

# SVENSK STANDARD

## SS-EN 547-1+A1:2008

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### **Maskinsäkerhet – Kroppsmått – Del 1: Principer för bestämning av storlek på öppningar avsedda för inträde med hela kroppen**

### **Safety of machinery – Human body measurements – Part 1: Principles for determining the dimensions required for openings for whole body access into machinery**

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Denna standard ersätter SS-EN 547-1, utgåva 1.

The European Standard EN 547-1:1996+A1:2008 has the status of a Swedish Standard. This document contains the official English version of EN 547-1:1996+A1:2008.

This standard supersedes the Swedish Standard SS-EN 547-1, edition 1.

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 547-1:1996+A1**

September 2008

ICS 13.110; 13.180

Supersedes EN 547-1:1996

English Version

**Safety of machinery - Human body measurements - Part 1:  
Principles for determining the dimensions required for openings  
for whole body access into machinery**

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

Sicherheit von Maschinen - Körpermaße des Menschen -  
Teil 1: Grundlagen zur Bestimmung von Abmessungen für  
Ganzkörper Zugänge an Maschinenarbeitsplätzen

This European Standard was approved by CEN on 15 November 1996 and includes Amendment 1 approved by CEN on 14 August 2008.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.





This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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## Foreword

This document (EN 547-1:1996+A1:2008) has been prepared by Technical Committee CEN/TC 122 “Ergonomics”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

This document includes Amendment 1, approved by CEN on 2008-08-14.

This document supersedes EN 547-1:1996.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** and **A1**.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

**A1** For relationship with EU Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document. **A1**

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

## SS-EN 547-1+A1:2008 (E)

### Introduction

This European Standard is one of several ergonomics standards for the safety of machinery. EN 614-1 "Safety of machinery – Ergonomic design principles – Part 1: Terminology and general principles" describes the principles designers should adopt in order to take account of ergonomic factors.

This European Standard describes how these principles should be applied to the design of openings which will allow whole body access. This standard has been prepared to be a harmonized standard in the sense of the Machinery Directive and associated EFTA regulations.

### 1 Scope

This European Standard specifies the dimensions of openings for whole body access as applied to machinery as defined in EN 292-1. It provides the dimensions to which the values given in EN 547-3 are applicable. Values for additional space requirements are given in annex A. This European Standard 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 95<sup>th</sup> or the 99<sup>th</sup> percentile of the expected user population. Values for the 99<sup>th</sup> percentile apply to emergency egress routes.

The anthropometric data given in EN 547-3 originate from static measurements of nude persons and do not take into account body movements, clothing, equipment, machinery operating conditions or environmental conditions.

This European Standard 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 EN 294.

### 2 Normative references

This European standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 292-1, *Safety of Machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology.*

EN 294, *Safety of Machinery - Safety distances to prevent danger zones being reached by the upper limbs.*

EN 547-3, *Safety of Machinery – Human body measurements – Part 3: Anthropometric data.*

EN 614-1, *Safety of Machinery - Ergonomic design principles – Part 1: Terminology and general principles.*

### 3 General requirements

This European Standard 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 gives the application on how to apply this European standard in practice.

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

## **4 Passage openings**

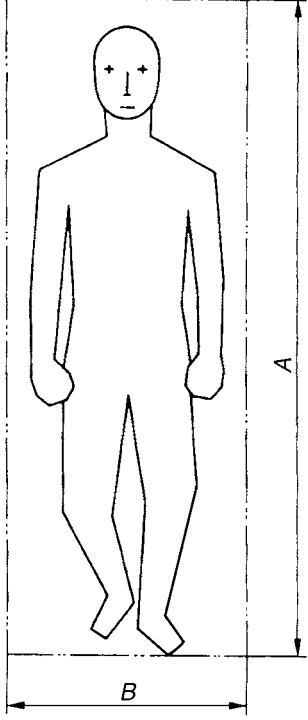
A passage opening is an opening which allows the movement or the entry of a person's entire body, to enable the person to carry out measures such as operating of control actuators, monitoring of work processes and inspection of work results.

This European Standard specifies minimum, not optimum, dimensions for openings. Wherever possible from the safety point of view the dimensions should be increased.

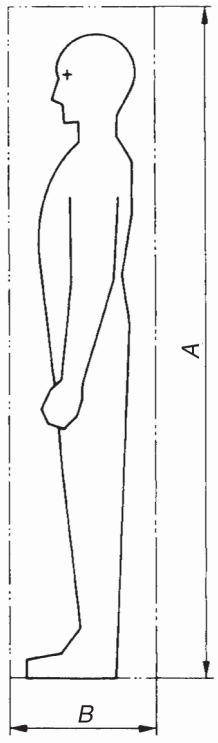
Furthermore, passage openings should be sufficiently large to allow rapid egress in the event of danger.

The allowances  $x$  and  $y$  in sub-clauses 4.1 to 4.5 are given in annex A. The values for  $a_1$ ,  $h_1$  etc. are given in EN 547-3.

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No		Notations	Explanation of measurement
4.1	<p>Opening for horizontal forward movement in upright posture</p> 	<p>A B</p> <p><math>h_1</math> <math>a_1</math></p> <p>x y</p>	<p><math>A = h_1 (P95^{1}) \text{ or } P99^{1}) + x</math></p> <p><math>B = a_1 (P95 \text{ or } P99) + y</math></p> <p>Opening height Opening width</p> <p>Body height Elbow-to-elbow breadth</p> <p>Height allowance Width allowance</p>
4.2	<p>Opening for horizontal sideways movement over short distances in upright posture</p>	<p>A B</p> <p><math>h_1</math> <math>b_1</math></p> <p>x y</p>	<p>Not applicable for emergency egress routes</p> <p><math>A = h_1 (P95) + x</math></p> <p><math>B = b_1 (P95) + y</math></p> <p>Opening height Opening width</p> <p>Body height Body depth</p> <p>Height allowance Width allowance</p>

1) P95: 95<sup>th</sup> percentile of the expected user population  
P99: 99<sup>th</sup> percentile of the expected user population

			
<p>4.3</p>	<p>Vertical movement through a duct, using a ladder</p>	<p>A B C</p> <p><math>c_1</math> <math>c_2</math></p> <p>x</p> <p>D <math>a_1</math> y</p>	<p><math>A = c_1 (P95 \text{ or } P99) + x</math>  <math>B = 0,74 \times c_2 (P95)</math>  <math>C = A + B</math></p> <p>Opening width<sup>2)</sup>                  Clearance for foot                  Duct width</p> <p>Thigh length                  Foot length</p> <p>Width allowance</p> <p><math>D = a_1 (P95 \text{ or } P99) + y</math></p> <p>Opening breadth                  Elbow-to-elbow breadth                  Breadth allowance</p>

2) Opening width A does not take account of the need for fall protection