

# SVENSK STANDARD

## SS-EN 547-2+A1:2008

Fastställt/Approved: 2008-10-03

Publicerad/Published: 2008-11-03

Utgåva/Edition: 1

Språk/Language: engelska/English

ICS: 13.110; 13.180; 14.040

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### **Maskinsäkerhet – Kroppsmått – Del 2: Principer för bestämning av storlek på öppningar avsedda för åtkomst med delar av kroppen**

### **Safety of machinery – Human body measurements – Part 2: Principles for determining the dimensions required for access openings**



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Denna standard ersätter SS-EN 547-2, utgåva 1.

The European Standard EN 547-2:1996+A1:2008 has the status of a Swedish Standard. This document contains the official English version of EN 547-2:1996+A1:2008.

This standard supersedes the Swedish Standard SS-EN 547-2, edition 1.

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 547-2:1996+A1**

September 2008

ICS 13.110; 13.180

Supersedes EN 547-2:1996

English Version

## Safety of machinery - Human body measurements - Part 2: Principles for determining the dimensions required for access openings

Sécurité des machines - Mesures du corps humain - Partie  
2: Principes de détermination des dimensions requises  
pour les orifices d'accès

Sicherheit von Maschinen - Körpermaße des Menschen -  
Teil 2: Grundlagen für die Bemessung von  
Zugangsöffnungen

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

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## Contents

Page

Foreword.....	3
Introduction .....	4
1 Scope .....	4
2 Normative references .....	4
3 General requirements.....	5
4 Access openings .....	5
Annex A (normative) Application of the measurements in practice .....	11
A.0 Introduction .....	11
A.1 Principles for determining additional space.....	11
A.2 Additional space requirements for access openings .....	12
A.2.1 Access opening for the upper body and arms (see 4.1).....	12
A.2.2 Access opening for the head up to the shoulders for inspection tasks (see 4.2) .....	12
A.2.3 Access opening for both arms (see 4.3) .....	12
A.2.4 Access opening for both lower arms up to elbow (see 4.4).....	12
A.2.5 Access opening to the side for one arm up to shoulder joint (see 4.5).....	13
A.2.6 Access opening for a lower arm up to the elbow (see 4.6) .....	13
A.2.7 Access opening for fist (see 4.7).....	13
A.2.8 Access opening for flat hand to wrist, including thumb (see 4.8).....	13
A.2.9 Access opening for flat hand (four fingers) to base of thumb (see 4.9) .....	13
A.2.10 Access opening for index finger, restricted by the other fingers (see 4.10) .....	14
A.2.11 Access opening for one foot to ankle bone (see 4.11) .....	14
A.2.12 Access opening for forefoot operated controls (see 4.12).....	14
Annex B (informative) Position of access openings .....	15
B.1 This Annex gives information on the position of access openings to facilitate access for the intended user population. ....	15
B.2 Provision for adjustability.....	15
B.3 Conditions to be met with in location of access openings .....	15
B.3.1 Access opening for the upper body and arms (see 4.1).....	16
B.3.2 Access opening for the head as far as the shoulders for inspection tasks (see 4.2) .....	17
B.3.3 Access opening for both arms (either forward or downward) (see 4.3) .....	18
B.3.4 Access opening for both lower arms up to the elbow, either forward or downward (see 4.4).....	19
B.3.5 Opening for access to the side for one arm up to the shoulder joint (see 4.5).....	20
B.3.6 Access opening for one lower arm up to the elbow (see 4.6).....	21
B.3.7 Access opening for fist (see 4.7).....	22
B.3.8 Access opening for flat hand to wrist, including thumb (see 4.8).....	22
B.3.9 Access opening for flat hand (four fingers) to base of thumb (see 4.9) .....	22
B.3.10 Access opening for index finger, restricted by the other fingers (see 4.10) .....	22
B.3.11 Access opening for one foot to ankle bone (see 4.11) .....	22
B.3.12 Access opening for forefoot operated controls (see 4.12).....	22
Annex C (informative) Notations for dimensions and anthropometric body measurements .....	23
Annex ZA (informative) <b>ZA</b> Relationship between this European Standard and the Essential Requirements of EU Directive 98/37/EC, amended by 98/79/EC <b>ZA</b> .....	25
Annex ZB (informative) <b>ZB</b> Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC <b>ZB</b> .....	26
Bibliography.....	27

## Foreword

This document (EN 547-2:1996+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 547-2:1996.

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

## 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 access openings.

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 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 access openings are based on the values for the 95<sup>th</sup> percentile, whereas reach distances are based on the values for the 5<sup>th</sup> percentile, in each case the least favourable body dimension of the expected user population being used as a basis. The same considerations apply to the location of access openings.

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

Operations requiring reach through minimum access openings are likely to be less efficient, less safe and less healthy than working with unrestricted access. Therefore, before installing access openings other options should be considered, e.g. possibility to open machinery, withdrawal of parts for repair. This is particularly important where the task demands frequent access.

When access openings cannot be avoided the following criteria are of particular significance:

a) Ease of access is influenced by:

- The demands of the task, e.g. posture, nature and speed of movement, lines of sight, application of force;
- The location of the access opening relative to the position of the person, e.g. convenient height above floor, within easy reach, sufficient space outside to allow adoption of a comfortable posture, sufficient space inside to allow performance of the task;
- Frequency and duration of task;
- Whether tools are being carried, e.g. for maintenance or repair purposes;
- Length of access openings e.g. through a relatively thin wall (wall of a vessel) or through a channel type opening;
- Whether additional equipment such as personal protective equipment (including protective clothing), or portable lighting, is being carried or worn;
- The type of clothing, e.g. light or heavy clothing, bare hands or thick gloves, bare headed or wearing a helmet;

b) Environmental conditions (e.g. darkness, heat, noise, moisture);

c) Level of risk during the task.

