INTERNATIONAL STANDARD

ISO 9386-2

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Power-operated lifting platforms for persons with impaired mobility — Rules for safety, dimensions and functional operation —

Part 2: Powered stairlifts for seated, standing and wheelchair users moving in an inclined plane

Plates-formes élévatrices motorisées pour personnes à mobilité réduite — Règles de sécurité, dimensions et fonctionnement —

Partie 2: Élévateurs inclinés pour usager en position assise, debout ou en fauteuil roulant

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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 the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 9386 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 9386-2 was prepared by Technical Committee ISO/TC 178, *Lifts, escalators, passenger conveyors*.

ISO 9386 consists of the following parts, under the general title *Power-operated lifting platforms for persons with impaired mobility — Rules for safety, dimensions and functional operation*:

— *Part 1: Vertical lifting platforms*

— *Part 2: Powered stairlifts for seated, standing and wheelchair users moving in an inclined plane*

Annex F is a normative part of this part of ISO 9386. Annexes A, B, C, D, E and G are for information only, giving useful information and guidance to purchasers and installers.

Annex G is included to summarize those clauses within this part of ISO 9386 where separate requirements apply to stairlifts installed in buildings with restricted access or alternatively in buildings with public access.

Introduction

ISO 9386 specifies the safety rules, dimensions and functioning for permanently installed power-operated lifting platforms designed for use by persons with impaired mobility. This part of ISO 9386 covers powered stairlifts for seated, standing and wheelchair users moving in an inclined plane.

The location and dimensions of controls and other parts of the stairlift installation have been chosen to meet the functional needs of disabled persons and are compatible with the guidelines set out in ISO/TR 9527.

It is intended that equipment manufactured according to the requirements of this part of ISO 9386 is for use by disabled persons on a stairway with restricted access. In suitable circumstances, and subject to any special provisions detailed within this part of ISO 9386, such stairlifts may be used by disabled persons on stairways with a wider scope of access or unrestricted access.

Stairlifts manufactured according to the requirements of this part of ISO 9386 will be capable of being operated in a normal domestic environment as regards temperature and humidity. Additional features are likely to be necessary in more rigorous conditions, or if fitted in an external situation.

It is assumed that a stairlift complying with the requirements of this part of ISO 9386 will be used only by person(s) either capable of using it safely and unaided or, if not so capable, who only uses it when adequately attended by an assistant. On installations with restricted access, it is assumed that users will be fully instructed in the operation of the stairlift in accordance with clause A.3. On installations with public access, it is assumed that operating instructions or assistance will be provided.

When, for the sake of clarity, mention is made of a design, this should not be considered to be the only possible design, particularly in relation to recent developments in electronics and microprocessors and their use in control and safety circuits. Any other solution leading to the same result may be applied provided that it can be demonstrated to be equivalent in operation and at least equally safe.

It is recommended that stairlifts manufactured in accordance with this part of ISO 9386 should be subjected to independent verification of compliance through type approval.

Power-operated lifting platforms for persons with impaired mobility — Rules for safety, dimensions and functional operation —

Part 2:
Powered stairlifts for seated, standing and wheelchair users moving in an inclined plane

1 Scope

This part of ISO 9386 specifies the safety rules, dimensions and functional operation for permanently installed power-operated stairlifts intended for use by persons with impaired mobility, for seated, standing and wheelchair users moving in a substantially inclined plane.

It is restricted to stairlifts

a) which travel between fixed levels over a staircase or an accessible inclined surface (see note 1);

b) whose rated speed does not exceed 0,15 m/s;

c) whose rail inclination does not exceed 75° from the horizontal;

d) whose carriage is directly retained and guided by a rail or rails (see note 2).

NOTE No enclosure for the path of the stairlift is required.

This part of ISO 9386 does not specify every general technical requirement for all aspects of the electrical, mechanical or building construction.

As far as possible, this part of ISO 9386 specifies only the requirements that materials and equipment need to meet in the interests of safety and functional operation.

Requirements are also included for protection against harmful influences which may be experienced by equipment installed in external locations.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 9386. 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 9386 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.

ISO 606:1994, *Short-pitch transmission precision roller chains and chainwheels*.

ISO 3864:1984, *Safety colours and safety signs*.

ISO 4190-5, *Lifts and service lifts (USA: Elvators and dumbwaiters) — Part 5: Control devices, signals and additional fittings*.

ISO 4344:1983, *Steel wire ropes for lifts*.

