
**Safety of machinery — Permanent means
of access to machinery —**

**Part 3:
Stairs, stepladders and guard-rails**

*Sécurité des machines — Moyens d'accès permanents aux machines —
Partie 3: Escaliers, échelles à marches et garde-corps*
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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 14122 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 14122-3 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee TC 199, *Safety of machinery*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this standard, read "...this European Standard..." to mean "...this International Standard...".

ISO 14122 consists of the following parts, under the general title *Safety of machinery — Permanent means of access to machinery*:

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- *Part 1: Choice of fixed means of access between two levels*
 - *Part 2: Working platforms and walkways*
 - *Part 3: Stairs, stepladders and guard-rails*
 - *Part 4: Fixed ladders*

For the purposes of this part of ISO 14122, the CEN annex regarding fulfilment of European Council Directives has been removed.

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Foreword

The text of EN ISO 14122-3:2001 has been prepared by Technical Committee CEN/TC 114 "Safety of machinery", the secretariat of which is held by DIN, in collaboration with Technical Committee ISO/TC 199 "Safety of machinery".

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 2001, and conflicting national standards shall be withdrawn at the latest by October 2001.

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).

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

It is the third part of this document "Safety of machinery - Permanent means of access to machinery". The parts of the standard are:

Part 1: Choice of a fixed means of access between two levels

Part 2: Working platforms and walkways

Part 3: Stairs, step ladders and guard-rails

Part 4: Fixed ladders.

This document is a type B standard as stated in EN 1070.

This standard is to be read in conjunction with clause 1.6.2 "Access to operating position and servicing points" and 1.5.15 "Risk of slipping, tripping or falling" of the essential safety requirements expressed in annex A of EN 292-2:1991/A1:1995. See also 6.2.4 "Provision for safe access to machinery" of EN 292-2:1991.

The provisions of this document may be supplemented or modified by a type C standard.

NOTE 1 For machines which are covered by the scope of a type C standard and which have been designed and built according to the provisions of that standard, the provisions of that type C standard take precedence over the provisions of this type B standard.

The purpose of this standard is to define the general requirements for safe access to machines mentioned in EN 292-2. Part 1 of EN ISO 14122 gives advice about the correct choice of access means when the necessary access to the machine is not possible directly from the ground level or from a floor.

The dimensions specified are consistent with established ergonomic data given in EN 547-3 "Safety of machinery - Human body dimensions – Part 3 : Anthropometric data".

NOTE 2 The use of materials other than metals (composite materials, so-called "advanced" materials, etc.) does not alter the application of the present standard.

This standard contains a Bibliography.

1 Scope

This standard applies to all machinery (stationary and mobile) where fixed means of access are necessary.

This standard applies to stairs, step ladders and guard-rails which are a part of a machine.

This standard may also apply to stairs, step ladders and guard-rails to that part of the building where the machine is installed, providing the main function of that part of the building is to provide a means of access to the machine.

NOTE This standard may be used also for means of access which are outside the scope of this standard. In those cases the possible relevant national or other regulations should be taken into account.

This standard applies also to stairs, step ladders and guard-rails specific to the machine which are not permanently fixed to the machine and which may be removed or moved to the side for some operations of the machine (e.g. changing tools in a large press).

For the significant hazards covered by this standard, see clause 4 of EN ISO 14122 -1.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 14122. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 14122 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

EN 292—1 (ISO/TR 12100-1), *Safety of machinery — Basic concepts, general principles for design — Part 1 : Basic terminology, methodology*

[ISO 14122-3:2001](#)

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EN 292-2:1991 + A1 (ISO/TR 12100-2), *Safety of machinery — Basic concepts, general principles for design — Part 2 : Technical principles and specifications*

EN 1070, *Safety of machinery — Terminology*

EN ISO 14122-1:2001, *Safety of machinery — Permanent means of access to machinery — Part 1 : Choice of fixed means of access between two levels*

3 Terms and definitions

For the purposes of this part of EN ISO 14122, the terms and definitions stated in EN 1070 "Safety of machinery - Terminology" and of EN ISO 14122-1 apply.

