

LIFTIDE VALMISTAMISE JA PAIGALDAMISE  
OHUTUSEESKIRJAD. INIMESTE JA KAUBA TRANSPORDI  
LIFTID. OSA 22: KALDTÕUSUGA SÕIDU- JA  
KAUBALIFTID

Safety rules for the construction and installation of lifts  
- Lifts for the transport of persons and goods - Part 22:  
Passenger and goods passenger lifts with inclined  
travel path

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN 81-22:2021 sisaldab Euroopa standardi EN 81-22:2021 ingliskeelset teksti.	This Estonian standard EVS-EN 81-22:2021 consists of the English text of the European standard EN 81-22:2021.
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English Version

Safety rules for the construction and installation of lifts -  
Lifts for the transport of persons and goods - Part 22:  
Passenger and goods passenger lifts with inclined travel  
path

Règles de sécurité pour la construction et l'installation  
des élévateurs - Elévateurs pour le transport de  
personnes et d'objets - Partie 22 : Ascenseurs et  
ascenseurs de charge avec voie de déplacement  
inclinée

Sicherheitsregeln für die Konstruktion und den Einbau  
von Aufzügen - Aufzüge für den Personen- und  
Gütertransport - Teil 22: Personen- und Lastenaufzüge  
mit geneigter Fahrbahn

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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-CENELEC Management Centre or to any CEN member.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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## European foreword

This document (EN 81-22:2021) 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of an identical text or by endorsement, at the latest by March 2022, and conflicting national standards shall be withdrawn at the latest by September 2023.

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

This document supersedes EN 81-22:2014.

This document is a revision of EN 81-22:2014 in order to align its Annex ZA to the new format and requirements as laid out in the EU Commission Standardization Request “M/549 C(2016) 5884 final”. During this revision no technical changes are made and the technical requirements of this document remain identical to EN 81-22:2014.

This document has been prepared under a Standardization Request 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.

This document is part of the EN 81 series of standards: “*Safety rules for the construction and installation of lifts*”.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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

## 0 Introduction

### 0.1 General

This document is a type C standard as stated in EN ISO 12100.

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

When provisions of this type 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 inclined lifts in order to safeguard persons and objects against risks of accidents during installation, operation, maintenance, inspection work and emergency operations of lifts.

### 0.2 Considerations

Consideration has been taken into account of various categories of lifts with inclined travel path to ascertain the related hazards and risks owing to the configuration of structures (civil engineering works), inclination and outside influences such as the following:

- a) the large opening to the exterior;
- b) the possibility to walk around inside the lift well;
- c) the arrangement of the doors;
- d) the horizontal component of deceleration in the event of stopping of the vehicle.

The prescriptions relating to the protection of workers and to the evacuation from the car are different when it is possible to walk inside the well and when the car roof is used as working station for the maintenance.

An Interpretation Committee has been established to clarify, if necessary, the spirit in which the clauses of the document 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 (see CEN/TR 81-10 [1] for information).

### 0.3 Principles

In drawing up this standard the following have been used.

This document does not repeat all the general technical rules applicable to every electrical, mechanical, or building construction including the protection of building elements against fire.

It has, however, seemed necessary to establish certain requirements of good construction, either because they are peculiar to lift manufacture or because in the case of lift utilization the requirements may be more stringent than elsewhere.

This document does not only address the essential safety requirements of the Lift Directive, but additionally states minimum rules for the installation of lifts into buildings/constructions. There may be in some countries regulations for the construction of buildings, etc. which cannot be ignored.

Typical clauses affected by this are those defining minimum values for the height of the machine and pulley rooms and for their access doors dimensions.



When the weight, size and/or shape of components prevent them from being moved by hand, they are:

- a) either fitted with attachments for lifting gear, or
- b) designed so that they can be fitted with such attachments (e.g. by means of threaded holes), or
- c) shaped in such a way that standard lifting gear can easily be attached.

