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EUROPEAN STANDARD

EN 115

NORME EUROPÉENNE

EUROPÄISCHE NORM

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Supersedes EN 115:1983

Descriptors: escalators, passenger conveyors, safety requirements, accident prevention, equipment specifications, lighting, machine rooms, ports: openings, safety devices, stopper devices, handrails, steps (stairs), braking, brakes, electrical installation, overspeed protection, tests, maintenance, inspection

English version

Safety rules for the construction and installation of escalators and passenger conveyors

Règles de sécurité pour la construction et l'installation des escaliers mécaniques et trottoirs roulants

Sicherheitsregeln für die Konstruktion und den Einbau von Fahrtreppen und Fahrsteigen

This European Standard was approved by CEN on 1995-01-03. 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.

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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 WG 2 "Escalators and passenger conveyors" of the Technical Committee CEN/TC 10 "Passenger, goods and service lifts" and supersedes EN 115:1983. The secretariat is held by AFNOR.

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 EC Directive(s).

Considering that EN 115: 1983 had given rise to requests for interpretation and that the Directive on Machinery safety (89/392/EEC) had been adopted, CEN/TC 10 asked its working group WG 2 to amend EN 115: 1983

- to take into account these requests for interpretation;
- to cancel the national deviations;
- to cover the Directive 89/392/EEC.

This task was completed by CEN/TC 10/WG 2 in 1991 after 9 working meetings. The major changes are:

- reactivation for automatic restart;
- balustrades with central handrails (according to 5.1.5.8 EXCEPTION);
- interruption of electricity supply to the brake by at least 2 independent electrical devices;
- revision of the requirements for safety circuits;
- amendment in the article "introduction" concerning the transportation of trolleys, etc. (see 0.5.3)

Although this draft did not fully comply with EN 414 "Safety of machinery - Rules for the drafting and presentation of safety standards" it was agreed by the interested parties to submit it to the CEN enquiry with the aim to have as soon as possible a harmonized standard on escalators and passenger conveyors to provide one means of conforming with the Essential Safety Requirements of the Machinery Directive and associated EFTA Regulations. Those hazards which have been identified and taken into account are listed in annex C (normative).

EN 414 will be taken into account during the next revision of EN 115.

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 July 1995, and conflicting national standards shall be withdrawn at the latest by July 1995.

According to the CEN/CENELEC Internal Regulations, 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, United Kingdom.

0 Introduction

The purpose of this standard is to define safety rules for escalators and passenger conveyors in order to safeguard people and objects against risks of accidents during operation, maintenance and inspection work.

0.1 It is necessary that all components

0.1.1 are properly dimensioned, of sound mechanical and electrical construction and made of material with adequate strength and of suitable quality and free from defects; the use of materials with asbestos is not permitted;

0.1.2 are kept in good repair and working order. In particular, care shall be taken that the dimensions indicated are maintained despite wear; if necessary, the worn parts shall be replaced.

0.2 Where for elucidation of the text, an example is given this shall not be considered as the only possible design. Any other solution leading to the same result is permissible if it is guaranteed that with an equivalent function the same safety level exists.

0.3 It is not the purpose of this standard to preclude new developments of escalators and passenger conveyors. A new design shall meet at least the safety requirements of this standard.

0.4 Certain escalators and passenger conveyors are subject to special operational conditions. For these cases some additional requirements are defined, marked in this standard with the note "For Public Service Escalators and Public Service Passenger Conveyors". Additional recommendations for that kind of escalators and passenger conveyors are given in annex D (informative).

During the planning stage it should be specified if it will be a public service escalator or public service passenger conveyor (for criteria and definition see 3.9).

0.5 Special indications

0.5.1 Fire protection and building requirements differ from country to country and so far neither have been harmonized, either on the international level or in Europe.

Therefore, this standard cannot include specific requirements for fire protection and building requirements. However, it is recommended that as far as possible, escalators and passenger conveyors are made of materials that are not easy to ignite¹⁾.

