SLOVENSKI STANDARD
SIST EN 12159:2013

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SIST EN 12159:2002+A1:2009

Gradbena dvigala za osebe in tovor z navpično vodeno košaro

Builders hoists for persons and materials with vertically guided cages

Bauaufzüge zur Personen- und Materialbeförderung mit senkrecht geführten Fahrkörben

Ascenseurs de chantier pour personnes et matériaux avec cages guidées verticalement

Ta slovenski standard je istoveten z: EN 12159:2012

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English Version

Builders hoists for persons and materials with vertically guided cages

Ascenseurs de chantier pour personnes et matériaux avec cages guidées verticalement

Bauaufzüge zur Personen- und Materialbeförderung mit senkrecht geführten Fahrkörben

This European Standard was approved by CEN on 9 September 2012.

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Foreword

This document (EN 12159:2012) 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of an identical text or by endorsement, at the latest by May 2013, and conflicting national standards shall be withdrawn at the latest by May 2013.

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 supersedes EN 12159:2000+A1:2009.

EN 12159:2012 includes the following significant technical changes with respect to EN 12159:2000+A1:2009:

— Hydraulic driven hoists are removed from the scope of the standard;

— All references to EN 13849 are removed. The electric safety devices (Annex B) are described in each paragraph in a similar way as in EN 81-1;

— Normative references are updated.

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 2006/42/EC, see informative Annex ZA, which is an integral part of this document.

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, 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.

Introduction

This standard is one of a series of standards produced by CEN/TC 10/SC 1 as part of the CEN programme of work to produce machinery safety standards.

This standard is a type C standard as stated in EN ISO 12100:2010.

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

1 Scope

1.1 This European Standard deals with power operated temporarily installed builders hoists (referred to as "hoists" in this standard) intended for use by persons who are permitted to enter sites of engineering and construction, serving landing levels, having a cage:

- designed for the transportation of persons or of persons and materials;
- guided;
- travelling vertically or along a path within 15° max. of the vertical;
- supported or sustained by drum driven wire rope, rack and pinion, or an expanding linkage mechanism;
- where masts, when erected, may or may not require support from separate structures.

1.2 The European 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 This 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);
- electromagnetic compatibility (emission, immunity);
- handling of loads the nature of which could lead to dangerous situations (e.g. molten metal, acids/bases, radiating materials, fragile loads);
- the use of combustion engines;
- the use of remote controls;
- hazards occurring during manufacture;
- hazards occurring as a result of mobility;
- hazards occurring as a result of being erected over a public road;
- earthquakes.

1.4 This European Standard is not applicable to:

- builders hoists for the transport of goods only EN 12158-1 and EN 12158-2;
- lifts according to EN 81-1, EN 81-2, EN 81-3 and EN 81-43;
- work cages suspended from lifting appliances;
- work platforms carried on the forks of fork trucks;

— work platforms EN 1495;

— funiculars;

— lifts specially designed for military purposes;

— mine lifts;

— theatre elevators;

— builders hoists for persons and material with vertically guided cages which are manufactured before the date of its publication as EN;

— hoists with hydraulic drive/braking systems and hydraulic safety devices.

This document is not applicable to Builders hoists for persons and material with vertical guided cages which are manufactured before the date of its publication as EN.

1.5 This European Standard deals with the hoist installation. It includes the base frame and base enclosure but excludes the design of any concrete, hard core, timber or other foundation arrangement. It includes the design of mast ties but excludes the design of anchor screws to the supporting structure. It includes the landing gates and their frames but excludes the design of any anchorage fixing bolts to the supporting structure.

