



**SLOVENSKI STANDARD**  
**oSIST prEN ISO 13857:2018**  
**01-februar-2018**

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**Varnost strojev - Varnostne razdalje, ki preprečujejo doseg nevarnih območij z zgornjimi in spodnjimi udi (ISO/DIS 13857:2017)**

Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO/DIS 13857:2017)

Sicherheit von Maschinen - Sicherheitsabstände gegen das Erreichen von Gefährdungsbereichen mit den oberen und unteren Gliedmaßen (ISO/DIS 13857:2017)

Sécurité des machines - Distances de sécurité empêchant les membres supérieurs et inférieurs d'atteindre les zones dangereuses (ISO/DIS 13857:2017)

**Ta slovenski standard je istoveten z: prEN ISO 13857**

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**ICS:**

13.110	Varnost strojev	Safety of machinery
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<b>oSIST prEN ISO 13857:2018</b>	<b>en,fr,de</b>
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## Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs

*Sécurité des machines — Distances de sécurité empêchant les membres supérieurs et inférieurs d'atteindre les zones dangereuses*

ICS: 13.110

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**ISO 13857:2017(E)****Foreword**

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 199, *Safety of machinery*.

This second edition cancels and replaces the first edition (ISO 13857:2010), which has been technically revised.

The main changes compared to the previous edition are as follows:

- make it more readable and more in line with ISO 12100.

ISO 13857 is a consolidation of ISO 13852:1996 and ISO 13853:1998.

## Introduction

The structure of safety standards in the field of machinery is as follows:

- a) **type-A standards** (basic safety standards) giving basic concepts, principles for design, and general aspects that can be applied to all machinery;
- b) **type-B standards** (generic safety standards) dealing with one safety aspect or one or more type(s) of safeguard that can be used across a wide range of machinery:
  - type-B1 standards on particular safety aspects (e.g. safety distances, surface temperature, noise);
  - type-B2 standards on safeguards (e.g. two-hand controls, interlocking devices, pressure sensitive devices, guards);
- c) **type-C standards** (machine safety standards) dealing with detailed safety requirements for a particular machine or group of machines.

This International Standard is a type-B1 standard as stated in ISO 12100.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (regulators, accident prevention organizations, market surveillance etc.);

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups: <https://standards.iteh.ai/catalog/standards/sist/73251f81-2adc-4c14-905a->

- machine users/employers (small, medium and large enterprises);
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e.g. for maintenance (small, medium and large enterprises);
- consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

In addition, this document is intended for standardization bodies elaborating type-C standards.

The requirements of this document can be supplemented or modified by a type-C standard.

For machines that are covered by the scope of a type-C standard and have been designed and built according to the requirements of that standard, the requirements of that type-C standard take precedence.

One method of eliminating or reducing risks caused by machinery is to make use of safety distances preventing hazard zones from being reached by the upper and lower limbs.

In specifying safety distances, a number of aspects have to be taken into consideration, such as

- reach situations occurring when machinery is being used,

**ISO 13857:2017(E)**

- reliable surveys of anthropometric data, taking into account population groups likely to be found in the countries concerned,
- biomechanical factors, such as compression and stretching of parts of the body and limits of joint rotation,
- technical and practical aspects, and
- additional measures for particular groups of persons (e.g. persons with special needs), which could be required due to a deviation from the specified body dimensions.

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# Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs

## 1 Scope

This International Standard establishes values for safety distances in both industrial and non-industrial environments to prevent machinery hazard zones being reached. The safety distances are appropriate for protective structures. It also gives information about distances to impede free access by the lower limbs (see 4.3).

This International Standard covers people of 14 years and older (the 5<sup>th</sup> percentile stature of 14 year olds is approximately 1 400 mm). In addition, for upper limbs only, it provides information for children older than 3 years (5<sup>th</sup> percentile stature of 3 year olds is approximately 900 mm) where reaching through openings needs to be addressed.

NOTE 1 Data for preventing lower limb access for children is not considered.

The distances apply when adequate safety can be achieved by distance alone. Because safety distances depend on size, there will be some people of extreme dimensions who will be able to reach hazard zones even when the requirements of this International Standard are complied with.

