



# SLOVENSKI STANDARD SIST EN 115-1:2009

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Safety of escalators and moving walks - Part 1: Construction and installation

Sicherheit von Fahrtreppen und Fahrsteigen - Teil 1: Konstruktion und Einbau

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 115-1**

July 2008

ICS 91.140.90

Supersedes EN 115:1995

English Version

## Safety of escalators and moving walks - Part 1: Construction and installation

Sécurité des escaliers mécaniques et trottoirs roulants -  
Partie 1: Construction et installation

Sicherheit von Fahrtreppen und Fahrsteigen - Teil 1:  
Konstruktion und Einbau

This European Standard was approved by CEN on 29 May 2008.

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 CEN Management Centre or to any CEN member.

This European Standard exists 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 CEN Management Centre has the same status as the official versions.

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**EN 115-1:2008 (E)****Foreword**

This document (EN 115-1:2008) has been prepared by Technical Committee CEN/TC 10 "Lifts, escalators and moving walks", the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by January 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 115:1995.

This document 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 Annexes ZA and ZB, which are integral parts of this document.

This standard is part of the EN 115 series of standards, "Safety of escalators and moving walks".

Considering that EN 115:1995 had given rise to requests for interpretation and this standard did not fully comply with EN 414 (today CEN Guide 414 "Safety of machinery - Rules for the drafting and presentation of safety standards"), CEN/TC 10 asked its working group 2 to revise EN 115:1995. This task was completed by CEN/TC 10/WG 2 in 2007 by:

- taking into account the interpretations;
- taking over the agreed upon points from the work carried out by ISO/TC 178/WG 5;
- adapting the requirements to the state of the art using the risk assessment methodology as given in ISO/TS 14798:2006 [1];
- improving the references to other standards according to the progress in that field;
- covering the requirements of CEN Guide 414 by creating a new structure which addresses the safety rules for the machine and provides requirements in the normative annexes and information in the informative annexes;
- increasing the measures against foreseeable misuse;
- reviewing the safety requirements for escalators and moving walks;
- discussing the comments arising from the CEN Enquiry.

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

## Introduction

This standard is a Type C standard as stated in EN ISO 12100-1.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this standard.

When the provisions of this C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

The purpose of this standard is to define safety requirements for escalators and moving walks in order to safeguard people and objects against risks of accidents during installation, operation, maintenance and inspection work.

The contents of this standard are based on the assumption that persons using escalators and moving walks are able to do so unaided. However, physical and sensory abilities in a population can vary over a wide range, escalators and moving walks are also likely to be used by persons with a range of other disabilities.

Some individuals, in particular older people, might have more than one impairment. Some individuals are not able to use an escalator or moving walk independently and rely on assistance/support being provided by a companion. Furthermore some individuals can be encumbered by objects or be responsible for other persons, which can affect their mobility. The extent to which an individual is incapacitated by impairments and encumbrances often depends on the usability of products, facilities and the environment.

The use of wheelchairs on escalators and moving walks can lead to dangerous situations which cannot be mitigated by machine designs and therefore should not be permitted.

The use of lifts is the preferred method of vertical travel for most people with disabilities and in particular wheelchair users and persons with guide dogs.

Additional signs should be provided to indicate the location of other facilities, these facilities should be in close proximity to the escalators and moving walks and easy to find.

It is assumed that negotiations have been made for each contract between the customer and the supplier/installer (see also Annex A) about:

- a) intended use of the escalator or moving walk;
- b) environmental conditions;
- c) civil engineering problems;
- d) other aspects related to the place of installation.

If escalators or moving walks are intended to be operated under special conditions, such as directly exposed to the weather or explosive atmosphere, or in exceptional cases serve as emergency exits, appropriate design criteria, components, materials and instructions for use should be used that satisfy the particular conditions.

An Interpretation Committee has been established to clarify, if necessary, the spirit in which the clauses of the standard have been drafted and to specify the requirements appropriate to particular cases. Interpretation Requests can be sent to the National Standard Bodies which will contact the responsible Technical Committee CEN/TC 10. The formats of an interpretation request and the interpretation are given in Annex L.