As far as possible the document sets out only the requirements that materials and equipment will meet in the interests of safe operation of lifts.

#### **0.4 Assumptions**

The contents of this document are based on the assumption that persons using inclined lifts are able to do so unaided.

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

- a) intended use of the inclined lift;
- b) environmental conditions;
- c) civil engineering problems;
- d) other aspects relating to the place of installation (e.g. high-voltage electric line, bridges, dangerous buildings, natural obstacle).

Possible risks have been considered of each component that may be incorporated in a complete lift installation. Rules have been drawn up accordingly.

Components are:

- designed in accordance with usual engineering practice and calculation codes, taking into account all failure modes;
- of sound mechanical and electrical construction;
- made of materials with adequate strength and of suitable quality;
- be free of defects.

Harmful materials, such as asbestos are not used.

Components are kept in good repair and working order, so that the required dimensions remain fulfilled despite wear.

Components will be selected and installed so that foreseeable environmental influences and special working conditions do not affect the safe operation of the lift.

Especially for the extreme temperatures which were agreed between the customer and the supplier, the choice of materials and components will be made with particular attention that they keep their characteristics for impact strength for the steel, rigidity and function for plastics, functional for the electronic components, viscosity for oils, etc.

By design of the load bearing elements, a safe operation of the lift is ensured for loads ranging up to 125 % (static) and up to 110 % (dynamic) of the rated load.

The requirements of this document regarding electrical safety devices are such that the possibility of a failure of an electric safety device (see 5.11.1.2) complying with all the requirements of this document need not be taken into consideration.”

Users should be safeguarded against their own negligence and unwitting carelessness when using the lift in the intended way.

A user may, in certain cases, make one imprudent act. The possibility of two simultaneous acts of imprudence and/or the abuse of instructions for use is not considered.

If in the course of maintenance work a safety device, normally not accessible to the users, is deliberately neutralized, safe operation of the lift is no longer ensured, but compensatory measures will be taken to ensure users safety in conformity with maintenance instructions.

It is assumed that maintenance personnel is instructed and works according to the instructions.

Horizontal forces and/or energies to consider are indicated in the applicable clauses of the standard. Typically:

- the static force that a person normally exerts is of the magnitude of 300 N;
- the energies resulting from impact depend on the lift component where the impact can occur; if not otherwise specified the resulting force is assumed to be 1 000 N.

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 hazard without the possibility of detection.

The following mechanical failures are considered:

- breakage of the suspension;
- uncontrolled slipping of the ropes on the traction sheave;
- breakage and slackening of all linkage by auxiliary ropes, chains and belts;
- failure of one of the mechanical components of the electromechanical brake which take part in the application of the braking action on the drum or disk;
- failure of a component associated with the main drive elements and the traction sheave;
- ropes leaving the pulleys and, in case of change of inclination, leaving the rollers;
- blockage of the rope movement;
- blockage or derailment of the vehicle.

The possibility of the safety gear not setting, should the vehicle free fall from the lowest landing, before the vehicle strikes the buffer(s) is considered acceptable.

When the speed of the vehicle is linked to the electrical frequency of the mains up to the moment of application of the mechanical brake, the speed is assumed not to exceed 115 % of the rated speed or a corresponding fractional speed.

Means of access are provided for the hoisting of heavy equipment.

To ensure the correct functioning of the equipment in the machinery space(s), i.e. taking into account the heat dissipated by the equipment, the ambient temperature in the machine room is assumed to be maintained between + 5 °C and + 40 °C.

Access ways to the working areas are adequately lit.

Minimum passageways required by building regulations are not obstructed by the open door/trap of the lift and/or any protection means for working areas outside of the well, where fitted according to the maintenance instructions (see above Principles).

Where more than one person is working at the same time on a lift, an adequate means of communication between these persons is ensured.

The fixing system of guards, which will be removed during maintenance and inspection, remains attached to the guard or to the equipment when the guard is removed.

