International Standard

ISO 13855

Safety of machinery — Positioning of safeguards with respect to the approach of the human body

Sécurité des machines — Positionnement des moyens de protection par rapport à l'approche du corps humain

Third edition
2024-11

Reference number
ISO 13855:2024(en)

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Published in Switzerland

Contents

Page

Foreword ..... **v**
Introduction ..... **vii**
1 Scope **1**
2 Normative references **2**
3 Terms, definitions, symbols and abbreviated terms **2**
3.1 Terms and definitions 2
3.2 Symbols and abbreviated terms 5
3.2.1 Symbols 5
3.2.2 Abbreviated terms 5
4 Methodology **6**
4.1 General 6
4.2 Static and dynamic separation distances 8
4.3 Reference planes 8
4.4 Assumptions 10
4.5 Specific requirements for ESPE regarding whole body access 11
4.5.1 General 11
4.5.2 Additional requirements for detection zones mounted vertical to the reference plane 11
4.5.3 Additional requirements for single beam devices 12
4.6 Reaching distance to SRMCD 12
4.7 Direction of approach toward detection zone of SPE 12
4.8 Speed and separation control (SSC) 13
5 Separation distance **13**
5.1 General 13
5.2 Separation distance S 14
5.3 Approach speed K 14
5.3.1 Approach speed of the human body 14
5.3.2 Approach speed of mobile machinery 14
5.4 Overall system response time T 15
5.5 Reaching distance factors associated with a protective device D_{DS} 17
5.5.1 General 17
5.5.2 Reaching distance in applications initiating a safety function 17
5.5.3 Reaching distance in applications where hazard zones can be reached by circumventing the safeguard 17
5.6 Supplemental distance factors 18
6 Dynamic separation distance **18**
6.1 General 18
6.2 Dynamic separation distance for unknown human direction of approach 19
6.3 Dynamic separation distance for known human direction of approach 20
7 Consideration of the direction of approach to a detection zone **22**
8 Orthogonal approach to a detection zone **23**
8.1 Determination of the reaching distance for an orthogonal approach to a detection zone 23
8.2 Reaching over a vertical detection zone 25
8.2.1 General 25
8.2.2 Vertical detection zones without additional protective structures 25
8.2.3 Vertical detection zones with additional protective structures 27
8.3 Reaching through a vertical detection zone 27
8.3.1 General 27
8.3.2 Reaching through a vertical detection zone with effective detection capability $d_e \leq 40$ mm 28
8.3.3 Reaching through a vertical detection zone with effective detection capability 40 mm < $d_e \leq 55$ mm 29

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8.3.4 Reaching through a vertical detection zone with effective detection capability 55 mm < d_e ≤ 120 mm ... 29
8.3.5 Reaching through a vertical detection zone with effective detection capability d_e > 120 mm or undefined ... 30
8.3.6 Indirect approach — Path restricted by obstacles ... 31
8.4 Reaching under a vertical detection zone ... 33
8.4.1 General ... 33
8.4.2 Reaching under a vertical detection zone with (d_e + H_{DB}) ≤ 40 mm ... 34
8.4.3 Reaching under a vertical detection zone with height of the lower edge from the reference plane 40 mm < d_e + H_{DB} and H_{DB} ≤ 300 mm ... 34
8.4.4 Reaching under a vertical detection zone with additional protective structures ... 35
8.5 Single beam applications ... 36
8.6 Cycle re-initiation of machine operation employing active opto-electronic protective devices (AOPDs) with control function ... 36

9 Parallel approach to a detection zone ... 37
9.1 General ... 37
9.2 Height of a detection zone for a parallel approach ... 37
9.3 Separation distance of a detection zone for a parallel approach ... 39
9.4 Depth of a detection zone for a parallel approach ... 39

10 Two-hand control devices ... 40
10.1 Two-hand control devices not preventing encroachment ... 40
10.2 Two-hand control devices preventing encroachment ... 41

11 Single control devices ... 41
11.1 Hand-operated single control devices ... 41
11.2 Foot-operated single control devices ... 42

12 Interlocking guards ... 43
12.1 General ... 43
12.2 Interlocking devices without guard locking ... 43
12.2.1 General ... 43
12.2.2 Calculation of the opening *e* for an interlocking guard with an interlocking device with rotary cam actuated position switch ... 45
12.3 Interlocking devices with guard locking ... 46

Annex A (informative) **Achieving intended risk reduction ... 48**

Annex B (informative) **Measurement and calculation of system performance to achieve the intended risk reduction ... 49**

Annex C (normative) **Devices with multiple beams or arrangements of single beams with effective detection capability d_e > 120 mm or undefined — Number of beams and their height above the reference plane without change in elevation ... 52**

Annex D (normative) **Supplier information for time and distance to achieve the intended risk reduction ... 54**

Annex E (informative) **Variable key for determining separation distance for safeguards ... 55**

Annex F (normative) **Time factors in the overall system response time to achieve the intended risk reduction ... 64**

Annex G (informative) **Explanations of the formulae and values used within this document ... 67**

Bibliography ... 71

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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).