ISO 4413:1998, *Hydraulic fluid power — General rules relating to systems*.

ISO 7000:1989, *Graphical symbols for use on equipment — Index and synopsis*.

IEC 60204-1, *Electrical equipment of industrial machines — Part 1: General requirements*.

IEC 60335-1, *Safety of household and similar electrical appliances — Part 1: General requirements*.

IEC 60364, *Electrical installations of buildings.*

IEC 60417-2:1998, *Graphical symbols for use on equipment — Part 2: Symbol originals*.

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

IEC 60617, *Graphical symbols for diagrams*.

IEC 60664-1:1992, *Insulation coordination for equipment within low-voltage systems — Part 1: Principles, requirements and tests*.

IEC 60742:1983, *Isolating transformers and safety isolating transformers — Requirements*.

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

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

EN 50214, *Flexible cables for lifts*.

CENELEC HD 360 S2, *Circular rubber insulated lift cables for normal use*.

3 Terms and definitions

For the purposes of this part of ISO 9386, the following terms and definitions apply.

3.1
barrier arm
bar or similar device so arranged as to provide, when required, protection against falling from a stairlift

3.2
brake
electromechanical mechanism employed to hold the stairlift in position and/or to bring it to rest smoothly

3.3
carriage
whole moving part of the stairlift designed to carry the passenger or the passenger in a wheelchair

3.4
chain
simplex or duplex transmission chain that, if used as part of a drive system, either transmits rotary motion from one shaft to another or transmits motion directly to the carriage

3.5
chainwheel
wheel having machine-cut teeth specially designed to engage with a chain

3.6
competent person
person who, by virtue of specific training, is competent to assess technically the safety and function of the stairlift

3.7
contactor
relay
electromagnetically operated device of suitable rating for switching an electrical circuit

3.8
controller
assembly of electrical contactors, relays and/or other components which control the movement of the stairlift

3.9
direct-acting stairlift
stairlift in which a hydraulic jack or nut or screw is directly attached to the stairlift

3.10
down-direction valve
electrically controlled valve in a down-direction hydraulic circuit

3.11
drive
generic term covering the various electromechanical drive unit arrangements that cause the carriage to move under electrical power input

3.12
drive unit
complete assembly comprising an electric motor, brake and gearing, which supplies the tractive and braking effort controlling the movement of the carriage

3.13
driving nut
internally threaded annular component that acts in conjunction with a screw to produce linear motion of the carriage

EXAMPLE A rotating screw engaging with a fixed nut, or *vice versa.*

3.14
driving rack
strip incorporating specially shaped teeth with which a driving pinion may engage to form a positive driving means converting rotary motion into linear motion

3.15
driving screw
externally threaded driving component that acts in conjunction with a driving nut

3.16
duty cycle
number of journeys the stairlift is required to perform in a given period of time

3.17
final limit switch
electrical safety switch positively and mechanically operated by movement of the carriage in the event of over-travel

3.18
follow-through
amount of additional free movement provided in the actuation of an electrical switching device after the electrical contact has been broken

3.19
footrest
platform or bracket of adequate strength, so designed that the user is able to stand or to rest his/her feet upon it either during movement of the stairlift or when it comes to rest

3.20
full-load pressure
highest hydraulic system pressure for the stairlift carrying its rated load when at rest

3.21
guide rail
components which direct the course of the platform

3.22
guided chain
chain, which may be either fixed or moving, and which is completely guided over its entire length such that it may transmit a load either in thrust or tension

3.23
hydraulic stairlift
stairlift in which the lifting power is derived from an electric motor, driving a pump which transmits hydraulic fluid to a jack

3.24
journey
movement of the carriage between any two levels which incorporates one start and one stop

3.25
landing
defined level to be served by the stairlift, having adequate space to permit the manœuvring, boarding and alighting of users with a wheelchair where appropriate

3.26
overspeed governor
device which, when the stairlift attains a pre-determined speed, causes the stairlift to stop by application of the safety gear

3.27
pinion
wheel, having machine-cut teeth specially designed to engage with those of other similar toothed wheels or racks, used to transmit relative motion

3.28
platform
flat and substantially horizontal structure that is part of the carriage that supports the user

3.29
powered stairlift
stairlift that uses an external source of power, in contrast to one being operated manually

3.30
pressure-relief valve
valve which limits fluid pressure to a stated value by exhausting fluid