0.5.2 If escalators or passenger conveyors have 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 shall be used that satisfy the particular conditions.

In addition, it is recommended that for escalators and passenger conveyors which otherwise would be exposed to weather conditions, the customer provides a roof and enclosure.

¹⁾ "not easy to ignite" equals "schwer entflammbar" in German and "difficilement inflammable" in French

0.5.3 If, exceptionally, means of transportation, e.g. push chairs, luggage trolleys or baggage carts, shall be carried on escalators or passenger conveyors, special measures shall be agreed between the manufacturer of the escalator/ passenger conveyor, the manufacturer of the means of transportation and the customer. Within those measures, it has to be taken care that the conditions defined in 8.2.1 for the steps, pallets and the belt are observed when selecting the means of transportation. The measures to be taken are governed by very different conditions which make a standardization within the scope of EN 115 impossible.

0.6 Requirements related to the life of the escalators and passenger conveyors are not included in this standard as it depends on the place of installation and customers' special specifications.

0.7 This standard has been drawn up taking into account in certain cases the imprudent act of the user. However, this standard takes into consideration proper use and not abuse.

0.8 An Interpretation Committee 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.

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1 Scope

1.1 This standard is applicable for all new escalators and passenger conveyors (pallet or belt type).

1.2 Existing escalators and passenger conveyors are not subject to this standard. It is, however, recommended that they be adapted to this standard.

1.3 If some dimensions of this standard cannot be kept due to structural conditions in existing buildings, it has to be defined in the individual case which alternative requirements are necessary.

NOTE: in addition see 0.5 and 0.6

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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** Safety of machinery - Basic concepts, general principles for design
- Part 1: Basic terminology, methodology
- Part 2: Technical principles and specifications
- EN 294** Safety of machinery - Safety distances to prevent danger zones being reached by the upper limbs
- prEN 1037** Safety of machinery - Prevention of unexpected start-up
- prEN 60068-2-6** Environmental testing procedures - Part 2: Tests; Test Fc and guidance: vibration (sinusoidal)
- EN 60068-2-27** Environmental testing procedures - Part 2: Tests; Test Ea and guidance: Shock
- EN 60269-1** Low-voltage fuses - Part 1: General requirements
- EN 60439-1** Low-voltage switchgear and controlgear assemblies - Part 1: Type-tested and partially type-tested assemblies
- EN 60529** Degrees of protection provided by enclosures (IP code)
- EN 60742** Specifications for safety isolating transformers
- EN 60947-4-1** Low-voltage switchgear and controlgear - Part 4: Contactors and motor starters. Section 1 - Electro-Mechanical contactors and motor starters
- EN 60947-5-1** Low-voltage switchgear and controlgear - Part 5: Control circuit devices and switching elements. Section 1 - Electromechanical control circuit devices and switching elements
- IEC 249-2** Metal-clad base materials for printed circuits - Part 2: Specifications
- IEC 249-3** Metal-clad base materials for printed circuits - Part 3: Special materials
- IEC 326-1** Printed boards. Part 1: General information for the specification writer
- IEC 664-1** Insulation co-ordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests
- IEC 665** A.C. electric ventilating fans and regulations for household and similar purposes

IEC 747-5 Semi-conductor devices - discrete devices and integrated circuits - Part 5: Opto-electronic devices

CENELEC

HD 21 PVC-insulated cables of rated voltages up to and including 450/750 V
- Part 1: General requirements
- Part 3: Single-core non-shielded cables for fixed wiring
- Part 4: Cables for fixed wiring
- Part 5: Flexible cables

HD 22.4 Rubber-insulated cables of rated voltages up to and including 450/750 V
- Part 4: Cords and flexible cables

HD 323.2.39 Basic environmental testing procedures - Part 2: Tests; Test Z/AMD: Combined sequential cold, low air pressure, and damp heat test

HD 384 Electrical installations of buildings
- Part 4: Protection for safety - Chapter 41: Protection against electric shock
- Part 5: Selection and erection of electrical equipment - Chapter 54: Earthing equipment and protective conductors

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3 Definitions

For the purposes of this standard, the following definitions apply:

3.1 Escalator: Power-driven installation with endless moving stairway for the conveyance of passengers in the upward or downward direction (see also 0.5.3).