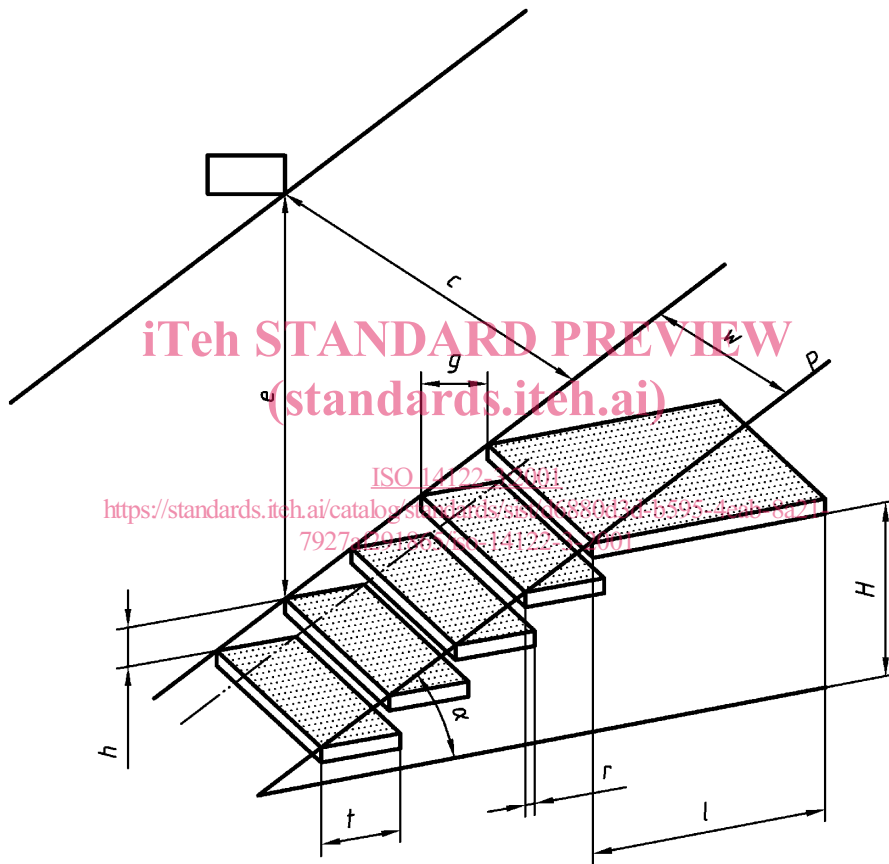
The following additional definitions particularly required for this standard apply :

3.1

stairs and step ladders

the definitions stated in 3.2 and 3.3 of EN ISO 14122-1:2001 are completed by:

Succession of horizontal levels (steps or landings) allowing passage on foot from one level to another composed of the following elements, shown in figure 1 and explained from 3.1.1 to 3.1.16.



Key

- H Climbing height
- g Going
- e Headroom
- h Rise
- l Length of landing
- r Overlap
- α Angle of pitch
- w Width
- p Pitch line
- t Depth of step
- c Clearance

Figure 1 — Parts of stairs and step ladders

3.1.1**climbing height**

vertical distance between the reference level and the landing (H in figure 1)

3.1.2**flight**

uninterrupted sequence of steps between two landings

3.1.3**going**

horizontal distance between the step nosing of two consecutive steps (g in figure 1)

3.1.4**headroom**

minimum vertical distance, clear of all obstacles (such as beams, ducts, etc.) above the pitch line (e in figure 1)

3.1.5**landing**

horizontal resting area situated at the end of a flight (l in figure 1).

3.1.6**walking line**

theoretical line indicating the average path of the users of the stair or the step ladder

3.1.7**overlap**

difference between the depth of the step and the going (r in figure 1)

3.1.8**pitch line**

a notional line connecting the leading edge of the nosing of successive steps taken on the walking line and which extends down to the landing at the bottom of the flight from the nosing on the landing at the top of the flight (p in figure 1)

3.1.9**angle of pitch of the stair or step ladder**

angle between the pitch line and its projection on the horizontal level (α in figure 1)

3.1.10**rise**

height between two consecutive steps measured from the tread surface of one to the tread surface of the next (h in figure 1)

3.1.11**step**

horizontal surface on which one places the foot to go up or down the stair or step ladder

3.1.12**nosing**

top edge at the front of the step or landing

3.1.13**string**

flanking framework element supporting the steps

3.1.14**width**

clear distance over the outside faces of the step (w in figure 1)

3.1.15

depth of step

clear distance from the leading edge or the nosing to the rear of the step (t in figure 1)

