
**Ergonomic design for the safety of
machinery —**

Part 1:

**Principles for determining the dimensions
required for openings for whole-body
access into machinery**

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Conception ergonomique pour la sécurité des machines —

*Partie 1: Principes de détermination des dimensions requises pour les
ouvertures destinées au passage de l'ensemble du corps dans les
machines*

<https://standards.iteh.ai/catalog/standards/sist/316454db-962b-4a2a-8b79-083111c631c2/iso-15534-1-2000>



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 ISO 15534-1:2000

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 3.

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 part of ISO 15534 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 15534-1 was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 3, *Anthropometry and biomechanics*.

ISO 15534 consists of the following parts, under the general title *Ergonomic design for the safety of machinery*.

- *Part 1: Principles for determining the dimensions required for openings for whole-body access into machinery*
- *Part 2: Principles for determining the dimensions required for access openings*
- *Part 3: Anthropometric data*

Annex A forms a normative part of this part of ISO 15534. Annex B is for information only.

Introduction

This part of ISO 15534 is one of several ergonomics standards for the safety of machinery.

EN 614-1 ([2] in the Bibliography) describes the principles designers should adopt in order to take account of ergonomic factors. This part of ISO 15534 describes how these principles should be applied to the design of openings which will allow whole-body access.

This part of ISO 15534 is based on EN 547-1:1996 that was prepared as a harmonized standard conforming with the Machinery Directive and associated European Free Trade Association (EFTA) regulations.

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Ergonomic design for the safety of machinery —

Part 1:

Principles for determining the dimensions required for openings for whole-body access into machinery

1 Scope

This part of ISO 15534 specifies the dimensions of openings for whole-body access into machinery as defined in ISO/TR 12100-1. It provides the dimensions to which the values given in ISO 15534-3 are applicable. Values for additional space requirements are given in annex A. This part of ISO 15534 has been prepared primarily for non-mobile machinery; there may be additional specific requirements for mobile machinery.

Dimensions for passages are based on the values for either the 95th or the 99th percentiles of the expected user population. Values for the 99th percentile apply to emergency egress routes.

The anthropometric data given in ISO 15534-3 originate from static measurements of nude persons and do not take into account body movements, clothing, equipment, machinery operating conditions or environmental conditions.

This part of ISO 15534 shows how to combine the anthropometric data with suitable allowances to take these factors into account.

Situations where people are to be prevented from reaching a hazard are dealt with in ISO 13852.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 15534. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 15534 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/TR 12100-1:1992, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology*. (EN 292-1:1991)

ISO 13852:1996, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs*. (EN 294:1992)

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

3 General requirements

This part of ISO 15534 specifies the relevant dimensions of openings with respect to different body positions.

In arriving at values for these dimensions, in addition to the basic anthropometric data, it is necessary to add allowances to permit unhindered and safe entry and working, taking into account aspects specific to the operator and to the operating conditions.

In this respect the following criteria are of particular significance:

- a) ease of passage of a person is influenced by
 - the type of clothing, e.g. light or heavy clothing,
 - whether tools are being carried, e.g. for maintenance or repair purposes,
 - whether additional equipment, such as personal protective equipment (including protective clothing), or portable lighting, is being carried or worn,
 - the demands of the task, e.g. posture, nature and speed of movement, lines of sight, application of force,
 - frequency and duration of task,
 - length of passage, e.g. through a relatively thin wall (wall of a vessel) where there is space for movement at the exit or through a channel-type passage,
 - amount of space available to allow for the dynamic nature of movement to escape from danger,
 - the position and size of supports for the body, e.g. foot support, hand holds;
- b) environmental conditions (e.g. darkness, heat, noise, moisture),
- c) level of risk during the task.

The allowances to be made for these items will depend on the particular machinery concerned and its application.

Annex A provides the application on how to apply this part of ISO 15534 in practice.

Annex B gives information on the use of symbols for dimensions and anthropometric measurements.