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 81-1:1998+A3:2009, *Safety rules for the construction and installation of lifts — Part 1: Electric lifts*

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

EN 894-1, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 1: General principles for human interactions with displays and control actuators*

EN 953, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

EN 1037, *Safety of machinery — Prevention of unexpected start-up*

EN 1088, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*

EN 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005, modified)*

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

EN 60947-4-1:2001, *Low-voltage switchgear and controlgear — Part 4-1: Contactors and motor-starters — Electromechanical contactors and motor-starters (IEC 60947-4-1:2000)*

EN 60947-5-1:2004, *Low-voltage switchgear and controlgear — Part 5-1: Control circuit devices and switching elements — Electromechanical control circuit devices (IEC 60947-5-1:2003)*

EN ISO 4871, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871)*

EN ISO 11201:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections (ISO 11201:2010)*

EN ISO 11688-1, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1)*

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

EN ISO 13850, *Safety of machinery — Emergency stop — Principles for design (ISO 13850)*

EN ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2008)*

ISO 2408, *Steel wire ropes for general purposes — Minimum requirements*

ISO 3864-1, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*

ISO 4302, *Cranes — Wind load assessment*

ISO 4309, *Cranes — Wire ropes — Care and maintenance, installation and discard*

ISO 6336-1, *Calculation of load capacity of spur and helical gears — Part 1: Basic principles, introduction and general influence factors*

ISO 6336-2, *Calculation of load capacity of spur and helical gears — Part 2: Calculation of surface durability (pitting)*

ISO 6336-3, *Calculation of load capacity of spur and helical gears — Part 3: Calculation of tooth bending strength*

ISO 6336-5, *Calculation of load capacity of spur and helical gears — Part 5: Strength and quality of materials*

3 Terms and definitions

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

3.1
builders hoist
temporary lifting machine serving landing levels on sites of engineering and construction with a platform, cage or other load carrying device, which is guided

3.2
working load/rated load
maximum load which the hoist has been designed to carry in service

3.3
rated speed
speed of the cage for which the equipment has been designed

3.4
wire rope hoist
hoist which uses wire rope as the load suspension system

3.5
positive drive
drive using means 3.6 other than friction

3.6
rack and pinion hoist
hoist which uses a toothed rack and pinion as the load suspension system

3.7
expanding linkage mechanism
mechanical linkage system (e.g. scissors) which supports and guides the cage by means of expansion or contraction under the control of an actuator

3.8
base frame
lowest framework of the hoist, upon which all other components are mounted

3.9
guides
rigid elements which determine the travel way of the cage or the counterweight (when provided)

3.10
mast
structure that supports and guides the cage and the counterweight (when provided)

3.11
mast section
indivisible piece of mast, between two adjacent mast joints

3.12
mast tie
connection system between the mast and any building structure, providing lateral support for the mast

3.13
hoistway
total space which is travelled by the cage and its load

3.14
counterweight way
total space which is travelled by the counterweight

3.15
cage
carrier including the floor, walls, gates and roof

3.16
counterweight
mass which is used for weight compensation

3.17
stopping distance
distance the cage moves from the moment when the control or safety circuit is broken until the cage has come to a full stop

3.18
overspeed safety device
mechanical device for stopping and maintaining stationary the cage or counterweight in the event of overspeed

3.19
slack rope
rope, normally under tension, from which all external loads have been removed

3.20
wire rope termination
adaptation at the end of a wire rope permitting attachment

3.21
landing
level in a building or construction intended for loading and unloading the cage

3.22
safety distance
minimum acceptable distance between any moving part of a hoist and any point of access

3.23
guard rail
fixed equipment, other than gates, which is used to prevent people from falling or from reaching hazardous areas

3.24
normal operation
usual operating conditions for the equipment when in use for carrying loads, but excluding routine maintenance, erection, dismantling, etc.

3.25
in service
condition during use of the hoist when the cage is in any position, laden or unladen, moving or stationary

3.26
out of service
installed condition when the cage is positioned such that it is provided with the most shelter from the wind. This is normally, but not necessarily, ground level. The cage is empty.

3.27
competent person
designated person, suitably trained, qualified by knowledge and practical experience, and provided with the necessary instructions to enable the required procedures to be carried out

4 List of hazards

The list of hazards according to the following tables are based on EN ISO 12100:2010.

