



SLOVENSKI STANDARD
SIST EN 547-2:1998
01-november-1998

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a Yf`nUXcglc`dbY`cXdfh]bY

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

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

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

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Ta slovenski standard je istoveten z: EN 547-2:1996

ICS:

13.110	Varnost strojev	Safety of machinery
13.180	Ergonomija	Ergonomics

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ICS 13.110; 13.180

Descriptors: safety of machines, human factors engineering, accident prevention, operators (personnel), human body, ports:openings, orifices

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 1996-11-15. 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 Central Secretariat or to any CEN member.

The European Standards exist 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

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Foreword

This European Standard 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 June 1997, and conflicting national standards shall be withdrawn at the latest by June 1997.

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).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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0 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 95th percentile, whereas reach distances are based on the values for the 5th 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.

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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.

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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.

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

4 Access openings

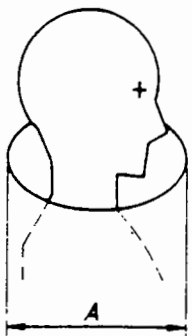
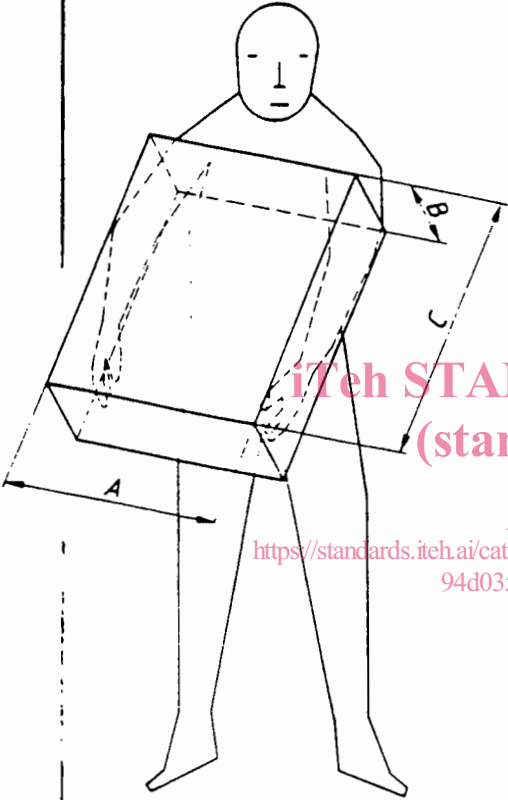
An access opening is an opening through which a person can lean forward, reach forward, or extend the upper body, head, arm, hand, a finger or several fingers, leg or foot, to be able to carry out measures during work procedures, such as operating of-control actuators, repair duties or monitoring of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

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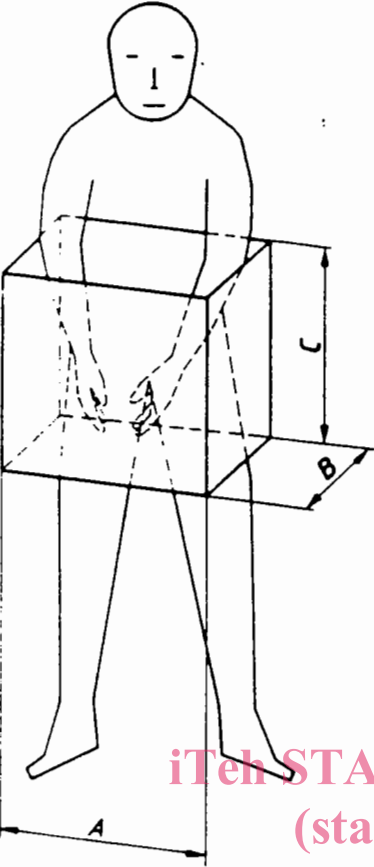
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No		Notations	Explanation of measurement
4.2	<p>Access opening for the head as far as the shoulders for inspection tasks</p> 	<p>A c₃ x</p>	<p>This type of access should be avoided wherever possible</p> <p>$A = c_3 (P95) + x$</p> <p>Opening diameter</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>A B C a₁ d₁ t₁ x y</p>	<p>$A = a_1 (P95) + x$ $B = d_1 (P95) + y$ $C = t_1 (P5)$</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>

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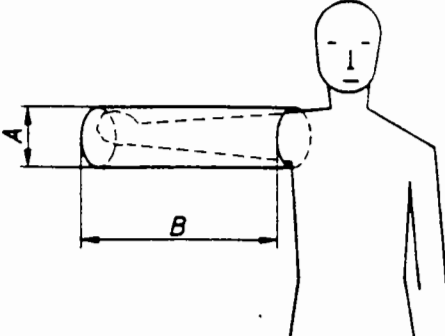
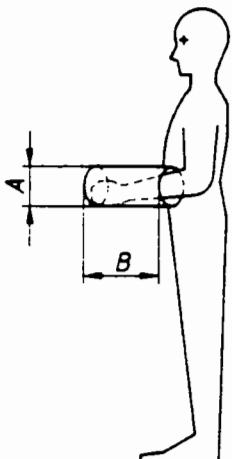
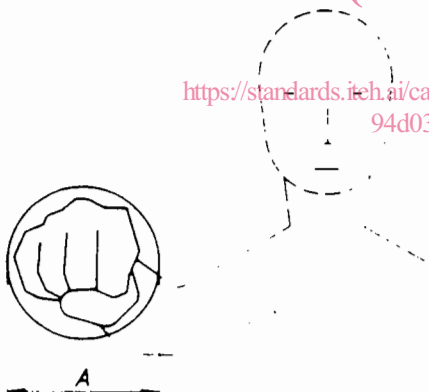
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No		Notations	Explanation of measurement
4.4	<p>Access opening for both lower arms up to elbow (either forward or downward)</p> 	<p> A B C d_2 t_2 x y </p>	<p> $A = 2d_2 (P95) + x$ $B = d_2 (P95) + y$ $C = t_2 (P5)$ </p> <p> Opening breadth Opening width Opening depth </p> <p> Lower arm diameter Forearm reach </p> <p> Breadth allowance Width allowance </p>

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No		Notations	Explanation of measurement
4.5	<p>Opening for access to the side for one arm up to shoulder joint</p> 	<p>A B</p> <p>d_1 t_3 x</p>	<p>$A = d_1 (P95) + x$ $B = t_3 (P5)$</p> <p>Opening diameter Opening depth</p> <p>Upper arm diameter Arm reach to the side</p> <p>Allowance</p>
4.6	<p>Access opening for one lower arm up to the elbow</p> 	<p>A B</p> <p>a_3 t_2 x</p>	<p>$A = a_3 (P95) + x$ $B = t_2 (P5)$</p> <p>Opening diameter Opening depth</p> <p>Hand breadth at thumb Forearm reach</p> <p>Allowance</p>
4.7	<p>Access opening for fist</p> 	<p>A</p> <p>d_3 x</p>	<p>$A = d_3 (P95) + x$</p> <p>Opening diameter</p> <p>Fist diameter</p> <p>Allowance</p>

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