Therefore, in addition to the anthropometric data in each case, allowances shall be provided for the respective opening dimensions and reach distances, taking into account the above criteria.

The applications on how to apply this European Standard in practice is contained in Annex A concerning allowances and in Annex B concerning position of access openings.

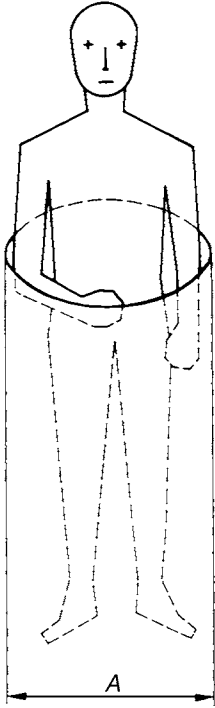
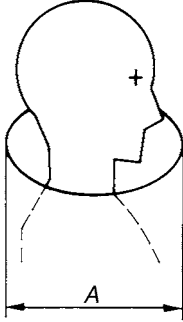
Annex C gives information on the use of notations for dimensions and anthropometric measurements.

### 4 Access openings

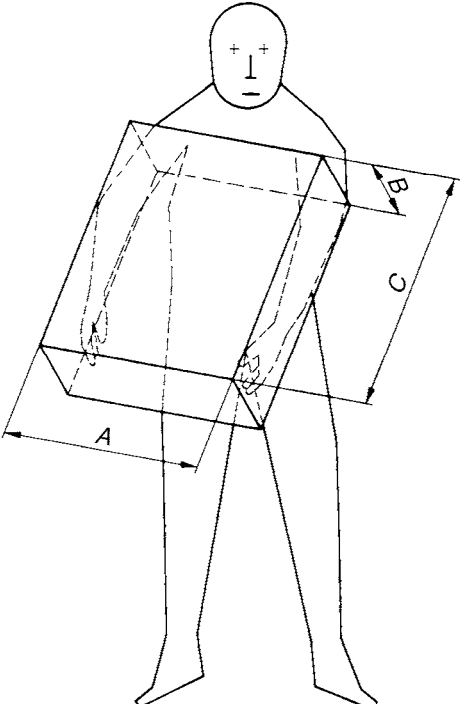
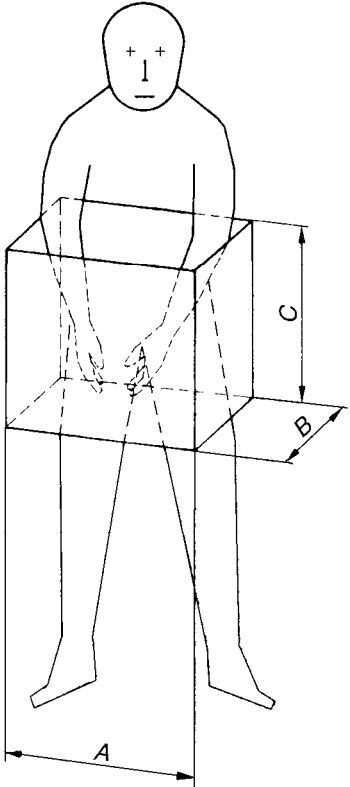
An access opening is an opening through which a person can lean forward, reach forward, or extend the upper body, head, arm, hand, a finger or several fingers, leg or foot, to be able to carry out measures during work procedures, such as operating of control actuators, repair duties or monitoring of processes or displays.

This European Standard does not specify optimum dimensions, but minimum dimensions for the size of the opening and maximum dimensions for reach. Wherever possible, the basic dimensions for the openings should be increased, and the maximum dimensions for reach should be decreased.

SS-EN 547-2+A1:2008 (E)

No		Notations	Explanation of measurement
4.1	<p>Access opening for the upper body and arms</p> 	<p>A a<sub>1</sub> x</p>	<p><math>A = a_1 (P95^1) + x</math></p> <p>Opening diameter</p> <p>Elbow to elbow breadth</p> <p>Allowance</p>
4.2	<p>Access opening for the head as far as the shoulders for inspection tasks</p> 	<p>A c<sub>3</sub> x</p>	<p>This type of access should be avoided wherever possible</p> <p><math>A = c_3 (P95) + x</math></p> <p>Opening diameter</p> <p>Head length from tip of nose</p> <p>Allowance</p>
4.3	<p>Access opening for both arms (either forward or downward)</p>		<p><math>A = a_1 (P95) + x</math>  <math>B = d_1 (P95) + y</math>  <math>C = t_1 (P5)</math></p>

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

		<p>A B C</p> <p><math>a_1</math> <math>d_1</math> <math>t_1</math></p> <p>x y</p>	<p>Opening breadth Opening width Opening depth</p> <p>Elbow-to-elbow breadth Upper arm diameter Operating arm length</p> <p>Breadth allowance Width allowance</p>
<p>4.4</p>	<p>Access opening for both lower arms up to elbow (either forward or downward)</p> 	<p>A B C</p> <p><math>d_2</math> <math>t_2</math></p> <p>x y</p>	<p><math>A = 2d_2 (P95) + x</math> <math>B = d_2 (P95) + y</math> <math>C = t_2 (P5)</math></p> <p>Opening breadth Opening width Opening depth</p> <p>Lower arm diameter Forearm reach</p> <p>Breadth allowance Width allowance</p>