Tables 1, 2 and 3 show 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.

A hazard which is not applicable or is not significant and for which, therefore, no requirements are formulated is shown in the relevant clauses column as n.a. (not applicable).

Table 1 — Hazards relating to the general design and construction of hoists for persons and materials

	Hazards	Relevant clauses in this standard
1	**Mechanical hazards**	
1.1	Crushing	5.5.2, 5.5.3, 5.5.6, 5.6, 5.7.2, 7.1.2.8, 7.1.2.9
1.2	Shearing	5.5, 5.6.1.3, 5.7.2, 7.1.2.8, 7.1.2.9
1.3	Cutting or severing	5.5, 5.6.1.3, 5.7.2, 7.1.2.8, 7.1.2.9
1.4	Entanglement	5.7.2, 7.1.2.8, 7.1.2.9
1.5	Drawing-in or trapping	5.5.2, 5.5.3, 5.6.1.3, 5.7.2, 7.1.2.8, 7.1.2.9
1.6	Impact	5.4.3, 5.5.3.9, 5.6.2, 7.1.2.8, 7.1.2.9
1.7	Stabbing or puncture	n.a.
1.8	Friction or abrasion	5.5.2, 5.5.3, 7.1.2.8, 7.1.2.9
1.9	High pressure fluid ejection	n.a.
1.10	Ejection of parts	5.6.1.3
1.11	Loss of stability	5.2, 5.3, 5.4.1, 5.4.2, 5.6.3, 7.1.2.8.4
1.12	Slip, trip and fall	5.5, 5.6.1, 5.6.2, 7.1.2.8.4, 7.1.2.9
2	**Electrical hazards**	
2.1	Electrical contact	5.7.4.11, 5.8, 7.1.2.8.4
2.2	Electrostatic phenomena	n.a.
2.3	Thermal radiation	n.a.
2.4	External influences	5.7.4.11, 5.8.3
3	**Thermal hazards**	
3.1	Burns and scalds	n.a.
3.2	Health-damaging effects	n.a.
4	**Hazards generated by noise**	
4.1	Hearing losses	5.11, 7.1.2.3
4.2	Interference with speech	5.11, 7.1.2.3
5	**Hazards generated by vibration**	n.a.
6	**Hazards generated by radiation**	
6.1	Electrical arcs	n.a.
6.2	Lasers	n.a.
6.3	Ionising radiation sources	n.a.
6.4	Use of H F electromagnetic fields	n.a.
7	**Hazards generated by materials and substances processed, used or exhausted by machinery**	
7.1	Contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	n.a.
7.2	Fire or explosion	n.a.
7.3	Biological and microbiological	n.a.
8	**Hazards generated by neglecting ergonomic principles in machine design**	
8.1	Unhealthy postures or excessive effort	5.1, 5.6.1.3, 7.1.2.8.4
8.2	Inadequate consideration of human hand/arm or foot/leg anatomy	5.5, 5.7.2, 7.1.2.8
8.3	Neglected use of personal protection equipment	n.a.
8.4	Inadequate area lighting	5.8.8, 7.1.2.8.4, 7.1.2.9
8.5	Mental overload or underload, stress	5.9

