SLOVENSKI STANDARD
SIST EN 81-50:2014

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Varnostna pravila za konstruiranje in vgradnjo dvigal (liftov) - Pregledi in preskusi - 50. del: Pravila konstruiranja, izračuni, pregledi in preskusi sestavnih delov dvigal

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

Sicherheitsregeln für die Konstruktion und den Einbau von Aufzügen - Prüfungen - Teil 50: Konstruktionsregeln, Berechnungen und Prüfungen von Aufzugskomponenten

Règles de sécurité pour la construction et l'installation des élévateurs - Examens et essais - Partie 50: Règles de conception, calculs, examens et essais des composants pour élévateurs

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

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This European Standard was approved by CEN on 28 May 2014.

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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-CENELEC Management Centre has the same status as the official versions.

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Foreword

This document (EN 81-50:2014) 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of an identical text or by endorsement, at the latest by February 2015 and conflicting national standards shall be withdrawn at the latest by August 2017.

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, in conjunction with EN 81-20:2014 supersedes EN 81-1:1998+A3:2009 and EN 81-2:1998+A3:2009.

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.

The content of this standard provides the design rules, calculations, examinations and tests for lifts component, the requirements of which are specified in other EN 81 series of standards. Therefore this standard can only be used in conjunction with the standards for specific lift types, e.g. EN 81-20 for passenger and goods passenger lifts.

This is the first edition of the standard. The need for replacement was based on the following points:

— improvement in safety due to changes in available technology;

— the need to reflect changes to the state of the art;

— incorporation of essential health and safety requirements from the relevant EU Directives;

— elimination of obvious errors;

— incorporation of proposals resulting from interpretation requests[1)];

— improvement of the references to other standards according to the progress in that field.

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, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1) Within CEN/TC 10 an interpretation committee has been established to answer questions about the spirit in which the experts have drafted the various clauses of this standard. All such interpretations are published within CEN TS 81-11 until incorporated by amendment into the standards concerned.

Introduction

The object of this standard is to define safety rules related to lifts with a view to safeguarding persons and objects against the risk of accidents associated with the user-, maintenance- and emergency operation of lifts.

Reference should be made to the respective introductions of the standards calling for the use of this standard with regard to persons and objects to be safeguarded, assumptions, principles, etc.

1 Scope

This European Standard specifies the design rules, calculations, examinations and tests of lift components which are referred to by other standards used for the design of passenger lifts, goods passenger lifts, goods only lifts, and other similar types of lifting appliances.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 81-20:2014, *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 10025 (all parts), *Hot rolled products of non-alloy structural steels - Technical delivery conditions*

EN 12385-5, *Steel wire ropes - Safety - Part 5: Stranded ropes for lifts*

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

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

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

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

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)*

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)*

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)*

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
approved body
organization or manufacturer, operating an approved full quality assurance system to undertake testing of safety components

3.2
safety component
component provided[2)] to fulfil a safety function when in use

3.3
type examination certificate
document issued by an approved body carrying out a type-examination in which it certifies that the product example under consideration complies with the provisions applicable to it

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 (see Table 1).

[2)] Under the Lifts Directive there is a list of items considered as safety components including safety gear, speed governor, landing door locks, etc. For the purposes of this standard other components may also be regarded as safety components where the aim is to certify their safe operation by type testing.

