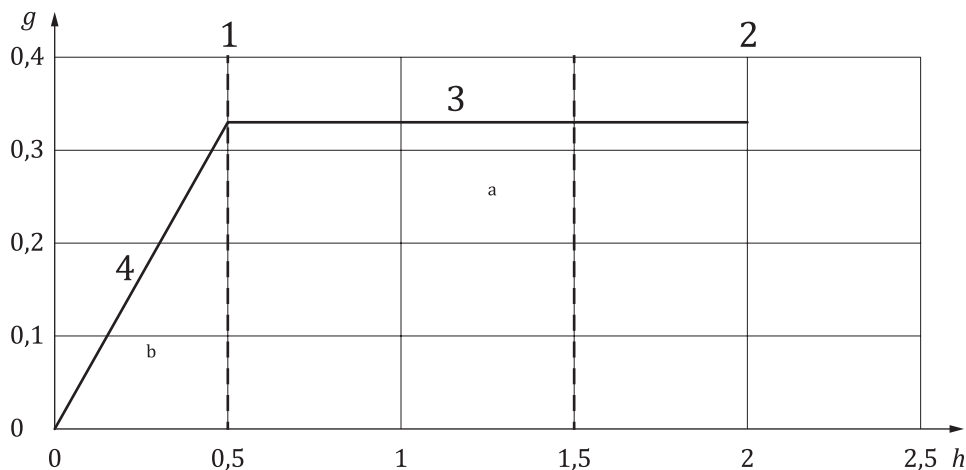
Replace list items f) and g) with the following:

- f) The initial force is measured in two conditions: one with any swivel casters aligned perpendicular to the direction of travel and one with any swivel casters aligned parallel to the direction of travel. To conduct a test, align the casters in the appropriate position. If a hand-held force-measuring device is used, place the device firmly in contact with the handle or push plate of the cart. Starting with the cart at rest, move it in a straight line through a distance of 0,5 m in 3 s using a smooth, consistent application of force. It can be useful to mark the travel distance on the floor. These conditions equate to a uniform acceleration of $0,11 \text{ m/s}^2$ and a final velocity of 0,33 m/s. Record the peak force. Repeat the measurement process for each condition until three measurements that do not differ from their average value by more than $\pm 15 \%$ are achieved. This is approximately equivalent to force values that are within 0,4 standard deviation of their average value. Use the highest measured peak force of these consistent measurements to characterize the initial force.
- g) The sustained force is measured with any swivel casters aligned parallel to the direction of travel and while the cart has a constant velocity of 0,33 m/s. This is equivalent to moving the cart through a straight-line distance of 1 m in 3 s. Once the cart is moving at a constant velocity of 0,33 m/s, continue to push it through a distance of at least one 1 m. It can be useful to mark the travel distance on the floor. Record the force required to maintain movement of the cart. Repeat the measurement process until at least three consistent measurements of the force that are within $\pm 15 \%$ of their average value are achieved. This is approximately equivalent to force values that are within 0,4 standard deviation of their average value. Report the average of these consistent force measurements to characterize the sustained force.

<https://standards.iteh.ai/catalog/standards/sist/7e046305-0b0d-496d-95c9-f2c0351a44c8/iso-11228-2-2007-amd-1-2022>

Annex D

Insert a new Figure D.1 as follows:



Key

1 $t = 3 \text{ s}$

2 $t = 6 \text{ s}$

3 $\bar{v} = 0,33 \text{ m/s}$

4 $\bar{a} = 0,11 \text{ m/s}^2$

g velocity in m/s

h distance in m

^a Measure average sustained force.

^b Measure peak initial force.

STANDARD PREVIEW
(standards.iteh.ai)

Figure D.1 — Illustration of a measurement of initial and sustained cart movement forces

ISO 11228-2:2007/Amd 1:2022

<https://standards.iteh.ai/catalog/standards/sist/7e046305-0b0d-496d-95c9-f2c0351a44c8/iso-11228-2-2007-amd-1-2022>

Bibliography

Add a new reference as follows:

[24] JÄGER, M. Extended compilation of autopsy material measurements on lumbar ultimate compressive strength for deriving reference values in ergonomic work design: The Revised Dortmund Recommendations. *EXCLI J.* 2018, 17, 362–385.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 11228-2:2007/Amd 1:2022

<https://standards.iteh.ai/catalog/standards/sist/7e046305-0b0d-496d-95c9-f2c0351a44c8/iso-11228-2-2007-amd-1-2022>