	Hazards	Relevant clauses in this standard
8.6	Human error	5.6.3, 5.9, 7.1.2.8, 7.1.2.9, 7.2, 7.3
9	**Hazard combinations with the environment in which the machine is used**	n.a.
9.1	Wind conditions	5.2.2.12
10	**Hazards caused by failure of energy supply, breaking down of machinery parts and other functional disorders**	
10.1	Failure of energy supply	5.6.1.6, 5.7.4.1, 5.8.2, 5.10, 7.1.2.5, 7.1.2.6
10.2	Unexpected ejection of machine parts or fluids	5.7.2.3
10.3	Failure or malfunction of control system	5.8.2, 5.9.2.2, 5.9.3, 5.10.26
10.4	Errors of fitting	5.4.1, 7.1.2.8
10.5	Overturn, unexpected loss of machine stability	5.2, 5.3, 5.4, 7.1.2.8
11	**Hazards caused by missing and / or incorrectly positioned safety related measures / means**	
11.1	Guards	5.5, 5.6.1.3, 5.6.1.4, 7.1.2.8, 7.1.2.11
11.2	Safety related (protection) devices	5.5, 7.1.2.8, 7.1.2.11
11.3	Starting and stopping devices	5.9.5, 5.9.7, 7.1.2.8, 7.1.2.9
11.4	Safety signs and signals	7.2
11.5	Information or warning devices	5.6.3, 7.2
11.6	Energy supply disconnecting devices	5.9.6
11.7	Emergency devices	5.6.2, 5.10, 7.1.2.6, 7.1.2.8, 7.1.2.11
11.8	Feeding/removal means of work pieces	n.a.
11.9	Essential equipment and accessories for safe adjusting and/or maintaining	7.1.2.6, 7.1.2.8, 7.1.2.11
11.10	Equipment evacuating gases	n.a.

Table 2 — Particular hazards involving the mobility and/or load lifting ability of hoists for persons and materials

	Hazards	Relevant clauses in this standard
	Hazards due to mobility	
12	**Inadequate lighting of moving / working area**	n.a.
13	**Hazards due to sudden movement instability etc. during handling**	n.a.
14	**Inadequate/non-ergonomic design of operating position**	n.a.
15	**Mechanical hazards**	n.a.
16	**Hazards due to lifting operations**	
16.1	Lack of stability	5.2.5, 5.3, 5.4.1, 5.4.2, 7.1.2.8
16.2	Derailment of the cage	5.4.1, 5.6.1, 5.9.7.2.2
16.3	Loss of mechanical strength of machinery and lifting accessories	5.2, 5.3, 5.5.4, 5.6.2, 5.7, 7.1.2.11
16.4	Hazards caused by uncontrolled movement	5.5.3, 5.6.2, 5.10, 7.1.2.9
16.5	Risks due to movements of the cage	5.5, 5.6.1, 5.10.3
16.6	Risk due to objects falling on the cage	5.6.1.4
17	**Inadequate view of trajectories of the moving parts**	5.5, 5.6.1, 7.1.2.9
18	**Hazards caused by lightning**	n.a.
19	**Hazards due to loading / overloading**	5.2, 5.6, 7.1.2.9

Table 3 — Particular hazards involving the lifting of persons by hoists for persons and materials

	Hazards to persons lifted by the hoist	Relevant clauses in this standard
20	**Overloading or overcrowding of the cage**	5.6, 5.7.3, 7.1.2.9
21	**Unexpected movement of the cage in response to external controls or other movements of the machine**	5.7.4.1, 5.9.7.1.2, 5.9.7.2.3, 5.10.4
22	**Excess speed**	5.4.3, 5.6.2, 5.7.4.5
23	**Persons falling from the cage**	5.6.1
24	**The cage falling or overturning**	5.4.1, 5.6.2, 5.7, 5.9.7.2.2
25	**Excess acceleration or braking of the cage**	5.4.3, 5.6.2, 5.7.4.5, 7.1.2.11
26	**Due to imprecise markings**	7.3
27	**Risks to persons in or on the cage**	5.6, 5.4.3, 5.10
28	**Controls at landings**	5.9.7.1
29	**Access to the cage**	5.5

5 Safety requirements and/or measures

5.1 General

The design of the hoist shall consider safe use, erection, dismantling and maintenance. It shall be possible to erect the hoist using safe access methods such as those offered by the roof of the cage or equivalent facilities.

The design of all components that have to be handled during erection e.g. mast sections, shall have their weight assessed against manual handling. Where the permissible weight for manual handling is exceeded,