**EN 115-1:2008 (E)****1 Scope**

**1.1** This standard is applicable for new escalators and moving walks (pallet or belt type) as defined in Clause 3.

This standard deals with all significant hazards, hazardous situations and events relevant to escalators and moving walks when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see Clause 4).

**1.2** This standard does not deal with hazards arising from seismic activities.

**1.3** This document is not applicable to escalators and moving walks which were manufactured before the date of its publication as EN. It is, however, recommended that existing installations be adapted to this standard.

**2 Normative references**

The following referenced documents are indispensable for the application 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.

EN 954-1:1996, *Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design*

EN 1929-2, *Basket trolleys - Part 2: Requirements, tests and inspection for basket trolleys with or without a child carrying facility, intended to be used on passenger conveyors*

EN 1929-4, *Basket trolleys - Part 4: Requirements and tests for basket trolleys with additional goods carrying facility(ies), with or without a child carrying facility, intended to be used on passenger conveyors*

EN 1993-1-1, *Eurocode 3: Design of steel structures – Part 1-1: General rules and rules for buildings*

EN 10025-1, *Hot rolled products of structural steels - Part 1: General technical delivery conditions*

EN 10025-2, *Hot rolled products of structural steels - Part 2: Technical delivery conditions for non-alloy structural steels*

EN 10025-3, *Hot rolled products of structural steels - Part 3: Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels*

EN 10025-4, *Hot rolled products of structural steels - Part 4: Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels*

EN 10025-5, *Hot rolled products of structural steels - Part 5: Technical delivery conditions for structural steels with improved atmospheric corrosion resistance*

EN 10025-6, *Hot rolled products of structural steels - Part 6: Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition*

EN 10083-1, *Steels for quenching and tempering - Part 1: General technical delivery conditions*

EN 10083-2, *Steels for quenching and tempering - Part 2: Technical delivery conditions for non alloy steels*

EN 10083-3, *Steels for quenching and tempering - Part 3: Technical delivery conditions for alloy steels*



- EN 12015, *Electromagnetic compatibility - Product family standard for lifts, escalators and moving walks – Emission*
- EN 12016, *Electromagnetic compatibility - Product family standard for lifts, escalators and moving walks – Immunity*
- EN 13015:2001, *Maintenance for lifts and escalators – Rules for maintenance instructions*
- EN 13501-1:2007, *Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests*
- EN 60068-2-6:1995, *Environmental testing - Part 2: Tests - Tests Fc: Vibration (sinusoidal) (IEC 60068-2-6:1995 + Corrigendum 1995)*
- EN 60068-2-14, *Environmental testing - Part 2: Tests - Test N: Change of temperature (IEC 60068-2-14:1984 + A1:1986)*
- EN 60068-2-27:1993, *Basic environmental testing procedures - Part 2: Tests - Test Ea and guidance: Shock (IEC 60068-2-27:1987)*
- EN 60068-2-29, *Basic environmental testing procedures - Part 2: Tests; Test Eb and guidance: Bump (IEC 60068-2-29:1987)*
- EN 60204-1:2006, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1:2005, modified)*
- EN 60269-1, *Low-voltage fuses - Part 1: General requirements (IEC 60269-1:2006)*
- EN 60439-1:1999, *Low-voltage switchgear and controlgear assemblies - Part 1: Type-tested and partially type-tested assemblies (IEC 60439 1:1999)*
- EN 60529, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*
- EN 60664-1:2007, *Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests (IEC 60664-1:2007)*
- EN 60947-4-1, *Low-voltage switchgear and controlgear - Part 4-1: Contactors and motor-starters; Electromechanical contactors and motor-starters (IEC 60947-4-1:2000)*
- EN 60947-5-1, *Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices (IEC 60947-5-1:2003)*
- EN 61249 series, *Materials for printed boards and other interconnecting structures (IEC 61249 series)*
- EN 61558-1:2005, *Safety of power transformers, power supplies, reactors and similar products - Part 1: General requirements and tests (IEC 61558-1:2005)*
- EN 62326-1, *Printed boards - Part 1: Generic specification (IEC 62326-1:2002)*
- EN ISO 12100-1:2003, *Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology (ISO 12100-1:2003)*
- EN ISO 12100-2:2003, *Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles (ISO 12100-2:2003)*
- EN ISO 13849-2:2003, *Safety of machinery - Safety-related parts of control systems - Part 2: Validation (ISO 13849-2:2003)*
- EN ISO 13850, *Safety of machinery - Emergency stop - Principles for design (ISO 13850:2006)*