Table 1 - List of significant hazards

No	Hazards as listed in Annex B of EN ISO 12100:2010	Relevant clauses
1	**Mechanical hazards** due to:	
	Acceleration, deceleration (kinetic energy)	5.3; 5.4; 5.5; 5.7; 5.8; 5.9
	Approach of a moving element to a fixed part	5.2
1	**Mechanical hazards** due to: *(continued)*	
	Elastic elements	5.10; 5.11; 5.12; 5.13
	Falling objects	5.3; 5.4; 5.5; 5.9
	Gravity (stored energy)	5.3; 5.4; 5.5; 5.9
	Height from the ground	5.3; 5.4; 5.5; 5.9
	High pressure	5.13
	Moving elements	5.2; 5.3; 5.4; 5.5; 5.6; 5.7; 5.8; 5.9; 5.10; 5.11; 5.12; 5.13; 5.14; 5.15; 5.16
	Rotating elements	5.4; 5.11; 5.12
	Stability	5.10; 5.11; 5.12; 5.13; 5.14
	Strength	5.10; 5.11; 5.12; 5.13; 5.14
2	**Electrical hazards**	
	Arc	5,2; 5.4; 5.6; 5.7; 5.8; 5.15; 5.16
	Electrostatic phenomena	5,2; 5.4; 5.6; 5.7; 5.8; 5.15; 5.16
	Live parts	5,2; 5.4; 5.6; 5.7; 5.8; 5.15; 5.16
	Not enough distance to live parts under high voltage	5,2; 5.4; 5.6; 5.7; 5.8; 5.15; 5.16
	Overload	5,2; 5.4; 5.6; 5.7; 5.8; 5.15; 5.16
	Parts which have become live under faulty conditions	5,2; 5.4; 5.6; 5.7; 5.8; 5.15; 5.16
	Short-circuit	5,2; 5.4; 5.6; 5.7; 5.8; 5.15; 5.16
6	**Hazards generated by radiation**	
	Low frequency electromagnetic radiation	5.6; 5.15; 5.16
	Radio frequency electromagnetic radiation	5.6; 5.15; 5.16
9	**Hazards associated with the environment in which the machine is used**	5.2; 5.3; 5.4; 5.5; 5.6; 5.7; 5.8; 5.9; 5.10; 5.11; 5.12; 5.13; 5.14; 5.15; 5.16

5 Design rules, calculations, examinations and tests

5.1 General provisions for type examinations of safety components

5.1.1 Object and extent of the tests

The safety component/device is submitted to a test procedure to verify that insofar as construction and operation are concerned, it conforms to the requirements imposed by this standard. It shall be checked in particular that the mechanical, electrical and electronic components of the device are properly rated and that in the course of time the device does not lose its effectiveness, particularly through wear or aging. If the safety component is needed to satisfy particular requirements (waterproof, dust proof or explosion proof construction) supplementary examinations and/or tests under appropriate criteria shall be made.

5.1.2 General provisions

5.1.2.1 For the purposes of this standard it is assumed that the laboratory undertakes both the testing and the certification as an approved body. An approved body may be that of a manufacturer operating an approved full quality assurance system. In certain cases the test laboratory and the body approved for the issue of type examination certificates may be separate. In these cases the administrative procedures may differ from those described in this standard.

5.1.2.2 The application for type examination shall be made by the manufacturer of the component or their authorized representative and shall be addressed to an approved test laboratory.

5.1.2.3 The despatch of samples for examination shall be made by agreement between the laboratory and the applicant.

5.1.2.4 The applicant may attend the tests.

5.1.2.5 If the laboratory entrusted with the complete examination of one of the components requiring the supply of a type examination certificate has not available appropriate means for certain tests or examinations, it may under its responsibility have these made by other laboratories with the agreement of the applicant.

5.1.2.6 The precision of the instruments shall allow, unless specified, measurements to be made within the following accuracy:

a) ± 1 % masses, forces, distances, speeds;

b) ± 2 % accelerations, retardations;

c) ± 5 % voltages, currents;

d) ± 5 °C temperatures;

e) recording equipment shall be capable of detecting signals, which vary in time of 0,01 s;

f) ± 2,5 % flow rate;

g) ± 1 % pressure $P \leq 200$ kPa;

h) ± 5 % pressure $P > 200$ kPa.

5.2 Type examination of landing and car door locking devices

5.2.1 General provisions

5.2.1.1 Field of application

These procedures are applicable to locking devices for landing and car doors. It is understood that each component taking part in the locking of doors and in the checking of the locking forms part of the locking device.

5.2.1.2 Documents to be submitted

5.2.1.2.1 Schematic arrangement drawing with description of operation

This drawing shall show clearly all the details relating to the operation and the safety of the locking device, including:

a) the operation of the device in normal service showing the effective engagement of the locking elements and the point at which the electrical safety device operates;

b) the operation of the device for mechanical checking of the locking position if this device exists;

c) the control and operation of the emergency unlocking device;

d) the type (A.C. and/or D.C.) and the rated voltage and rated current.

