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**Varnost strojev - Najmanjši razmiki, ki preprečujejo zmečkanine na delih  
človeškega telesa**

Safety of machinery - Minimum gaps to avoid crushing of parts of the human body

Sicherheit von Maschinen - Mindestabstände zur Vermeidung des Quetschens von  
Körperteilen

Sécurité des machines - Ecartements minimaux pour prévenir les risques d'écrasement  
de parties du corps humain

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[SIST EN 349:1997+A1:2008](https://standards.itteh.ai/catalog/standards/sist/8ea85a5a-70b8-491c-ad1a-105a5c772672/sist-en-349-1997-a1-2008)

**Ta slovenski standard je istoveten z: EN 349:1993+A1:2008**

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**ICS:**

13.110

Varnost strojev

Safety of machinery

**SIST EN 349:1997+A1:2008**

**en,fr,de**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 349:1993+A1**

June 2008

ICS 13.110

Supersedes EN 349:1993

English Version

**Safety of machinery - Minimum gaps to avoid crushing of parts  
of the human body**

Sécurité des machines - Ecartements minimaux pour  
prévenir les risques d'écrasement de parties du corps  
humain

Sicherheit von Maschinen - Mindestabstände zur  
Vermeidung des Quetschens von Körperteilen

This European Standard was approved by CEN on 2 April 1993 and includes Amendment 1 approved by CEN on 18 May 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.

CEN members are the national standards bodies of 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.

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## Foreword

This document (EN 349:1993+A1:2008) has been prepared by Technical Committee CEN/TC 114 “Safety of machinery”, 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 December 2008, and conflicting national standards shall be withdrawn at the latest by December 2008.

This document includes Amendment 1, approved by CEN on 2008-05-18.

This document supersedes EN 349:1993.

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

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

**A1** For relationship with EC 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.

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## Introduction

According to EN 292-1, in general, machinery is said to be safe if it can perform its function, be transported, installed, adjusted, maintained, dismantled and disposed of under the conditions of its intended use without causing injury or damaging health.

One method of avoiding the hazard of crushing of parts of the human body is to make use of the minimum gaps in this standard.

In specifying minimum gaps a number of aspects have to be taken into consideration, such as

- accessibility of the crushing zones;
- anthropometric data, taking into account ethnic groups likely to be found in European countries;
- technical and practical aspects.

If these aspects are further developed, the current state of the art, reflected in this European Standard, could be improved.

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### 1 Scope

The object of this European Standard is to enable the user (e.g. standard makers, designers of machinery) to avoid hazards from crushing zones. It specifies minimum gaps relative to parts of the human body and is applicable when adequate safety can be achieved by this method.

This European Standard is applicable to risks from crushing hazards only and is not applicable to other possible hazards, e.g. impact, shearing, drawing-in.

NOTE For e.g. impact, shearing, drawing-in hazards, additional or other measures need to be taken

### 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 292-1:1991, *Safety of machinery, basic concepts, general principles for design — Part 1: Basic terminology, methodology*

EN 292-2, *Safety of machinery, basic concepts, general principles for design — Part 2: Technical principles and specifications*

EN 294, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs*

### 3 Definitions

For the purpose of this standard the following definition applies in addition to the definitions given in EN 292-1 and EN 294:

#### 3.1

##### **crushing zone**

Zone in which the human body or parts of the human body are exposed to a crushing hazard. This hazard will be generated if

- two movable parts are moving towards one another;
- one movable part is moving towards a fixed part.

(see also Annex A)

### 4 Minimum gaps

#### 4.1 Methodology for the use of this European Standard

The method of using this European Standard shall form part of the iterative safety strategy outlined in clause 5 "Strategy for selecting safety measures" of EN 292-1.

