



National Standards Authority of Ireland

IRISH STANDARD

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**SAFETY OF MACHINERY – MINIMUM GAPS  
TO AVOID CRUSHING OF PARTS OF THE  
HUMAN BODY**

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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

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# **CEN**

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

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

## Foreword

This European Standard has been prepared by CEN/TC 114 "Safety of machinery", WG 2 "Safety distances".

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

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of an identical text or by endorsement, at the latest by October 1993, and conflicting national standards shall be withdrawn at the latest by October 1993.

In accordance with the CEN/CENELEC Internal Regulations, 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 United Kingdom.

## 0 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.

## 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:

**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.

The possibility of access to a crushing zone for a particular part of the body is dependant 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.

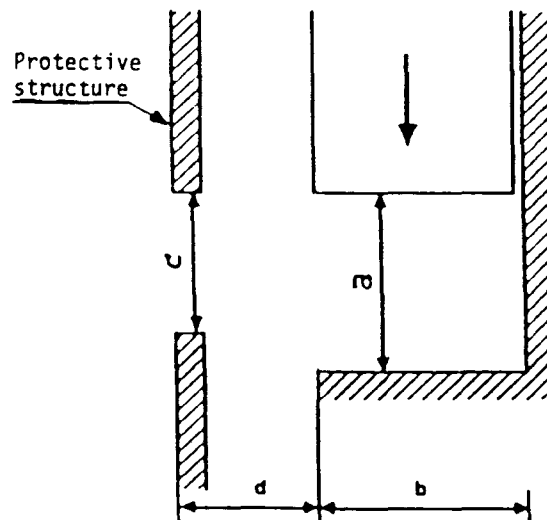


Figure 1:

- 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.

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