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This document was prepared by Technical Committee ISO/TC 199, *Safety of machinery*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 114, *Safety of machinery,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 13855:2010), which has been technically revised.

The main changes are as follows:

— document expanded for applicable cases and partly revised to be state-of-the-art;

— figures revised for clarity and better understanding;

— scope wording improved to better focus on the document’s content;

— Clause 4 improved for better explanation of the methodology;

— document restructured from Clause 5;

— calculation of reaching distances separated for those applications which are initiating a safety function and those which are not initiating a safety function;

— dynamic separation distance calculation included for mobile applications with unknown human direction of approach;

— improvements for better distinction of different paths of approach;

— requirements for single control devices (hand- and foot-operated) and interlocking guards added;

— annexes revised in order to match with the body text of this document;

— Annexes D to G added.

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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 type 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 control devices, 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 document 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 organisations, market surveillance).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

— 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 in 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 which are covered by the scope of a type-C standard and which have been designed and built according to the requirements of that type-C standard, the following applies: if the requirements of that type-C standard deviate from the requirements in type-B standards, the requirements of that type-C standard take precedence over the provisions of other standards.

Correct positioning of protective devices is critical for them to be effective. In deciding on these positions, a number of aspects are taken into account, such as:

— the necessity of a risk assessment according to ISO 12100;

— the practical experience in the use of the machine;

— the time taken to achieve the intended risk reduction following operation of the safeguard, for example, to stop the machine;

— the bio-mechanical and anthropometric data;

— any intrusion by a part of the body towards the hazard zone until the protective device is actuated;

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— the path taken by the body part when moving from the detection zone towards the hazard zone;

— the possible presence of a person between the safeguard and the hazard zone;

— the possibility of undetected access to the hazard zone.

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Safety of machinery — Positioning of safeguards with respect to the approach of the human body

1 Scope

This document specifies requirements for the positioning and dimensioning of safeguards with respect to the approach of the human body or its parts towards hazard(s) within the intended span-of-control as follows:

— the position and dimension of the detection zone(s) of ESPE and pressure-sensitive mats and pressure-sensitive floors;

— the position of two-hand control devices and single control devices;

— the position of interlocking guards.

This document also specifies requirements for the positioning of safety-related manual control devices (SRMCD) with respect to the approach of the human body or its parts from within the safeguard space relative to:

— the position and dimension of the detection zone(s) of ESPE and pressure-sensitive mats and pressure-sensitive floors; and

— the position and dimension of interlocking guards.

When evaluating the ability of the human body or its parts to access SRMCD from within the intended safeguarded space, the requirements of this document are also applicable to determine the dimensions of safeguard(s). Approaches such as running, jumping or falling, are not considered in this document.

NOTE 1 The values for approach speeds (walking speed and upper limb movement) in this document are time tested and proven in practical experience.

NOTE 2 Other types of approach can result in approach speeds that are higher or lower than those defined in this document.

This document applies to safeguards used on machinery for the protection of persons 14 years and older.

Safeguards considered in this document include:

a) electro-sensitive protective equipment (ESPE) such as:

   — active opto-electronic protective devices (AOPDs) (see IEC 61496-2);

   — AOPDs responsive to diffuse reflection that have one or more detection zone(s) specified in two dimensions (AOPDDRs-2D) (see IEC 61496-3);

   — AOPDs responsive to diffuse reflection that have one or more detection zone(s) specified in three dimensions (AOPDDRs-3D) (see IEC 61496-3);

   — vision based protective devices using reference pattern techniques (VBPDPP) (see IEC/TS 61496-4-2);

   — vision based protective devices using stereo vision techniques (VBPDST) (see IEC/TS 61496-4-3);

b) pressure-sensitive mats and pressure-sensitive floors (see ISO 13856-1);

c) two-hand control devices (see ISO 13851);

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d) single control devices;

e) interlocking guards (see ISO 14120).

This document is not applicable to:

— safeguards (e.g. pendant two-hand control devices) that can be manually moved, without using tools, nearer to the hazard zone than the separation distance;

— protection against the risks from hazards arising from emissions (e.g. the ejection of solid or fluid materials, radiation, electric arcs, heat, noise, fumes, gases);

— protection against the risks arising from failure of mechanical parts of the machine or gravity falls.

The separation distances derived from this document do not apply to safeguards used solely for presence sensing function.

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 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13857:2019, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*

3 Terms, definitions, symbols and abbreviated terms

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 Terms and definitions

3.1.1
overall system response time
DEPRECATED: overall system stopping performance
T
time interval between the actuation of the sensing function and achieving the intended risk reduction

Note 1 to entry: This time typically includes tolerance factors (e.g. due to uncertainty of measurements, consideration of environmental factor such as friction).

3.1.2
response time
t_x
maximum time between the occurrence of the event leading to the actuation of the safeguarding device and the achieving of its intended state

Note 1 to entry: This time typically includes tolerance factors (e.g. due to uncertainty of measurements, consideration of environmental factor such as friction).

[SOURCE: IEC 61496-1:2020, 3.21, modified — The wording “output signal switching devices OSSD achieving the OFF state” has been replaced by “achieving of its intended state”. The wording “sensing” has been

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