5.2.1.2.2 Assembly drawing with key

This drawing shall show all parts, which are important to the operation of the locking device, in particular those required to conform to requirements of this standard. A key shall indicate the list of principal parts, the type of materials used, and the characteristics of the fixing elements.

5.2.1.3 Test samples

One door locking device shall be submitted to the laboratory.

If the test is carried out on a prototype, it shall be repeated later on a production model.

If the test of the locking device is only possible when the device is mounted in the corresponding door the device shall be mounted on a complete door in working order. However, the door dimensions may be reduced by comparison with a production model, on condition that this does not falsify the test results.

5.2.2 Examination and tests

5.2.2.1 Examination of operation

This examination has the aim of verifying that the mechanical and electrical components of the locking device are operating correctly with respect to safety, and in conformity with the requirements of this standard, and the standard calling for this locking device and that the device is in conformity with the particulars provided in the application.

In particular it shall be verified that:

a) there is at least 7 mm engagement of the locking elements before the electric safety device operates;

b) it is not possible from positions normally accessible to persons to operate the lift with a door open or unlocked, after one single action, not forming part of the normal operation.

5.2.2.2 Mechanical tests

5.2.2.2.1 General

These tests have the purpose of verifying the strength of the mechanical locking components and the electrical components.

The sample of the locking device in its normal operating position is controlled by the devices normally used to operate it.

The sample shall be lubricated in accordance with the requirements of the manufacturer of the locking device.

When there are several possible means of control and positions of operation, the endurance test shall be made in the arrangement which is regarded as the most unfavourable from the point of view of the forces on the components.

The number of complete cycles of operation and the travel of the locking components shall be registered by mechanical or electrical counters.

5.2.2.2.2 Endurance test

The locking device shall be submitted to 1 000 000 (±1 %) complete cycles; one cycle comprises one forward and return movement over the full travel possible in both directions.

The driving of the device shall be smooth, without shocks, and at a rate of 60 (±10 %) cycles per minute.

During the endurance test the electrical contact of the lock shall close a resistive circuit under the rated voltage and at a current value double that of the rated current.

If the locking device is provided with a mechanical checking device for the locking pin or the position of the locking element, this device shall be submitted to an endurance test of 100 000 (±1 %) cycles.

The driving of the device shall be smooth, without shocks, and at a rate of 60 (±10 %) cycles per minute.

5.2.2.2.3 Static test

For locking devices intended for hinged doors, a test shall be made consisting of the application over a total period of 300 s of a static force increasing progressively to a value of 3000 N.

This force shall be applied in the opening direction of the door and in a position corresponding as far as possible to that which may be applied when a user attempts to open the door. The force applied shall be 1 000 N in the case of a locking device intended for sliding doors.

5.2.2.2.4 Dynamic test

The locking device, in the locked position, shall be submitted to a shock test in the opening direction of the door.

The shock shall correspond to the impact of a rigid mass of 4 kg falling in free fall from a height of 0,50 m.

5.2.2.3 Criteria for the mechanical tests

After the endurance test (5.2.2.2.2), the static test (5.2.2.2.3) and the dynamic test (5.2.2.2.4), there shall not be any wear, deformation or breakage, which could adversely affect safety.

5.2.2.4 Electrical test

5.2.2.4.1 Endurance test of contacts

This test is included in the endurance test laid down in 5.2.2.2.2.

5.2.2.4.2 Test of ability to break circuit

5.2.2.4.2.1 General

This test shall be carried out after the endurance test. It shall check that the ability to break a live circuit is sufficient. This test shall be made in accordance with the procedure in EN 60947-4-1 and EN 60947-5-1, the values of current and rated voltage serving as a basis for the tests shall be those indicated by the manufacturer of the device.

If there is nothing specified, the rated values shall be as follows:

a) Alternating current: 230 V, 2 A;

b) Direct current: 200 V, 2 A.

In the absence of an indication to the contrary, the capacity to break circuit shall be examined for both A.C. and D.C. conditions.