## 1 Scope

**1.1** This document specifies the safety rules for the construction and installation of permanently installed new electric lifts, with traction or positive drive, serving defined landings levels, having a vehicle designed to convey passengers or passengers and loads, suspended by ropes or chains and travelling in a vertical plan along guide rails that are inclined at an angle of between 15° and 75° in relation to the horizontal.

**1.2** In addition to the requirements of this document, supplementary requirements should be considered in special cases (potentially explosive atmosphere, extreme climate conditions, seismic conditions, transporting dangerous goods, etc.).

**1.3** This document does not cover:

- a) lifts with drives other than those stated in 1.1;
- b) installation of electric lifts in existing buildings to the extent that space does not permit;
- c) important modifications (see Annex E) to a lift installed before this document is brought into application;
- d) lifting appliances, such as paternosters, mine lifts, theatrical lifts, appliances with automatic caging, skips, lifts and hoists for building and public works sites, ships' hoists, platforms for exploration or drilling at sea, construction and maintenance appliances;
- e) safety during transport, installation, repairs, and dismantling of lifts;
- f) lifts with rated speed  $\leq 0,15$  m/s.

However, this document can usefully be taken as a basis.

Noise is not dealt with in this document because it is not relevant to the safe use of the lift.

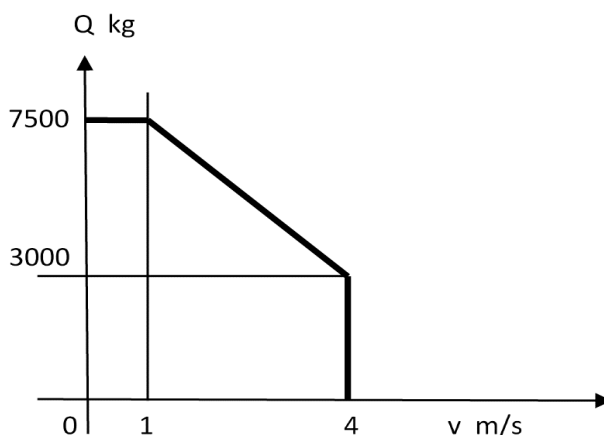
Vibrations are dealt with for electric parts only. Direct effects on human bodies are not considered as harmful.

**1.4** This document does not specify the additional requirements necessary for the use of lifts in case of fire.

**1.5** Taking into account the state of the art, the scope of the present standard is limited as follows:

- inclination: a variation in inclination is permitted for the travel path;
- travel path: confined within the vertical plane;
- maximum capacity of the car: 7 500 kg (100 passengers);
- maximum rated speed ( $v$ ): 4 m/s.

Both characteristics (capacity and speed) are linked by the relation given in the following Figure 1.

**Key** $Q$  maximum capacity $v$  rated speed**Figure 1 — Speed and capacity**

The document applies to all the constituent components of the lift including: running tracks, guides, safety gear operating device, counter-rails, but excludes the supporting structures, civil engineering structures and anchorages that are dealt with by other regulations.

**1.6** This document is not applicable for inclined lifts which are manufactured before the date of its publication as EN.

**2 Normative references**

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 81-20:2020, *Safety rules for the construction and installation of lifts - Lifts for the transport of persons and goods - Part 20: Passenger and goods passenger lifts*

EN 81-50:2020, *Safety rules for the construction and installation of lifts - Examinations and tests - Part 50: Design rules, calculations, examinations and tests of lift components*

EN 81-28:2018+AC:2019, *Safety rules for the construction and installation of lifts - Lifts for the transport of persons and goods - Part 28: Remote alarm on passenger and goods passenger lifts*

EN 81-58:2018, *Safety rules for the construction and installation of lifts - Examination and tests - Part 58: Landing doors fire resistance test*