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EN ISO 13857:2006, *Safety of machinery – Safety distances to prevent hazard zones being reached by the upper and lower limbs (ISO 13857:2008)*

ISO 3864-1, *Graphical symbols - Safety colours and safety signs - Part 1: Design principles for safety signs in workplaces and public areas (Note: Corrected and reprinted in 2003-12)*

ISO 3864-3, *Graphical symbols - Safety colours and safety signs - Part 3: Design principles for graphical symbols for use in safety signs*

HD 21.3 S3, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 3: Non-sheathed cables for fixed wiring (IEC 60227-3:1993, modified)*

HD 21.4 S2, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 4: Sheathed cables for fixed wiring*

HD 21.5 S3, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 5: Flexible cables (cords) (IEC 60227-5:1979, modified)*

HD 22.4 S4, *Cables of rated voltages up to and including 450/750 V and having crosslinked insulation - Part 4: Cords and flexible cables*

HD 60364-4-41, *Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock (IEC 60364- 4-41:2005, modified)*

IEC 60747-5-5, *Semiconductor devices - Discrete devices -- Part 5-5: Optoelectronic devices – Photocouplers (NOTE: This standard is intended to be published unmodified as an EN 60747-5-5.)*

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**3 Terms and definitions - Symbols and abbreviations**

SIST EN 115-1:2009

**3.1 Terms and definitions**

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For the purposes of this document, the terms and definitions given in EN ISO 12100-1:2003 and the following apply.

**3.1.1****angle of inclination**

maximum angle to the horizontal in which the steps, the pallets or the belt move

**3.1.2****balustrade**

part of the escalator/moving walk which ensures the user's safety by providing stability, protecting from moving parts and supporting the handrail

**3.1.3****balustrade decking**

transverse member of the balustrade which meets the handrail guidance profile and which forms the top cover of the balustrade

**3.1.4****brake load**

load on the step/pallet/belt which the brake system is designed to stop the escalator/moving walk

**3.1.5 a****comb**

pronged section at each landing that meshes with the grooves

**3.1.5 b****comb plate**

platform at each landing to which the combs are attached

**3.1.6****electrical safety system**

safety related part of the electrical control system as an arrangement of safety circuits and monitoring devices

**3.1.7****electrical safety devices**

part of a safety circuit consisting of safety switches and/or fail safe circuits

**3.1.8****escalator**

power-driven, inclined, continuous moving stairway used for raising or lowering persons in which the user carrying surface (e.g. steps) remains horizontal

NOTE Escalators are machines - even when they are out of operation - and cannot be considered as fixed staircases.

**3.1.9****exterior panel**

part of the exterior side of the enclosure of an escalator or moving walk

**3.1.10****fail safe circuit**

safety related electrical and/or electronic system with defined failure mode behaviour

**3.1.11****handrail**

power-driven moving rail for persons to grip while using the escalator or moving walk

**3.1.12****interior panel**

panel located between the skirting or lower inner decking and the handrail guidance profile or balustrade decking

**3.1.13 a****lower inner decking**

profile that connects the skirting with the interior panel when they do not meet at a common point

**3.1.13 b****lower outer decking**

profile that connects the exterior panels with the interior panel

**3.1.14****machinery**

escalator or moving walk machine(s) mechanisms and associated equipment

**3.1.15****machinery spaces**

space(s) inside or outside of the truss where the machinery as a whole or in parts is placed

**3.1.16****maximum capacity**

maximum flow of persons that can be achieved under operational conditions

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**EN 115-1:2008 (E)****3.1.17****moving walk**

power-driven installation for the conveyance of persons in which the user carrying surface remains parallel to its direction of motion and is uninterrupted (e.g. pallets, belt)

NOTE Moving walks are machines - even when they are out of operation – and should not be used as a fixed access.