3.31
rack
bar with specially shaped teeth with which a pinion may engage and which forms a positive driving means to convert rotary motion into linear motion

3.32
rated load
load for which the equipment has been built and for which safe operation is guaranteed by the supplier

3.33
rated speed
nominal speed of the stairlift as agreed in the contract for the particular installation

3.34
restricted access
access which is restricted to a known user or users

3.35
rupture valve
valve designed to close automatically when the fluid pressure drop across the valve, caused by increased flow in a predetermined flow direction, exceeds a predetermined amount

3.36
safety circuit
electrical or electronic circuit which has been subjected to failure analysis to confirm an equivalent degree of safety to a safety contact

3.37
safety contact
contact in which the separation of the circuit-breaking elements is made by positive means

3.38
safety factor
ratio, for a particular material under static or dynamic conditions (as defined in the text), of the yield load or the ultimate tensile load (as defined in the text) to the load that can be imposed upon a member by the rated load

3.39
safety gear
mechanical device for stopping and maintaining the carriage stationary on the guides in the event of overspeeding in the downward direction or breaking of the suspension

3.40
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

3.41
safety switch
electrical switch incorporating one or more safety contacts

3.42
self-sustaining drive system
drive system that, under free running conditions with the brake lifted, will not permit the stairlift to increase in speed.

NOTE The system will not permit the stairlift to start moving from a standstill with the brake lifted. All other systems are non-self-sustaining.

3.43
sensitive edge
safety device attached to any edge of the stairlift to provide protection against a trapping, shearing or crushing hazard

3.44
sensitive surface
safety device similar in effect to a sensitive edge but so arranged to provide protection over a whole surface, such as the underside of a platform or other large area

3.45
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

3.46
stairlift
appliance for transporting a person or person with a wheelchair between two or more levels by means of a guided carriage moving substantially in the direction of a flight of stairs and travelling in the same path in both upward and downward directions

3.47
stairway
part of a building that provides a route of travel and is formed either by a single flight of stairs or by a combination of two or more flights of stairs and one or more intervening landings

3.48
terminal switch
switch, or combination of switches, arranged to bring the stairlift to rest automatically at or near the landing

3.49
toothed belt
flexible continuous belt, having teeth formed in one or other of its surfaces, and designed to engage with specially cut or moulded teeth in wheels attached to separate shafts in order to provide a drive between the two

3.50
travel
distance between the highest and lowest levels served

3.51
unlocking zone
zone, extending above and below a landing, in which the stairlift must be positioned to enable the appropriate ramp(s) and barrier arm(s) to be unlocked

3.52
user
person(s) for whom the stairlift is installed or designed

4 General requirements for stairlifts

4.1 Pattern of use

The design of the stairlift shall take account of the frequency of usage to which it will be subjected.

4.2 Protection against hazards

Protection so as to minimize the risk of all of the following hazards shall be incorporated:

a) shearing, crushing, trapping or abrading;

b) entanglement;

c) falling and tripping;

d) physical shock and impact;

e) electric shock;

f) fire, attributable to use of the stairlift.

4.3 General design

Components shall be of sound mechanical and electrical construction, using materials that are free from obvious defects and that are of adequate strength and suitable quality. It shall be ensured that the dimensions specified in this part of ISO 9386 are maintained, despite wear. Consideration shall also be given to the need for protection against the effects of corrosion. The transmission of noise and vibration to any surrounding walls and other supporting structures shall be minimised. All materials shall be asbestos free.

4.4 Design guidelines particular to the installation

Ensure that design requirements particular to the installation or the user are taken into account.

4.5 Access for maintenance, repair and inspection

Stairlifts shall be designed, constructed and installed so that components requiring periodic inspection, testing, maintenance or repair shall be easily accessible.

4.6 Fire resistance

Materials used in the construction of the stairlift shall not support combustion, neither shall they be dangerous through the toxic nature and quantity of gas and fumes they may generate in a fire situation.

Plastic components and electrical wiring insulation shall be flame retardant and self-extinguishing.

4.7 Rated speed

The rated speed of the stairlift in the direction of travel shall not be greater than 0,15 m/s when measured at the reference points defined in Figures 1 and 2.

4.8 Rated load

Stairlifts shall be designed either for a capacity of one person, for which the rated load shall be not less than 115 kg, or for a capacity of one person in a wheelchair with a minimum rated load of 150 kg.

