INTERNATIONAL STANDARD

ISO 15537

First edition
2004-11-15

Principles for selecting and using test persons for testing anthropometric aspects of industrial products and designs

Principes de choix et d'utilisation de sujets d'essai pour l'essai des aspects anthropométriques des produits industriels et leur conception

Reference number
ISO 15537:2004(E)

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 Normative references 1

3 Terms and definitions 1

4 Types of tests 2
4.1 General 2
4.2 Screening test 3
4.3 Detailed test 3

5 Test with test persons 3
5.1 General requirements and recommendations 3
5.2 Procedure for testing 3
5.3 Selection of test persons within the intended user population for screening test 4
5.4 Selection of test persons within the intended user population for detailed test 4
5.5 Experienced or inexperienced persons 6
5.6 Criteria for acceptance of a product with regard to anthropometric aspects 6
5.7 Documentation of the test procedure and the results 7

Annex A (informative) **Example of a test procedure for testing of anthropometric aspects of an elevator** 8

Bibliography 11

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 15537 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 122, *Ergonomics*, in collaboration with Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 3, *Anthropometry and biomechanics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Introduction

An investigation into how far ergonomic requirements are taken into consideration with regard to industrial products and designs is often performed using test equipment, giving possibilities to register only one parameter (for example only the body height) or perhaps a few parameters. With regard to the concurrent multifunctional testing and/or determination of product characteristics for which no technical testing procedures have been laid down, one or several persons are often designated as test persons and are observed and/or questioned while or after using the product under test.

The reliability of any findings established in this way is very much dependent on the extent to which the test persons represent the intended user group in different aspects. How well a product or design is adjusted to the anthropometrics of the intended user population is dealt with in this International Standard.

According to EN 614-1, work equipment, e.g. machinery, has to be designed with proper regard to the body dimensions of the intended user population. One means to verify that a product or a design fulfils this requirement is to set up a panel of test persons and let them test the product in different ways.

An example of the use of this International Standard is given in Annex A (informative).

Principles for selecting and using test persons for testing anthropometric aspects of industrial products and designs

1 Scope

This International Standard establishes methods for determining the composition of groups of persons whose anthropometric characteristics are to be representative of the intended user population of any specific object under test.

This International Standard is applicable to the testing of anthropometric aspects of industrial products and designs having direct contact with the human body or dependent on human body measurements, e.g. machinery, work equipment, personal protective equipment (PPE), consumer goods, working spaces, architectural details or transportation equipment.

This International Standard is also applicable to the testing of such safety aspects of products that are dependent on human body measurements. It does not deal with other aspects of the task or other requirements, such as perception of information (except geometrical arrangement of the viewing targets) and the use of controls (except their geometrical placement).

Although this International Standard deals with selecting test persons from an anthropometric perspective, similar general principles could be applied for other test variables, e.g. biomechanical aspects.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7250:1996, *Basic human body measurements for technological design*

ISO 15534-3:2000, *Ergonomic design for the safety of machinery — Part 3: Anthropometric data*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
critical dimension of a product to be tested
dimension estimated to cause a major limitation for the usage from an anthropometrical point of view, for the whole body or body parts, depending on the function of the product in question

NOTE 1 Critical dimension is related to reach, clearance, posture, contact pressure or other factors which may result in difficulties of use, discomfort or health risks.

NOTE 2 A product to be tested can have more than one critical dimension, for example, a combination of a reach- and a clearance-dimension.

EXAMPLE The critical dimension for an access opening could be the width, or a combination of two dimensions, for example the width and the opening height.

3.2
critical anthropometric measurement
anthropometric measurement which is most affected by the critical dimensions of the product

NOTE For instance, the critical anthropometric measurement for a person entering an opening for whole body access is the one with the greatest constraint (for example, the body height and/or the body width, depending on the form of the access opening).

3.3
worst-case combination of critical dimensions and anthropometric measurements
combination of critical dimensions of the product, additional equipment and the critical anthropometric measurement imposing the biggest restriction on a person who is able to use the product or design as intended

3.4
slim body type
person for whom at least two width measurements (preferably shoulder width and hip breadth) and two depth measurements (preferably chest depth and abdominal depth) are smaller than the figure representing the 25th percentile or, where this figure is not available, the average value of the 5th and the 50th (mean) percentile for the population in question

EXAMPLE For the European shoulder breadth (see Table 1) the figure in question is $\frac{395\ \text{mm} + 474\ \text{mm}}{2} = 434{,}5\ \text{mm}$.

3.5
corpulent body type
person for whom at least two breadth measurements (preferably shoulder breadth and hip breadth) and two depth measurements (preferably chest depth and abdominal depth) are bigger than the figure representing the 75th percentile or, where this figure is not available, the average value of the 50th percentile (mean) and the 95th percentile for the population in question

EXAMPLE For the European hip breadth, standing (see Table 1) the figure in question is $\frac{359\ \text{mm} + 400\ \text{mm}}{2} = 379{,}5\ \text{mm}$.

3.6
medium body type
person belonging neither to the slim nor to the corpulent body type

4 Types of tests

4.1 General

Depending on the accuracy of the test results required and the availability of test persons, either a screening or a detailed test can be performed. In addition to critical dimensions of the product, at least the following shall be taken into account as selection criteria:

— the geographical origin of the user population (global, European Union or a specific population);

— the age of the user population (all or specific age groups);

— the gender of the user population (both or specific);

— occupation (if relevant).

4.2 Screening test

The screening test is not as complete or accurate as a detailed test and is used in the preliminary assessment of the usability of products and designs for a defined intended user population.

NOTE Where appropriate, particularly early in the design process, screening tests can also be performed with the help of computer manikins or body templates, representing the variation of the intended user population defined in 4.1. For more information on computer manikins, see ISO 15536-1.

Screening tests are never sufficient for complete assessment of safety aspects.

4.3 Detailed test

The detailed test takes account of all dimensions of a product or design (for example by using a mock-up, prototype or other physical model), in relation to anthropometric dimensions. The selection of anthropometric measurements and percentiles depends on the features of the product or design under test. The duration of a detailed test shall be long enough to give a good representation of the intended use of the product, including foreseeable non-regular or emergency use and maintenance.

5 Test with test persons

5.1 General requirements and recommendations

Test persons shall be selected to represent the anthropometric measurements of the relevant percentile of the intended user population.

The test shall be reproducible, as far as possible.

5.2 Procedure for testing

The following shall be taken into account:

— identify the intended user population (see 4.1);

— identify critical tasks that the user will perform in or with the product design, and the type of clothing and equipment used during these tasks;

— define the critical dimensions of the product under test;

— define worst-case combinations of critical dimensions and anthropometric measurements, including critical measurements with additional equipment;

— define safety margins, absolute (figures) or relative (percentile) to be added to the dimensions;

— select test persons according to 5.3 or 5.4, respectively;

— run the test(s), taking the following into account:

  — the measuring of critical dimensions and corresponding anthropometric measurements of the test persons,

  — registration of the test persons' subjective opinions during and/or after using the product,

  — observation of the test persons' behaviour and ability to perform the task when using the product as intended;

— document the test procedure and the test results (see 5.7).