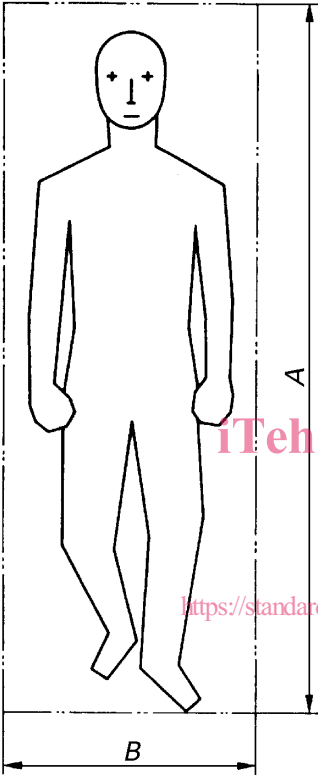
4 Passage openings

A passage opening is an opening which allows the movement or the entry of a person's entire body, to enable the person to carry out measures such as operating of control actuators, monitoring of work processes and inspection of work results. See Figures 1 to 6.

This part of ISO 15534 specifies minimum, not optimum, dimensions for openings.

SAFETY PRECAUTIONS — Wherever possible, from the safety point of view, the dimensions should be increased. Furthermore, passage openings should be sufficiently large to allow rapid egress in the event of danger.

The allowances x and y in 4.1 to 4.5 are given in annex A. The values for a_1 , h_1 , etc. are given in ISO 15534-3.

	Symbol	Explanation of measurement
<p>4.1 Opening for horizontal forward movement in upright posture</p>  <p style="text-align: center;">Figure 1</p>	<p>A</p> <p>B</p> <p>h_1</p> <p>a_1</p> <p>x</p> <p>y</p>	<p>$A = h_1 (P95^1) \text{ or } P99^2) + x$</p> <p>$B = a_1 (P95 \text{ or } P99) + y$</p> <p>Opening height</p> <p>Opening width</p> <p>Body height</p> <p>Elbow-to-elbow breadth</p> <p>Height allowance</p> <p>Width allowance</p>

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1) P95: 95th percentile of the expected user population.
 2) P99: 99th percentile of the expected user population.

4.2 Opening for horizontal sideways movement over short distances in upright posture

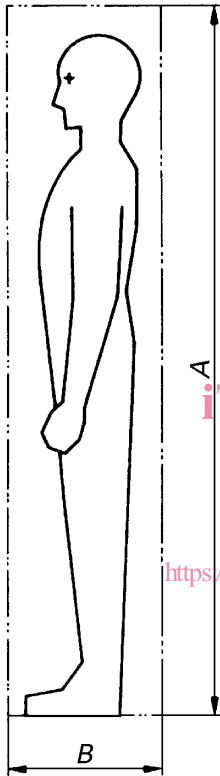


Figure 2

Symbol

Explanation of measurement

Not applicable for emergency egress routes

$$A = h_1 (P95) + x$$

$$B = b_1 (P95) + y$$

A Opening height

B Opening width

*h*₁ Body height

*b*₁ Body depth

x Height allowance

y Width allowance

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4.3 Vertical movement through a duct, using a ladder

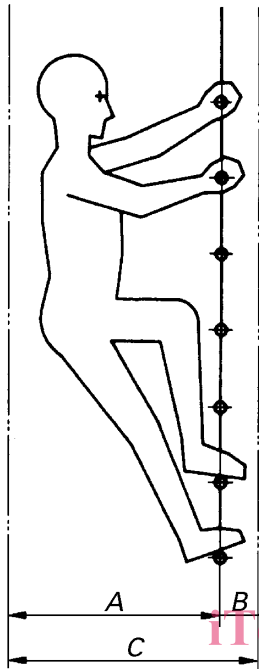


Figure 3

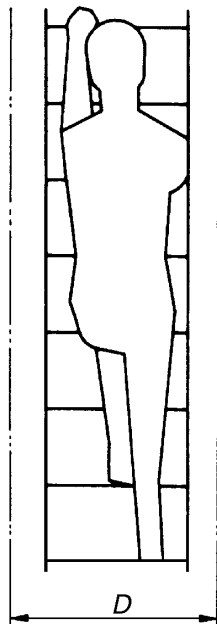


Figure 4

Symbol

Explanation of measurement

	$A = c_1 \text{ (P95 or P99)} + x$
	$B = 0,74 \times c_2 \text{ (P95)}$
	$C = A + B$
A	Opening width ³⁾
B	Clearance for foot
C	Duct width
c_1	Thigh length
c_2	Foot length
x	Width allowance

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	$D = a_1 \text{ (P95 or P99)} + y$
D	Opening breadth
a_1	Elbow-to-elbow breadth
y	Breadth allowance

3) Opening width A does not take account of the need for protection from falling.