3.1.16

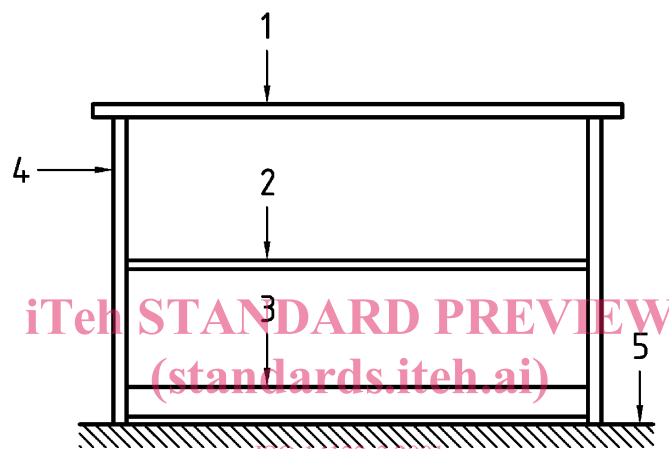
clearance

absolute minimum clear distance between any obstacle and the pitch line (c in figure 1) measured at an angle of 90° from the pitch line

3.2

guard-rail

device for protection against accidental fall or accidental access to a hazardous area, with which stairs, step ladders or landings, platforms and walkways may be equipped. Typical parts of a guard-rail are shown in figure 2 and defined in 3.2.1 to 3.2.5



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Key

- 1 Handrail
- 2 Kneerail
- 3 Toe plate
- 4 Stanchion
- 5 Walking level

Figure 2 — Example of the parts of a typical structure of a guard-rail

3.2.1

handrail

top element designed to be grasped by the hand for body support which can be used individually or as the upper part of a guard-rail (1 in figure 2)

3.2.2

kneerail

element of the guard-rail placed parallel with the handrail, giving extra protection against the passage of a body (2 in figure 2)

3.2.3

stanchion

vertical structural element of the guard-rail to anchor the guard-rail to the platform or stair. (4 in figure 2)

3.2.4

toe-plate

solid lower part of a guard-rail or upstand on a landing to prevent the fall of objects from a floor level (3 in figure 2)

NOTE A toe-plate also reduces the free space between the floor and kneerail to prevent the passage of a body.

3.2.5**self closing gate**

part of the guard-rail which is intended to be opened easily. When the gate is released, it will close automatically using e.g. the effect of gravity or a spring

4 General safety requirements concerning materials and dimensions

4.1 The materials and dimensions of constituent elements and construction mode used shall meet the safety objectives of this standard.

4.2 The materials used shall be, themselves, by their nature or by a complementary treatment, able to resist corrosion provoked by the surrounding atmosphere.

4.3 Any parts liable to be in contact with the users shall be designed so as not to hurt or hinder (sharp corners, welds with burrs, rough edges, etc.).

4.4 Steps and landings shall offer satisfactory slip resistance to avoid any risk of slipping.

4.5 Opening or closing of moving parts (gates) shall not cause further hazards (for example by shearing or by falling) to users and other persons in the vicinity.

4.6 Fittings, hinges, anchorage points, supports and mountings shall provide sufficient rigidity and stability to the assembly to ensure safety.

4.7 The structure and the steps shall be designed to satisfactorily resist the intended imposed loads.

4.7.1 For the structure the unfactored loads used in the industrial field, may vary from 1,5 kN/m² for low density pedestrian traffic without load, up to 5 kN/m² for low density pedestrian traffic with load or for high density pedestrian traffic.

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4.7.2 Steps shall resist the following unfactored loadings:

- if the width $w < 1200$ mm, then 1,5 kN shall be distributed over an area of 100 mm x 100 mm where one boundary is the leading edge of the nosing applied at the middle of the stair width;
- if the width $w \geq 1200$ mm, then respectively 1,5 kN shall be distributed simultaneously over each of the 100 mm x 100 mm areas applied at the most unfavourable points spaced at intervals of 600 mm where one boundary is the leading edge of the nosing.

The deflection between the structure and the steps under an unfactored load shall not exceed $1/300^{\text{th}}$ of the span or 6 mm whichever is the lesser.

5 Safety requirements applicable to stairs

5.1 Going, g , and rise, h , shall meet the formula (1):

$$600 \leq g + 2h \leq 660 \quad (\text{dimensions in mm}) \quad (1)$$

5.2 The overlap, r , of the step shall be ≥ 10 mm and shall apply equally to landings and floors.

5.3 On the same flight, the rise shall be constant wherever possible. In the case where it is not possible to maintain the height of the rise between the level of departure and the lower step, it may be reduced by a maximum of 15 %. If it is justified, it may be increased, for example in the case of certain mobile machines.