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SIST EN 811:1998

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EUROPEAN STANDARD

EN 811

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 1996

ICS 13.110

Descriptors: safety of machinery, dangerous machines, accident prevention, hazards, human body, lower limbs, dangerous areas, distance, dimensions

English version

Safety of machinery - Safety distances to prevent danger zones being reached by the lower limbs

Sécurité des machines - Distances de sécurité pour empêcher l'atteinte des zones dangereuses par les membres inférieurs

Sicherheit von Maschinen - Sicherheitsabstände gegen das Erreichen von Gefahrenstellen mit den unteren Gliedmaßen

This European Standard was approved by CEN on 1996-08-31. 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 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of an identical text or by endorsement, at the latest by April 1997, and conflicting national standards shall be withdrawn at the latest by April 1997.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.

This European Standard is a Type-B1 standard in accordance with EN 414.

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.

0 Introduction

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

One method of eliminating or reducing risks caused by machinery is to make use of safety distances preventing danger zones from being reached.

Sometimes reasonably foreseeable reach situations can occur, e.g. while persons

- try to use a foot to clean out discharge and/or feed openings or
- operate pedestrian controlled machinery.

This standard specifies safety distances only for the lower limbs. Safety distances for the upper limbs are covered by EN 294.

In specifying safety distances to prevent access (see clause 4) and distances to impede free access (see clause 5) a number of aspects have to be taken into consideration, such as:

- reach situations of the lower limbs occurring when machinery is being used;
- anthropometric data taking into account ethnic groups likely to be found in European countries;
- bio-mechanical facts, such as compression and stretching of parts of the human body and limits of joint rotation;
- technical and practical aspects.

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

1 Scope

This European Standard specifies values for safety distances to prevent access and distances to impede free access by the lower limbs of persons of 14 years of age and above. The values are based on practical experience which has been found to be adequate for this group of persons.

The distances apply when adequate safety can be achieved by distance alone and when access by the upper limbs is not foreseeable according to the risk assessment.

NOTE: These distances will not provide sufficient protection against certain hazards, for example radiation and emission of substances. For such hazards additional or other measures can be necessary.

The safety distances to prevent access relate to openings and protect those persons trying to reach danger zones under the conditions specified for the different reaching situations. Sometimes a reasonably foreseeable approach to danger zones can occur while persons try to use a foot to clean out discharge and/or feed openings or operate pedestrian controlled machinery.

The distances to impede free access relate to the height up to the protective structure and reduce risk to persons by limiting the free movement of the lower limbs.

If persons below 14 years of age are to be taken into account it is not relevant to establish values other than those for upper limbs. Then the safety distances to prevent danger zones being reached by the upper limbs derived from table 5 of EN 294:1992 will apply.

For certain applications there are justifiable reasons to deviate from these distances. Standards dealing with these applications should indicate how adequate safety can be achieved.

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 294:1992	Safety of machinery – Safety distances to prevent danger zones being reached by the upper limbs
EN 1050	Safety of machinery – Principles for risk assessment

3 Definitions

For the purposes of this standard the definitions given in EN 292-1 and EN 294 apply.

4 Safety distances to prevent access

4.1 General

4.1.1 Assumptions

The safety distances have been derived by making the following assumptions:

- The protective structures and any openings in them retain their shape and position. Otherwise further consideration shall be given to achieve adequate safety.
- Safety distances are measured from the surface restricting the body or the relevant part of the body.

4.1.2 Risk assessment

Determination of the required safety distance for reaching danger zones shall depend on a risk assessment (see EN 292-1 and EN 1050).

This European Standard shall be used if the risk assessment justifies that there is only a risk to the lower limbs. Where there is a risk to both upper and lower limbs, then for a given opening the largest safety distance given in table 1 of this standard or in table 4 of EN 294:1992 shall be used.

4.2 Reaching through openings for the lower limbs

The safety distances s_r given in table 1 apply to persons reaching through openings in an attempt to reach a danger zone.

4.2.1 Regular openings

The dimension e of openings corresponds to the side of a square opening, the diameter of a round opening and the narrowest dimension of a slot opening.

Slot openings > 180 mm and square or round openings > 240 mm will allow access for the whole body.

The values given in table 1 are independent of whether clothing or footwear is being worn.

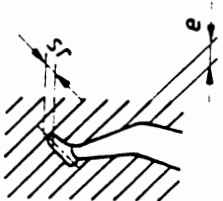
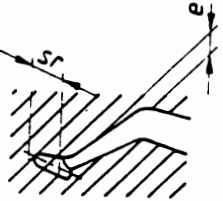
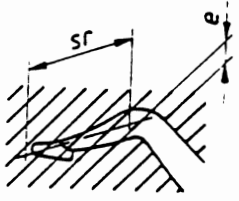

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Table 1

Dimensions in millimetres

Part of lower limb	Illustration	Opening	Safety distance s_r	
			Slot	Square or Round
Toe tip		$e \leq 5$	0	0
Toe		$5 < e \leq 15$	≥ 10	0
		$15 < e \leq 35$	$\geq 80^{1)}$	≥ 25
Foot		$35 < e \leq 60$	≥ 180	≥ 80
		$60 < e \leq 80$	$\geq 650^{2)}$	≥ 180
Leg up to knee		$80 < e \leq 95$	$\geq 1100^{3)}$	$\geq 650^{2)}$
Leg up to crotch		$95 < e \leq 180$	$\geq 1100^{3)}$	$\geq 1100^{3)}$
		$180 < e \leq 240$	not admissible	$\geq 1100^{3)}$

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¹⁾ If the length of the slot opening is ≤ 75 mm the distance can be reduced to ≥ 50 mm.

²⁾ The value corresponds to "Leg up to knee".

³⁾ The value corresponds to "Leg up to crotch".

4.2.2 Irregular openings

In case of irregular openings the following steps shall be carried out:

a) Determine first:

- the diameter of the smallest round opening and
- the side of the smallest square opening and
- the width of the narrowest slot opening

into which the irregular opening can be completely inserted (see hatched area in figure 1).

b) Select the corresponding three safety distances in accordance with table 1.

c) The shortest safety distance of the three values selected in b) can be used.

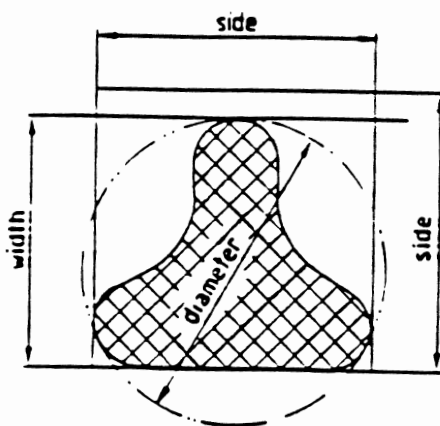


Figure 1

5 Distances to impede free access

A protective structure can be used to restrict the free movement of the lower limbs under protective structures. When this method has to be used, distances are given in annex A in relation to the height to the protective structure.

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NOTE 1: This method gives limited protection and in many cases other methods will be more appropriate.

NOTE 2: Additional precautions can be required to restrict access of the upper limbs and/or to prevent access of the whole body to the danger zone.