**3.1.18****newel**

end of the balustrade

**3.1.19****nominal speed**

speed in the direction of the moving steps, pallets or the belt, when operating the equipment under no load condition (i.e. without persons), stated by the manufacturer as that for which the escalator or moving walk has been designed

NOTE Rated speed is the speed the escalator/moving walk moves under rated load conditions.

**3.1.20****rated load**

load which the equipment is designed to move

NOTE For maximum capacity, see Annex H.

**3.1.21****rise**

vertical distance between the upper and lower finished floor levels

**3.1.22****safety circuit**

part of the electric safety system consisting of electrical safety devices

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**3.1.23****skirting**

vertical part of the balustrade interfacing with the steps, pallets or belt

**3.1.24****skirt deflector**

device to minimise the risk of trapping between the step and the skirting

**3.1.25****stand-by operation**

mode in which an escalator/moving walk can be stopped or operated under no load condition with any speed below the nominal speed

**3.2 Symbols and abbreviations**

The following symbols and corresponding units of measurement of the following Table 1 are used in this standard.

Table 1 — Symbols and corresponding units of measurement used in this standard

Symbol	Designation	Unit	Figure
$b_1$	Distance between the handrail centre lines	m	3
$b_2$	Width of the handrail	mm	3
$b_3$	Horizontal distance between skirting and interior panel	mm	3
$b_4$	Width of the horizontal part of the lower inner decking that directly joins the interior panel	mm	3
$b_5$	Horizontal distance between the inner edge of the handrail and the top edge of the interior panel	mm	3
$b_6, b_6''$	Horizontal distance between the handrail profile and guide or cover profiles	mm	3
$b_7$	Width of the grooves	mm	2
$b_8$	Web width	mm	2
$b_9$	Horizontal distance between the outer edge of the handrail and a non-continuous obstruction, e.g. roof intersection, column	mm	A.1
$b_{10}$	Horizontal distance between the outer edge of the handrail and a continuous obstruction, e.g. wall	mm	A.1
$b_{11}$	Horizontal distance between the handrails of adjacent escalators/moving walks	mm	A.1
$b_{12}$	Vertical distance between the lower edge of the handrail and the balustrade decking	mm	3
$b_{13}$	Width of the lower outer decking	mm	4
$b_{14}$	Horizontal distance between the outer edges of interior panels on adjacent escalators or moving walks	mm	4
$b_{15}$	Horizontal distance between the building structure (wall) and the centreline of the handrail	mm	4
$b_{16}$	Horizontal distance between the centrelines of the handrails of adjacent escalators/moving walks	mm	4
$b_{17}$	Horizontal distance of the anti-slide device to the outer edge of the handrail	mm	4
$h_1$	Vertical distance between the top of the handrail and step nose or pallet surface or belt surface	m	2, 3
$h_2$	Vertical distance between top edge of skirting or bottom edge of cover joints and the line of the step nose or the tread surface of the pallets or belt	mm	3
$h_3$	Distance between the entry of handrail into the newel and the floor	m	2,3
$h_4$	Free height above any point of step surfaces, pallets or belt over the area between both outer edges of the handrails	m	2, A.1
$h_5$	Height of the deflector	m	2,4

Table 1 (continued)