If the load to be transported is not known (e.g. in a public building), then it is recommended that the rated load of a wheelchair platform stairlift shall be not less than 225 kg.

The maximum rated load shall be 350 kg.

4.9 General safety factor

Unless stated otherwise in this part of ISO 9386, the safety factor for all parts of the equipment shall not be less than 1,6 based on yield load and the maximum dynamic load. This safety factor is based on steel or equivalent ductile materials. Increased safety factors shall be considered for other materials.

4.10 Resistance to operating forces

4.10.1 The complete stairlift installation shall resist, without permanent deformation, the forces imposed on it during normal operation, during the application of the safety devices and at impact on mechanical stops when travelling at the rated speed. However, local deformation that does not affect the operation of the stairlift arising from the safety gear gripping device is permissible.

4.10.2 Guiding components, their attachments and joints shall withstand deflections due to uneven loading without affecting normal operation.

4.11 Protection of equipment against harmful external influences

4.11.1 General

Mechanical and electrical components shall be protected from the harmful and hazardous effects of external influences that will be encountered at the proposed installation site, for example:

a) the ingress of water and solid bodies;

b) the effects of humidity, temperature, corrosion, atmospheric pollution, solar radiation, etc.;

c) the actions of flora, fauna, etc.

4.11.2 Protection

The protection shall be designed and constructed and the stairlift shall be installed in such a manner that the influences mentioned above do not prevent the stairlift from operating safely and reliably.

4.11.3 Degree of protection for outdoor use

For outdoor use, stairlifts shall have a degree of protection for electrical equipment which is not less than IP4X as defined in IEC 60529:1989.

NOTE 1 Guidance on the construction of equipment, selection of enclosures, selection and treatment of materials, electrical insulating materials, sealing techniques, etc., should be obtained by reference to relevant national standards and International Standards.

The degree of protection shall be increased as necessary appropriate to the location and operating conditions (see 8.4.1).

4.12 Suppression of radio and television interference

The design of the electric motor, contact devices and control devices shall comply with legal requirements for the suppression of electromagnetic interference. However, components necessary to give an adequate degree of suppression shall not be used in any part of a circuit where failure might cause an unsafe condition.

4.13 Guarding

Components (e.g. gearing and the drive unit) shall be guarded so far as is possible to prevent risk of personal injury. Where necessary, guards shall be of imperforate material. Access panels shall be secured by means requiring the use of a tool or key for their release. See also 7.4.5 and 7.7.4.

5 Guide rails and mechanical stops

5.1 Guide rails

5.1.1 Guide rails shall be provided to retain and guide the carriage throughout its travel.

5.1.2 Guide rails shall be made of metal.

5.2 Folding guide rails

5.2.1 Folding guide rails shall not obstruct the stairway or landing when in the folded position.

5.2.2 Manual folding sections shall be counter-balanced.

5.2.3 A safety switch shall be fitted to prevent the stairlift from reaching the folding guide rail section, except when the folding section is correctly positioned for the operation of the stairlift.

On stairlifts with cableless control, the hinged rail position proving switch may act indirectly on the equipment controlling the supply to the driving motor and brake. This is a permissible deviation from 8.6.1.

5.2.4 The control system for motorized folding guide rail drives shall operate from constant pressure (hold-to-run) controls. However, self-maintaining controls may be used if the energy within the motorized folding rail system is less than 4 J.

5.2.5 Motorized drives shall also be capable of emergency manual operation.

5.2.6 The drive to the folding mechanism shall be protected to prevent damage to the mechanism or danger to the user should the folding section of guide rail encounter an obstruction.

5.3 Stairlift guide rail

Only one carriage shall be fitted on any one stairlift guide rail. Any adjacent stairlift guide rail shall be so positioned that there is no crushing or shearing hazard between the carriages when they are in the positions of closest proximity.

5.4 Mechanical end stops

These shall be fitted if it is possible for the stairlift to be driven beyond the extremes of travel.

6 Safety gear and overspeed governor

6.1 General

6.1.1 The stairlift shall be provided with a safety gear. The safety gear shall operate to stop and sustain the stairlift with the rated load taking into account associated shock loads.

There are four exceptions to this requirement, as follows:

a) direct acting hydraulic jack drives do not require a safety gear (see 7.13.6);

b) when the stairlift is driven by worm/segment drive;

c) when the stairlift is driven by a self-sustaining rotating screw or nut (see 6.8 and 7.7.5);

d) other drives provided that