The user of this European Standard shall:

- a) Identify the crushing hazards;
- b) Assess the risks from these hazards in accordance with EN 292-1 paying particular attention to the following:
  - Where it is foreseeable that the risk from a crushing hazard involves different parts of the body, the minimum gap in table 1 relating to the largest of these parts shall be applied (see also d));
  - The unpredictable behaviour of children and their body dimensions if children are included in the population at risk;
  - Whether parts of the body could enter the crushing zone in a configuration other than those indicated in Table 1;
  - Whether thick or bulky clothing (e.g. protective clothing for extreme temperatures) or tools have to be taken into account;
  - Whether machinery will be used by persons wearing thick soled footwear (e.g. clogs) which will increase the effective dimension of the foot.
- c) Select from Table 1 the appropriate minimum gap relating to the body part at risk (see also Annex A).
- d) If adequate safety cannot be achieved by the minimum gaps selected from table 1, other or additional measures and/or means shall be used (see e.g. EN 292-1, EN 292-2 and EN 294).

If the minimum gap for the largest expected body part cannot be achieved, the following example gives one particular means of restricting access to smaller body parts.

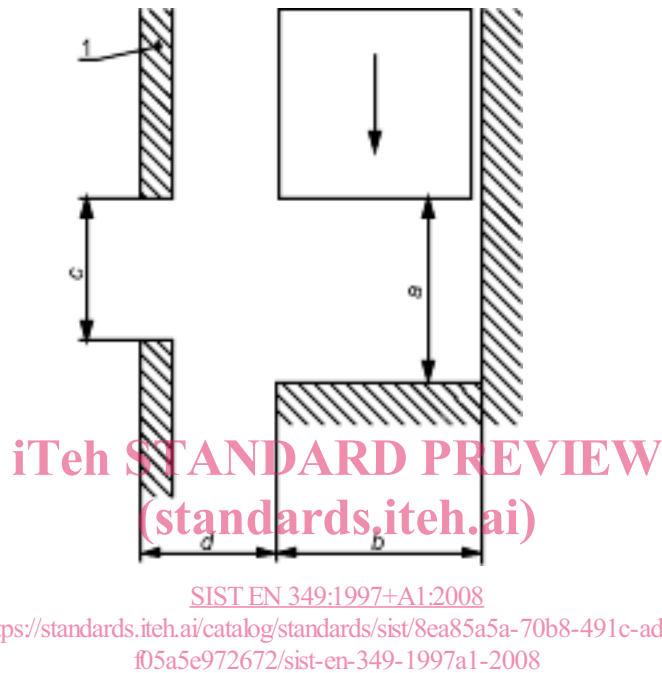
**EXAMPLE** Access of larger body parts to the crushing zone can be prevented by the use of protective structures having a restricted opening, as indicated in Figure 1.

**EN 349:1993+A1:2008 (E)**

The possibility of access to a crushing zone for a particular part of the body is dependent on the following:

- The gap  $a$  between the fixed and moving part or between two moving parts;
- The depth  $b$  of the crushing zone;
- The dimensions  $c$  of the opening in the protective structure and its distance  $d$  from the crushing zone.

NOTE The dimensions for openings in relation to safety distances can be found in EN 294.



**Key**  
1 protective structure

**Figure 1**

- e) For certain applications there may be justifiable reasons to deviate from the minimum gaps in Table 1. Standards dealing with these applications shall indicate how adequate safety can be reached.





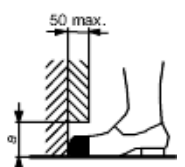


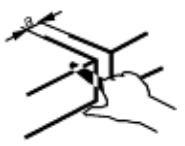
## 4.2 Values

Table 1 gives values for minimum gaps to avoid crushing of parts of the human body. For the selection of the appropriate minimum gap see 4.1.



Table 1

Dimensions in mm

Part of body	Minimum gap <i>a</i>	Illustration
Body	500	
Head (least favourable position)	300	
Leg	180	
Foot	120	
Toes	50	
Arm	120	
Hand Wrist Fist	100	
Finger	25	

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