The tests shall be carried out with the locking device in the working position. If several positions are possible, the test shall be made in the most unfavourable position.

The sample tested shall be provided with covers and electric wiring as used in normal service.

5.2.2.4.2.2 A.C. locking devices shall open and close an electric circuit under a voltage equal to 110 % of the rated voltage 50 times, at normal speed, and at intervals of 5 s to 10 s. The contact shall remain closed for at least 0,5 s.

The circuit shall comprise a choke and a resistance in series. Its power factor shall be 0,7 ± 0,05 and the test current shall be 11 times the rated current indicated by the manufacturer of the device.

5.2.2.4.2.3 D.C. locking devices shall open and close an electric circuit under a voltage equal to 110 % of the rated voltage 20 times, at normal speed, and at intervals of 5 s to 10 s. The contact shall remain closed for at least 0,5 s.

The circuit shall comprise a choke and a resistance in series having values such that the current reaches 95 % of the steady-state value of the test current in 300 ms.

The test current shall be 110 % of the rated current indicated by the manufacturer of the device.

5.2.2.4.2.4 The tests are considered as satisfactory if no tracking or arcing is produced and if no deterioration occurs which could adversely affect safety.

5.2.2.4.3 Test for resistance to leakage currents

This test shall be made in accordance with the procedure in EN 60112. The electrodes shall be connected to a source providing an A.C. voltage which is sinusoidal at 175 V, 50 Hz.

5.2.2.4.4 Examination of clearances and creepage distances

The clearances in air and creepage distances shall be in accordance with the requirements laid down in the standards calling for the use of this standard (e.g. EN 81-20:2014, 5.11.2.2.4).

5.2.2.4.5 Examination of the requirements appropriate to safety contacts and their accessibility

This examination shall be made taking account of the mounting position and the layout of the locking device, as appropriate.

5.2.3 Test particular to certain types of locking devices

5.2.3.1 Locking device for horizontally or vertically sliding doors with several panels

According to the requirements laid down in the standards calling for the use of this standard the devices providing direct mechanical linkage between panels (e.g. EN 81-20:2014, 5.3.14.1) or indirect mechanical linkage (e.g. EN 81-20:2014, 5.3.14.2) are considered as forming part of the locking device.

These devices shall be submitted to the tests mentioned in 5.2.2. The number of cycles per minute in such endurance tests shall be suited to the dimensions of the construction.

5.2.3.2 Flap type locking device for hinged door

If this device is provided with an electric safety device required to check the possible deformation of the flap and if, after the static test envisaged in 5.2.2.2.3 there are any doubts on the strength of the device, the load shall be increased progressively until the safety device begins to open. No component of the locking device or of the door shall be damaged or permanently deformed by the load applied.

If, after the static test, the dimensions and construction leave no doubt as to its strength, it is not necessary to proceed to the endurance test on the flap.

5.2.4 Type examination certificate

The certificate shall indicate the following:

a) information according to Annex A;

b) type and application of locking device;

c) the type (A.C. and/or D.C.) and values of rated voltage and rated current;

d) in the case of flap type door locking devices: the necessary force to actuate the electric safety device for checking the elastic deformation of the flap.

5.3 Type examination of safety gear

5.3.1 General provisions

The applicant shall state the range of use provided, i.e.:

— minimum and maximum masses;

— maximum rated speed and maximum tripping speed.

Detailed information shall be provided on the materials used, the type of guide rails and their surface condition (drawn, milled, ground).

The following documents shall be attached to the application:

a) detailed and assembly drawings showing the construction, operation, materials used, the dimensions and tolerances on the construction components;

b) in the case of progressive safety gear, also a load diagram relating to elastic parts.

5.3.2 Instantaneous safety gear

5.3.2.1 Test samples

Two gripping assemblies with wedges or clamps and two lengths of guide rail shall be submitted to the laboratory.

The arrangement and the fixing details for the samples shall be determined by the laboratory in accordance with the equipment that it uses.

If the same gripping assemblies can be used with different types of guide rail, a new test shall not be required if the thickness of the guide rails, the width of the grip needed for the safety gear and the surface state (drawn, milled, ground) are the same.