3.2 Passenger conveyor: Power-driven installation with endless moving walkway (e.g. pallets, belt) for the conveyance of passengers either on the same or between different traffic levels (see also 0.5.3).

3.3 Handrail: Moving part intended to serve as a handhold for the passengers.

3.4 Comb: Parts which at both landings mesh with the steps, pallets or the belt in order to facilitate the transition of passengers.

3.5 Deflector device: An additional device to minimize the risk of trapping between the step and the skirting.

3.6 Rated speed: Speed in the direction of the moving steps, pallets or the belt, when operating the equipment under no load condition, stated by the manufacturer as that for which the escalator or passenger conveyor had been designed and at which it should operate.

3.7 Angle of inclination: Maximum angle to the horizontal in which the steps, the pallets or the belt move.

3.8 Theoretical capacity: Number of persons that can be carried theoretically by the escalator or passenger conveyor in 1 h.

For the determination of the theoretical capacity it is assumed that on one step with an average depth of 0,4 m, and per 0,4 m visible length of a pallet or belt, there are carried:

- 1 person at a nominal width $z_1 = 0,6$ m
- 1,5 persons at a nominal width $z_1 = 0,8$ m
- 2 persons at a nominal width $z_1 = 1,0$ m.

The theoretical capacity calculation is then:

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$$c_t = v \cdot 3600 \cdot k / 0,4$$

where:

- c_t theoretical capacity (persons/h)
- v rated speed (m/s)
- k factor

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For the most common widths there will be

- $k = 1$ for $z_1 = 0,6$ m
- $k = 1,5$ for $z_1 = 0,8$ m
- $k = 2$ for $z_1 = 1,0$ m

With this formula the theoretical capacity:

Table 1: Theoretical capacity

Nominal Width m	Rated Speed m/s		
	0,5	0,65	0,75
0,6	4 500 persons/h	5 850 persons/h	6 750 persons/h
0,8	6 750 persons/h	8 775 persons/h	10 125 persons/h
1,0	9 000 persons/h	11 700 persons/h	13 500 persons/h

3.9 Public service escalator/passenger conveyor

Escalator/passenger conveyor to which the following conditions apply:

- a) they are part of a public traffic system including entrance and exit points;
- b) they are suitable for regularly operating for approximately 140 h/week with a load reaching 100 % of the brake load (12.4.4.1 and 12.4.4.3) during periods lasting for at least 0,5 h during any time interval of 3 h.

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4 Symbols for quantities

The units used are chosen from the International System of units (SI).

Table 2: List of symbols for quantities

Clause	Explanation (in the order it appears in the document)	Symbol for quantity	Unit
3	Theoretical capacity	c_t	persons/h
3	Rated speed	v	m/s
3	Factor for different step width	k	-
5.1.5.6	Vertical distance between top edge of skirting or bottom edge of cover joints and the tread surface of the steps, pallets or belt	h_2	mm
5.1.5.7	Angle of inclination between the interior profile and the balustrade interior panelling	γ	°(degree)
5.1.5.7.1	Horizontal part of the interior profile that directly joins the balustrade interior panelling	b_4	mm
5.1.5.9	Newel including the handrail in longitudinal direction measured from the combs	l_2	m
5.2.2	Root of the comb teeth	L_1	-
5.2.3	Free height above the steps, pallets or belt	h_4	m
5.2.4	Vertical obstruction	h_5	m
5.2.4	Distance between the centerline of the handrail and an obstacle	b_9	m
5.3 and 8.1.3	Nominal width for the load carrying area (step, pallet or belt)	z_1	m
5.3	Distance between supports	l_1	m
7.2	Horizontal portion of the handrail in the direction of landing measured from the root of the comb teeth	l_3	m
7.3.1	Distance between the handrail profile and guide or cover profiles	b_6 b_6''	mm mm
7.3.1	Horizontal distance between the outer edge of the handrail and walls or other obstacles	b_{10}	mm
7.3.2	Width of the handrail	b_2	mm
7.3.3	Distance between the handrail and the edge of the balustrade	b_5	mm
7.4	Distance between the handrail centerlines	b_1	m
7.4	Distance between skirting	z_2	m
7.5.1	Distance between the entry of handrail into the newel and the floor	h_3	m
	(continued)		