NOTE 2 These safety distances will not provide sufficient protection against certain hazards, for example, radiation and emission of substances. For such hazards, additional or other measures need to be taken.

The clauses of the International Standard covering lower limbs apply when access by the upper limbs is not foreseeable according to the risk assessment.

The safety distances are intended to protect those persons trying to reach hazard zones under the conditions specified (see 4.1.1).

NOTE 3 This International Standard is not intended to provide measures against reaching a hazard zone by climbing over (see ISO 14120:2015, 5.18).

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

**ISO 13857:2017(E)****3.1****protective structure**

safeguard (e.g. a guard, an impeding device) or other physical obstruction (e.g. a part of a machine) which restricts the movement of the body and/or a part of it in order to prevent reaching hazard zones

**3.2****reference plane**

level at which persons would normally stand during the use of the machine or access to the hazard zone

Note to entry 1: The reference plane is not necessarily the ground or the floor (for example a working platform could be the reference plane).

**3.3****safety distance**

safe separation distance

$s_r$

minimum distance a protective structure is required to be placed from a hazard zone

**4 Safety distances to prevent reach or access by upper and lower limbs****4.1 General****4.1.1 Assumptions**

The safety distances in this International Standard have been derived by making the following assumptions:

- the protective structures and any openings in them retain their shape and position;
- safety distances are measured from the surface restricting the body or the relevant part of the body;
- persons may force parts of the body over protective structures or through openings in an attempt to reach the hazard zone;
- the reference plane is a level at which persons would normally stand, but is not necessarily the floor (e.g. a working platform could be the reference plane);
- there is some contact with the reference plane while wearing shoes (use of high-soled shoes, climbing and jumping are not included);
- no aids such as chairs or ladders are used to change the reference plane;
- no aids such as rods or tools are used to extend the natural reach of the upper limbs.

**4.1.2 Risk assessment****4.1.2.1 General**

Safety distances are determined, if the hazard to be considered has been identified as being significant (see ISO 12100:2010, 3.8). All reasonably foreseeable access means shall be taken into account. When using different tables, the highest restricting value shall be applied (see examples in Annex A).

The safety distances ( $s_r$ ) given in Table 7 apply to persons reaching through openings using the lower limbs in an attempt to reach a hazard zone.

If the requirements of this International Standard cannot be complied with, then other safety measures shall be used.

#### 4.1.2.2 Selection of safety distances when reaching upwards and reaching over

Prior to selecting a suitable safety distance in case of reaching upwards and reaching over protective structures, it is necessary to consider the severity of harm and the probability of occurrence of the hazard which has been identified as being significant.

In case of reaching upwards (see 4.2.1), the higher value according to 4.2.1.2 shall be applied and for reaching over protective structures (see 4.2.2), the values of Table 2.

If the severity of harm and the probability of occurrence of harm caused by the hazard which has been identified as being significant show that the probability of the occurrence of harm is low (see ISO 12100: 2010, 5.5.2.3) and at the same time only slight damages may occur (see ISO 12100:2011, 5.5.2.2), the lower value according to 4.2.1.2 and Table 1 may be applied. The probability of occurrence of harm can be assumed low with e. g.

— slow movements which allow to escape from the hazardous movement.

The severity of the harm can be assumed low e. g.

— when the contact duration is below the burn threshold value in case of hot surfaces (for data according to the burn threshold values, see ISO 13732-1)

— for hazards which do not cause permanent harm or irreversible damages to the body such as e. g. haematomas by slight contusions or breaking of parts of the body which grow again such as finger nails.

More guidance is given in ISO/TR 14121-2:2012, clause 6.

## 4.2 Safety distances to prevent access by upper limbs

### 4.2.1 Reaching upwards

#### 4.2.1.1 General

Figure 1 shows the safety distance for reaching upwards.

#### 4.2.1.2 Height of the hazard zone

The height of the hazard zone,  $h$ , shall be 2700 mm or more.

If the severity of harm and the probability of occurrence of harm caused by the hazard which has been identified as being significant show that the probability of the occurrence of harm is low and at the same time only slight damages may occur, the height of the hazard zone  $h$  shall be 2500 mm or more.