Symbol	Designation	Unit	Figure
$h_6$	Clearance between the upper edge of the tread surface and the root of the comb teeth	mm	2
$h_7$	Depth of the grooves	mm	2
$h_8$	Mesh depth of the comb into the grooves of the tread	mm	2
$h_9$	Vertical distance between floor and lower end of the anti-climbing device	mm	4
$h_{10}$	Vertical distance between lower edge of the handrail and upper end of the access restriction device	mm	4
$h_{11}$	Height of the anti-slide device	mm	4
$h_{12}$	Height of the upper edge of the free space outside the handrail	mm	A.1
$h_{13}$	Vertical distance between the upper and lower finished floor levels	m	2
$L_1$	Root of the comb teeth	-	2
$l_1$	Horizontal distance between supports	m	2
$L_2$	Comb intersection line	-	2
$l_2$	Distance between the furthest point reached by the handrail and the comb intersection line measured parallel to the tread surface	m	2
$l_3$	Length of the straight portion of the handrail in the direction of landing measured from the comb intersection line	m	2
$l_4$	Distance between the furthest point reached by the handrail and the point of entry into the newel measured parallel to the tread surface	m	2
$l_5$	Length of anti-climbing device on the lower outer decking	mm	4
$v$	Nominal speed	m/s	-
$x_1$	Step height	m	5
$y_1$	Step depth	m	5
$z_1$	Nominal width for the load carrying area (step, pallet or belt)	m	3, 5
$z_2$	Horizontal distance between skirting	m	3
$z_3$	Transverse distance between the supporting rollers	mm	8
$\alpha$	Angle of inclination of the escalator or moving walk	°(degree)	2
$\beta$	Design angle of the teeth of the comb	°(degree)	2
$\gamma$	Cross-sectional angle of inclination of the lower inner decking	°(degree)	3
$\mu$	Friction coefficient	-	-

## 4 List of significant hazards

### 4.1 General

This clause contains all the significant hazards, hazardous situations and events, as far as they are dealt with in this standard, identified by risk assessment as significant for escalators and moving walks and which require action to eliminate or reduce the risk. These significant hazards are based upon EN ISO 14121-1 [2].

## 4.2 Mechanical hazards

Mechanical hazards on escalators and moving walks and in their immediate vicinity can occur because of the design of the machine or access to it.

These include:

- contact with moving machinery parts (e.g. driving unit, handrail drive) normally not accessible to the public (see 5.2.1.1, 5.2.1.2, 5.2.1.3, 5.2.1.5, 5.2.1.6, 5.2.3, 5.2.4, 5.8.1, 5.8.4, 5.12.2.5, A.3.2, A.3.3);
- crushing and shearing of fingers between handrail and balustrade and between balustrades (see 5.5.2.5, 5.6.2);
- cutting hazard caused by adjacent cover profile parts (see 5.5.2.4);
- impact on bodies caused by collision with building structures (wall, roof, criss-cross arrangement), or with persons on adjacent escalators/moving walks (see A.2.1, A.2.2, A.2.3, A.2.4);
- drawing-in at handrail entry into the balustrade (see 5.6.4.3, 5.6.5);
- trapping between skirting and steps, between comb and step/pallet (see 5.3.4, 5.3.5, 5.4.2.1, 5.4.2.2, 5.5.3, 5.5.5, 5.7.2.5, 5.7.3, Fig. G.2);
- trapping between the floor and the handrail (see 5.6.4.1, 5.6.4.2);
- trapping between step and step or pallet and pallet (see 5.3.2).

## 4.3 Electric hazards

Electric hazardous situations can occur due to:

- contact of persons with live parts (see 5.8.3.3, 5.11.1.3);
- indirect contact (see 5.11.1.4, A.4);
- inadequate emergency stops (see 5.12.2.2.3);
- wrong assembly of electric components (see 5.11.5.4);
- electrostatic phenomena (see 5.11.7);
- external influences on electric equipment (see 5.12.1.2.1.4, 5.12.1.2.1.5, 5.12.1.2.2.3).

## 4.4 Radiation hazards

### 4.4.1 Electromagnetic radiation generated by the machine

Electromagnetic radiation can be emitted by the escalator or moving walk during normal operation (see 5.11.1.2.3, 5.12.1.2.1.5).

### 4.4.2 Electromagnetic radiation received from outside

Immission of low frequency radiation, radio frequency radiation, and microwaves can occur (see 5.11.1.2.3, 5.12.1.2.1.5).