Table 2 (concluded)

Clause	Explanation (in the order it appears in the document)	Symbol for quantity	Unit
7.5.2	Horizontal distance between the furthest point reached by the handrail and the point of entry into the newel	l_4	m
7.6	Vertical distance between the handrail and step nose or pallet surface or belt surface	h_1	m
8.1.1	Step height	x_1	m
8.1.2	Step depth	y_1	m
8.2.3.2 and 8.2.4.2	Width of the grooves	b_7	mm
8.2.3.3 and 8.2.4.3	Depth of the grooves	h_7	mm
8.2.3.4 and 8.2.4.4	Web width	b_8	mm
8.2.4.6.1.1	Transverse distance between the supporting rollers	z_3	mm
8.3.2.3	Design angle of the teeth of the comb	β	°(degree)
10.1.1	Angle of inclination of the escalator or passenger conveyor	α	°(degree)
11.3.1 and 11.4.1	Mesh depth of the comb into the grooves of the tread	h_8	mm
11.3.2 and 11.4.2	Clearance between the upper edge of the tread surface and the root of the comb teeth	h_6	mm
14.2.1.1	Comb intersection line	L_2	-

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5 Enclosure, surrounds, supporting structure and lighting

5.1 Enclosure of the escalator and passenger conveyor

5.1.1 General

5.1.1.1 All mechanically moved parts of the escalator or passenger conveyor shall be completely enclosed within imperforate panels or walls. Exempt from this are the accessible steps, the accessible pallets, the accessible belt and that part of the handrail available for the user. Apertures for ventilation are permitted.

5.1.1.2 It is permissible to omit an enclosure of the mechanically moved parts if other measures (such as rooms with locked doors accessible to authorized personnel only) make a hazard to the public impossible.

5.1.1.3 Accumulation of materials (e.g. grease, oil, dust, paper) represents a fire risk. Therefore it should be possible to clean the underside enclosure, if any, of dirt. If such cleaning is not possible, other precautions (e.g. sprinkler-system or other fire abatement system) shall be taken to avoid the related fire hazard arising.

5.1.2 The enclosure shall have adequate mechanical strength and rigidity.

5.1.3 Inspection doors and trap doors

5.1.3.1 Inspection doors and trap doors shall be provided only where necessary for the inspection and maintenance of the equipment.

5.1.3.2 It shall be possible to open inspection doors and trap doors by means only of a key or a tool specially suited for that purpose, which shall be in the hands of authorized persons only.

If rooms behind inspection or trap doors can be entered, it shall be possible to open the inspection or trap doors from the inside without a key even when locked.

5.1.3.3 Inspection doors or trap doors which open on to adjacent escalator or passenger conveyor treadways shall be provided with safety contacts according to 14.1.2 which prevent adjacent escalators or passenger conveyors from being operated when these doors are opened.

5.1.3.4 Inspection doors and trap doors shall be imperforate and conform to the same conditions as required for the enclosure material (see 5.1.2).

5.1.4 Apertures for ventilation

It shall not be possible to touch any moving part through a ventilation aperture (see 5.4 of EN 294: 1992).

5.1.5 Balustrades (see figure 2)

5.1.5.1 Balustrades shall be installed on each side of the escalator or passenger conveyor. The balustrade consists of components for which the following terms are usual: