
Varnostna pravila za konstruiranje in vgradnjo dvigal (liftov) – Posebna dvigala za prevoz oseb in blaga – 40. del: Priprave za vzpenjanje po stopnicah in dvižne ploščadi z diagonalnim pomikanjem za osebe z omejenimi gibalnimi sposobnostmi

(istoveten prEN 81-40:2004)

Safety rules for the construction and installation of lifts - Special lifts for the transport of persons and goods - Part 40: Stairlifts and inclined lifting platforms intended for persons with impaired mobility

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Règles de sécurité pour la construction et l'installation des élévateurs - Élévateurs spéciaux pour le transport des personnes et des charges - Partie 40 : Ascenseurs et plates-formes élévatrices inclinées à l'usage des personnes à mobilité réduite

Sicherheitsregeln für die Konstruktion und den Einbau von Aufzügen - Spezielle Aufzüge für den Personen- und Gütertransport - Teil 40: Treppenschrägaufzüge und Plattformaufzüge mit geneigter Fahrbahn für Behinderte

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 10.

If this draft becomes a European Standard, 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.

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Foreword

This document (prEN 81-40:2004) has been prepared by Technical Committee CEN/TC 10 “Lifts, escalators and moving walks”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

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 Annex ZA, which is an integral part of this document.

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Introduction

The standard is a Type C standard as stated in EN 1070.

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

The stairlifts defined in this standard are suitable for Type A and Type B wheelchairs as defined in EN 12183 and/or EN 12184.

When provisions of this type C standard are different from those which are stated in type A and type 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.

Those items relevant to lifting platforms referenced within EN 81-70 have been included within this standard.

Assumptions

With the aim of clarifying the intentions of the standard and avoiding doubts when reading it, the following assumptions were made when producing it:

- components without specific requirements are:
 - a) designed in accordance with the usual engineering practice and calculation codes, including all failure modes;
 - b) of sound mechanical and electrical construction;
 - c) general electrical hazards are dealt with according to B level electrical safety standards.
- components are kept in good repair and working order, so that the required characteristics remain despite wear;
- by design of the load bearing elements, a safe operation of the machine is assured throughout the entire load range;
- with the exception of the items listed below, a mechanical device built according to good practice and the requirements of the standard, will not deteriorate to a point of creating a hazard without the possibility of detection;
- to ensure the safe functioning, the operating temperature range of the equipment has to take into account the conditions of the place of use of the machinery, inside the range of ambient temperature between 0 °C and +40 °C.

Negotiation occurs between the manufacturer and the user concerning the specificity of the use and places of use of the stairlift:

- the place of installation allows a safe use for the machine;
- any additional fire protection requirements.

1 Scope

1.1 This European standard deals with safety requirements for construction, manufacturing, installation, maintenance and dismantling of electrically operated stairlifts (chair, standing platform and wheelchair platform) affixed to a building structure, moving in an inclined plane and intended for use by persons with impaired mobility:

- travelling between fixed levels, over a staircase or an accessible inclined surface;
- intended for use by one person;
- the inclination should not exceed 75° from the horizontal, with the exception of landing areas where a maximum vertical rise of 500 mm is permissible;
- whose carriage is directly retained and guided by a guide rail or rails;
- supported or sustained by, chain, rack and pinion, screw and nut, friction traction drive, rope and ball;
- with hold-to-run control;
- with rated speed not exceeding 0.15 m/s.

1.2 The standard identifies hazards as listed in clause 4 which arise during the various phases in the life of such equipment and describes methods for the elimination or reduction of these hazards when used as intended by the manufacturer.

1.3 European standard does not specify the additional requirements for:

- operation in severe conditions (e.g. extreme climates, strong magnetic fields);
- lightning protection;
- operation subject to special rules (e.g. potentially explosive atmospheres);
- handling of materials the nature of which could lead to dangerous situations;
- the use of energy systems other than electricity;
- hazards occurring during manufacture;
- earthquakes, flooding, fire;
- noise and vibrations;
- type C wheelchairs as defined in EN 12183 and/or EN 12184;
- evacuation during a fire;
- stairlifts for goods only;
- concrete, hardcore, timber or other foundation or building arrangement;
- the design of anchorage bolts to the supporting structure.

1.4 This document is not applicable to power operated stairlifts which are manufactured before the date of publication of this document by CEN.

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 81-1, *Safety rules for the construction and installation of lifts — Part 1: Electric lifts.*

EN 294:1992, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs.*

EN 349, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body.*

HD 384-5, *Selection and erection of electrical equipment — Chapter 54: Earthing arrangements and protective conductors.*

EN 418, *Safety of machinery — Emergency stop equipment, functional aspects — Principles for design.*

ISO/DIS 606:2000, *Short pitch transmission precision roller and bush chains, attachments and associated chain sprockets.*

EN 953:1997, *Safety of machinery — Guards — General requirements for the design and construction of fixed and moveable guards.*

EN 1050:1996, *Safety of machinery — Principles for risk assessment.*

EN 1070:1998, *Safety of machinery — Terminology.*

EN 12385-4:2002, *Steel wire ropes — Safety stranded ropes for general lifting applications.*

EN 12183:1999, *Manually propelled wheelchairs — Requirements and test methods.*

EN 12184:1999, *Electrical powered wheelchairs, scooters and their chargers — Requirements and test methods.*

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EN 60204-1:2000, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements.*

EN 60204-32:1998, *Safety of machinery — Electrical equipment of machines — Part 32: Requirements for hoisting machines (IEC 60204-32:1998).*

EN 60364, *Electrical installation of buildings.*

IEC 60417-1:1998, *Graphical symbols for use on equipment.*

EN 60529:1991, *Degrees of protection provided by enclosures (IP-Code) (IEC 60529:1989).*

EN 60617-1:1985, *Graphical symbols for diagrams, Part 1: General information, general index. Cross reference tables.*

EN 60742:1995, *Isolating transformers and safety isolating transformers — Requirements.*

IEC 60947-1:1999, *Low voltage switchgear and control gear Part 1: General rules.*

EN 60947-4-1:2000, *Low-voltage switchgear and control gear — Part 4-1: Contactors and motor-starters - Electromechanical contactors and motor-starters (IEC 60947-4-1:2000).*

EN 60947-5-1:1997, *Low-voltage switchgear and controlgear — Part 5-1: Control circuit devices and switching elements — Electromechanical control circuit devices (IEC 60947-5-1:1997).*

EN ISO 12100-1, *Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology (ISO 12100-1:2003).*

EN ISO 12100-2, *Safety of machinery – Basic concepts, general principles for design – Part 2: Technical principles (ISO 12100-2:2003).*

IEC 61508-2:2000, *Requirements for electrical/electronic/programmable electronic safety related systems.*

IEC 61508-3:2000, *Functional safety of electrical/electronic/programmable electronic safety related systems.*

ISO 7000:1998, *Graphical symbols for use on equipment: index and synopsis.*

ISO 9085:2002, *Guidance concerning the calculation of load capacity of spur and helical gears.*

3 Terms and definitions

For the purposes of this European standard the terms and definitions given in EN 1070, EN 81-1 and the following apply:

3.1

barrier arm

bar or similar device so arranged as to provide, protection against falling from a stairlift

3.2

brake

a mechanism employed to bring the stairlift to stop and hold it in position

3.3

carriage

a mobile trolley which is retained, supported and guided by one or more rails, upon which a chair, platform or other purpose made adaptation to carry the user is supported and securely attached

3.4

chainwheel

wheel having teeth specially designed to engage with a chain

3.5

drive system

a generic term covering the various drive unit arrangements that cause the carriage to move under power input

3.6

drive unit

the unit including the motor that drives and stops the stairlift

3.7

driving nut

internally threaded annular component that acts in conjunction with a screw to produce linear motion of the carriage

3.8

driving screw

externally threaded driving component that acts in conjunction with a nut

3.9

electric safety chain

the total of the electric safety devices connected in series

3.10

final limit switch

the last safety switch

3.11

guide rail

the rigid components which provide guiding for the carriage

3.12

guided chain

chain that is either fixed or moving, and is completely guided over its entire length such that it may transmit a load either in thrust or tension

3.13

guided rope

rope that is either fixed or moving, and is completely guided over its entire length such that it may transmit a load either in thrust or tension

3.14

overspeed governor

a device which, when the stairlift attains a pre-determined speed, causes the stairlift to stop and if necessary causes the safety gear to be applied

3.15

rack

a bar with teeth with which a driving pinion engages to form a slip free driving means converting rotary motion into linear motion

3.16

rated load

the load for which the equipment has been designed

3.17

rated speed

the nominal speed v in metres per second of the stairlift for which the equipment has been built

3.18

safety gear

a mechanical device for stopping and maintaining the carriage stationary on the guide rail/s in case of overspeeding in the downward direction or breaking of the suspension

3.19

safety nut

internally threaded annular component, used in conjunction with a screw/nut drive, so arranged that it does not normally carry the load but is capable of doing so in the event of failure of the threads in the main driving nut

3.20

self-sustaining drive system

a system that, under free running conditions, ensures that the speed of the stairlift decreases

3.21

sensitive edge

a device attached to any edge to provide protection against a trapping, shearing or crushing hazard

3.22

sensitive surface

a device similar in effect to a sensitive edge but so arranged to protect a whole surface

3.23**slack rope/chain switch**

switch or combination of switches, arranged to stop the stairlift if any suspension rope or chain slackens by a pre-determined amount

3.24**stairlift**

an appliance for transporting a person (either seated or standing) or person in a wheelchair between two or more landings by means of a guided carriage moving in an inclined plane

3.25**terminal switch**

a switch or combination of switches arranged to stop the stairlift at or near a landing

3.26**unlocking zone**

a zone extending above and below a landing in which the carriage must be positioned to enable the corresponding ramp(s) and barrier arm(s) to be unlocked

4 List of significant hazards

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 this type of machinery and which require action to eliminate or reduce the risk.

The significant hazards are based upon EN 1050. Also shown are the sub clause references to the safety requirements and/or protective measures in this standard.

Before using this standard it is important to carry out risk assessment of the Stairlift to check that its hazards have been identified in this clause.

Table1 shows the hazards which have been identified and where the corresponding requirements have been formulated in this standard, in order to limit the risk or reduce these hazards in each situation.

NOTE Hazards resulting from allergic reactions to persons are not addressed in this standard, but advice on such materials is given Annex D of EN 81-70.

Table 1 — Significant hazards relating to the general design and construction of stair lifts

	Hazards	Relevant clauses in prEN 81-40
1	Mechanical hazards <ul style="list-style-type: none"> a) Shape b) relative location: c) mass and stability (potential energy of elements which may move under the effect of gravity); d) mass and velocity (kinetic energy of elements in controlled motion); e) inadequacy of energy inside the machinery e.g.; <ul style="list-style-type: none"> — accumulation of energy inside the machinery e.g.: f) elastic elements (springs); g) liquids and gasses under pressure h) the effect of vacuum 	5 5.3.1.7 5.4
1.1	Crushing hazard	5.6.2.4, 5.6.3.5, 5.6.4.10
1.2	Shearing hazard	5.6.2.4, 5.6.3.5, 5.6.4.10
1.3	Cutting or severing hazard	5.6.2.4.5
1.4	Entanglement hazard	5.4.7.4
1.5	Drawing-in or trapping hazard	5.1.8, 5.4.1.2, 5.4.4.5, 5.4.6.3, 5.4.7.4
1.6	Impact hazard	5.6.4.4
1.7	Stabbing or puncture hazard	5.1.8
1.8	Friction or abrasion hazard	5.6.2.4.5
1.10	Falling hazard	5.2.1.1, 5.3.1.7
2	Electrical hazards	
2.1	Electrical contact of persons with live parts	5.5.11, 5.5.12, 5.1.7
2.2	Electrical contact of persons with parts which have become live under faulty conditions	5.5.1.2, 5.5.11
2.3	Approach to live part under high voltage	5.5.4.1, 5.5.1.3
2.4	Electrostatic phenomena	5.5.1.2, 5.5.12.10
3	Thermal hazards	
3.1	Burns and scalds	5.5.8, 5.5.1.3
3.2	Health-damaging effects	5.1.6, 5.1
7.1	Contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	5.1.3
7.2	Fire or explosion	5.1.6, 5.1.3.1
8	Hazards generated by neglecting ergonomic principles in machine design	
8.1	Unhealthy postures or excessive effort	Annex E, 5.2.2.2, 5.6.4.4, 5.3.4
8.2	Inadequate consideration of human hand/arm or foot/leg anatomy	5.6.1.2, Annex C 1.2,
8.4	Inadequate area lighting	Annex C2
8.6	Human error	5.5.14, 5.5.9.7, 5.5.7, 7.4
8.7	Inadequate design, location or identification of manual controls	7.3.4, 7.3.5, 7.3.6, 7.4.1, 5.5.14, 5.1.2

(to be continued)

Table 1 — Significant hazards relating to the general design and construction of stair lifts *(continued)*