EN 131-2:2010+A2:2017, *Ladders - Part 2: Requirements, testing, marking*

EN 10025-2:2019, *Hot rolled products of structural steels - Part 2: Technical delivery conditions for non-alloy structural steels*

EN 12015:2020, *Electromagnetic compatibility - Product family standard for lifts, escalators and moving walks - Emission*

EN 12016:2013, *Electromagnetic compatibility - Product family standard for lifts, escalators and moving walks - Immunity*

EN 13015:2001+A1:2008, *Maintenance for lifts and escalators - Rules for maintenance instructions*

EN 13796-1:2017, *Safety requirements for cableway installations designed to carry persons - Carriers - Part 1: Grips, carrier trucks, on-board brakes, cabins, chairs, carriages, maintenance carriers, tow-hangers*

EN 50214:2006, *Flat polyvinyl chloride sheathed flexible cables*

EN 60068-2-6:2008, *Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal) (IEC 60068-2-6:2007)*

EN 60068-2-14:2009, *Environmental testing - Part 2-14: Tests - Test N: Change of temperature (IEC 60068-2-14:2009)*

EN 60068-2-27:2009, *Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock (IEC 60068-2-27:2008)*

EN 60112:2003, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials (IEC 60112:2003)*

EN 60204-1:2018, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1:2016, modified)*

EN 60269-1:2007, *Low-voltage fuses - Part 1: General requirements (IEC 60269-1:2006)*

EN 60747-5-5:2011, *Semiconductor devices - Discrete devices - Part 5-5: Optoelectronic devices - Photocouplers (IEC 60747-5-5:2007)*

EN 60529:1991<sup>1)</sup>, *Specification for 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 60947-4-1:2010, *Low-voltage switchgear and controlgear - Part 4-1: Contactors and motor-starters - Electromechanical contactors and motor-starters (IEC 60947-4-1:2009)*

EN 60947-5-1:2017, *Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices (IEC 60947-5-1:2016)*

EN 61249-2 (all parts), *Materials for printed boards and other interconnecting structures - Part 2: Reinforced base materials, clad and unclad (IEC 61249-2, all parts)*

EN 61508-1:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 1: General requirements (IEC 61508-1:2010)*

EN 61508-2:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems (IEC 61508-2:2010)*

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1) As impacted by EN 60529:1991/A1:2000 and EN 60529:1991/A2:2013.

EN 61508-3:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 3: Software requirements (IEC 61508-3:2010)*

EN 61508-7:2010, *Functional safety of electrical/electronic/programmable electronic safety related systems - Part 7: Overview of techniques and measures (IEC 61508-7:2010)*

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 61800-5-2:2017, *Adjustable speed electrical power drive systems - Part 5-2: Safety requirements - Functional (IEC 61800-5-2:2016)*

EN 62326-1:2002, *Printed boards - Part 1: Generic specification (IEC 62326-1:2002)*

EN ISO 12100:2010, *Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 13857:2019, *Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2019)*

HD 60364-4-41:2007, *Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock (IEC 60364-4-41:2005, modified)*

HD 60364-6:2016, *Low voltage electrical installations - Part 6: Verification (IEC 60364-6:2016)*

IEC 60227-6:2001, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 6: Lift cables and cables for flexible connections*

IEC 60245-5:1994, *Rubber insulated cables - Rated voltages up to and including 450/750 V - Part 5: Lift cables*

ISO 7465:2007, *Passenger lifts and service lifts - Guide rails for lift cars and counterweights - T-type*

### **3 Terms and definitions, symbols and abbreviated terms**

#### **3.1 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN ISO 12100:2010, EN 81-20:2020, EN 81-50:2020 and the following apply.

NOTE The term "lift" in this documents means "lift with an inclined travel path".

##### **3.1.1**

##### **building**

civil engineering works

##### **3.1.2**

##### **angle of inclination**

$\alpha$

(angle d'inclinaison) (Neigungswinkel)

angle between the travel path as measured against the horizontal