	Hazards	Relevant clauses in prEN 81-40
8.8	Inadequate design or location of visual display units	7.3.3
10	Hazards caused by failure of energy supply, breaking down of machinery parts and other functional disorders	
10.1	Failure/disorder of the control system	5.5.5.1, 5.5.14.1.4, 5.4.2.1, 5.5.15, 5.6.5.5, 5.4.2, 5.5.3.3, 5.5.5.1, 6.3
10.2	Restoration of the energy after an interruption	5.5.5.1, 5.5.14.1.4, 5.5.2.4, 5.5.3.2, 5.5.5.1, 6.3
10.5	Errors in software	6.3, 5.5.6.5
10.6	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities, see 5.5.6	5.5.14, 5.5.9.7, 7, 5.4.3,
11	Impossibility of stopping the machine in the best possible conditions	
11.1	unsafe position	5.5.15, 5.2.3.1, 5.4.2.1
11.2	Overspeeding	5.4.2, 5.5.3.3, 5.5.5.1
13	Failure of the power supply	
13.1	Overspeeding	5.4.2, 5.5.3.3, 5.5.5.1
13.2	unexpected start	5.5.5.1, 5.5.14.1.4
13.3	Change of direction	5.5.2.4, 5.5.3.2, 5.5.5
13.4	Loss of memory	5.5.5.1, 6.3
13.5	Unsafe position	5.2.4, 5.4.2, 5.5.15.1
13.6	Entrapment	5.4.3, 5.5.16, 5.6.4.7.2, 5.6.4.9, 5.6.4.11
14	Failure of the control circuit	
14.1	Errors on software	5.5.6.5, 6.3
14.2	Failure to stop	5.5.2, 5.5.3, 5.5.4, 5.5.5, 5.5.6, 6.3
14.3	Unexpected stop	5.5.2, 5.5.3, 5.5.4, 5.5.5, 5.5.6, 6.3
14.4	Unexpected start	5.5.2, 5.5.3, 5.5.4, 5.5.5, 5.5.6, 6.3
14.5	External influences	5.1.7.3
14.6	Unexpected start	5.5.5.1, 5.5.13.1, 5.5.14.1.4
14.7	Failure to start	5.6.3.4
14.8	Maintenance operation	5.4.3, 7.3.5, 7.3.6
14.9	Unexpected activation	5.4.3, 5.6.4.12
14.10	Brake remains lifted	5.3, 5.4.2.2, 5.5.3.1
14.11	Prevent stopping	5.4.2, 5.5.3.2
14.12	Ineffective protection	5.6.4.6, 5.6.4.10, 5.6.2.4.1
14.13	Isolation	5.5.9
15	Errors of fitting	5.5.9.2.1, 5.5.9.3

(to be continued)

Table 1 — Significant hazards relating to the general design and construction of stair lifts *(continued)*

	Hazards	Relevant clauses in prEN 81-40
16	Break-up during operation	
16.1	Stress failure	5.5.4
16.2	Falling	5.5.4, 5.6.2.5, 5.6.3.3, 5.6.4.6, 5.6.4.7, 5.6.4.8
17	Falling or ejected objects or fluid	
17.1	falling objects	5.6.4.5, 5.6.4.6.3, 5.6.3.2.1
18	Loss of stability / overturning of machinery	
18.1	Overturning	5.2, 5.3.1.7
18.2	Falling	5.2, 5.3.1.7, 5.6.2
19	Slip, trip and fall of persons (related to machinery)	
19.1	Slipping	5.6.2, 5.6.4.1
19.2	Tripping	5.6.3.2
19.3	Falling	5.6.4.6.1, 5.6.4.6.3, 5.6.4.7, 5.6.4.5.2.
27	Mechanical hazards and hazardous events	
27.1	from load falls, collisions, machine tipping caused by:	
27.1.1	lack of stability	5.2.1
27.1.2	uncontrolled loading- overloading- overturning moments exceeded	5.5.8, 5.6.4.3, 6.3
27.1.3	uncontrolled amplitude of movements	5.1.4, 5.1.5, 5.4.2, 5.4.2.2, 6,3
27.1.4	unexpected/unintended movement of loads	5.1.4, 5.1.5, 5.4.2, 5.4.2.2, 6,3
27.1.5	inadequate holding devices/ accessories	7.3
27.3	from derailment	5.1.6.2, 5.2.1, 5.2.3.1, 5.2.2.
27.4	from insufficient mechanical strength of parts	5.1.1, 5.1.6
27.5	from inadequate design of pulleys, drums	5.4.1.3
27.6	from inadequate selection of chains, ropes, lifting and accessories and their inadequate integration into the machine	5.4.1.3, 5.4.4, 5.4.1.5, 5.4.1.6, 5.4.7.2, 7.3.1
27.7	from lowering of the load under the control of the friction break	5.4.2.1
27.8	from abnormal conditions of assembly/testing/use/maintenance	6.3, 7.4
27.9	From the effect of load on the persons (impact by load or counterweight	5.2.2.2, 6.4
29	Hazards generated by neglecting ergonomic principles	
29.1	insufficient visibility from the driving position	5.6.4.12, 6.3
34	Mechanical hazards and hazardous events due to:	
34.1	Inadequate mechanical strength – inadequate working coefficients	5.1.1, 5.1.5, 5.1.6, 5.4.1.3, 5.4.4.1, 5.4.5.1, 5.4.5.2, 5.4.6, 5.4.6.1, 5.4.7.5, 5.4.6.2, 5.4.7.1, 5.4.8, 5.4.9, 5.4.10.1, 5.4.11.1, 5.4.11.2, 5.4.12.1, 5.4.14.1.1, 5.4.14.1.2, 5.4.14.1.3
34.2	Failing of loading control	5.5.1.1
34.3	Failing of controls in person carrier (function, priority)	5.5.14.3, 5.5.14.1

(to be continued)