SLOVENSKI STANDARD
oSIST prEN 12159:2020

01-november-2020

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: **prEN 12159**

ICS:

53.020.99	Druga dvigalna oprema	Other lifting equipment
91.220	Gradbena oprema	Construction equipment

oSIST prEN 12159:2020 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 12159

September 2020

ICS 91.140.90

Will supersede EN 12159:2012

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 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.

This draft European Standard was established by CEN 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.

CEN members are the national standards bodies of 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 United Kingdom.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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

Contents

Page

European foreword

This document (prEN 12159:2020) has been prepared by Technical Committee CEN/TC 10 “Lifts, escalators and moving walks”, the secretariat of which is held by AFNOR.

This document supersedes EN 12159:2012.

prEN 12159:2020 includes the following significant technical changes with respect to EN 12159:2012:

— hydraulic driven hoists, drum driven hoists and expanding linkage mechanism are removed from the scope of the standard;

— additional clarifications of the scope concerning multiple hoists;

— limit state method added;

— out of service wind calculation updated;

— introducing performance levels for safety functions;

— modified the definition of overload;

— 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.

Introduction

This document 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 document 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 document.

1 Scope

1.1 This document deals with power operated temporarily installed builders hoists (referred to as "hoists" in this document) 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 rack and pinion;

— where masts, when erected, may or may not require support from separate structures.

1.2 The document 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 document 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;

— dual (twin) cage hoists;

— twin masts hoists;

— combination hoists, e.g. an EN 12159 hoists with an EN 12158-1 hoists.

1.4 This document is not applicable to:

— builders hoists for the transport of goods only EN 12158-1 and EN 12158-2;

— lifts according to EN 81-20, 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;

— transport platforms EN 16719;

— 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 document 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 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 894-1:1997+A1:2008, *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 ISO 14118:2018, *Safety of machinery — Prevention of unexpected start-up (ISO 14118:2017)*

EN ISO 14119:2013, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection (ISO 14119:2013)*

EN 60204-1:2018, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

EN 60529:1991,[1] *Degrees of protection provided by enclosures (IP-Code) (IEC 60529:1989)*

EN IEC 60947-4-1:2019, *Low-voltage switchgear and controlgear — Part 4-1: Contactors and motor-starters — Electromechanical contactors and motor-starters (IEC 60947-4-1:2018)*

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

EN ISO 4871:2009, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

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 11688-1:2009, *Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 1: Planning (ISO/TR 11688-1:1995)*

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

EN ISO 13850:2015, *Safety of machinery — Emergency stop function — Principles for design (ISO 13850:2015)*

EN ISO 13854:2019, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body (ISO 13854:2017)*

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

ISO 2394:2015, *General principles on reliability for structures*

ISO 2408:2017, *Steel wire ropes — Requirements*

ISO 3864-1:2016, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*

ISO 4302:2016, *Cranes — Wind load assessment*

ISO 4309:2017, *Cranes — Wire ropes — Care and maintenance, inspection and discard*

ISO 6336-1:2016, *Calculation of load capacity of spur and helical gears — Part 1: Basic principles, introduction and general influence factors*

ISO 6336-2:2016, *Calculation of load capacity of spur and helical gears — Part 2: Calculation of surface durability (pitting)*

ISO 6336-3:2016, *Calculation of load capacity of spur and helical gears — Part 3: Calculation of tooth bending strength*

---

[1] As impacted by EN 60529:1991/AC:2006-12, EN 60529:1991/A1:2000, EN 60529:1991/A2:2013 and EN 60529:1991/A2:2013/AC:2019-02.

ISO 6336-5:2016, *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 following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

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
person, suitably trained, qualified by knowledge and practical experience, provided with necessary instructions to safely carry out the required operations for maintaining or inspecting the hoist, or rescuing users

Note 1 to entry: National Regulation may require certification of competence.

3.28
authorized person
person with the permission of the natural or legal person who has the responsibility for the operation and use of the hoist, to access restricted areas (cage roof and hoistway) for maintenance, inspection or rescue operations

Note 1 to entry: Authorized persons should be competent for the tasks they have been authorized for (see also 3.27).

4 Safety requirements and/or measures

4.1 General

4.1.1 Design considerations

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, the manufacturer shall give recommendations in the instruction handbook concerning suitable lifting equipment. All removable and detachable covers shall be retained by captive fastenings.

Builders hoists shall comply with the safety requirements and/or protective measures of this clause. In addition, the machine shall be designed according to the principles of EN ISO 12100:2010 for relevant but not significant hazards, which are not dealt with by this document.

4.1.2 Proof calculation

The objective of this calculation is to prove theoretically that a hoist, taking into account the service conditions agreed between the user, designer and/or manufacturer, as well as the states during erection, dismantling and transport, has been designed in conformance to the safety requirements to prevent mechanical hazards.

The proof of competence according to this standard shall be carried out by using the general principles and methods appropriate for this purpose and corresponding with the recognized state of the art in mechanical design. For guidance governing analysis of structural members and their connections (e.g. fatigue, welding, bolts) EN 13001-3-1:2012+A2:2018 is recommended. For aluminium considers EN 1999-1-1:2007/A2:2013.

Alternatively, advanced and recognized theoretical or experimental methods may be used in general, provided that they conform to the principles of this standard.

4.1.3 Load combinations

Loads shall be superimposed in such a way that the resulting load effects attain their instantaneous extreme values for the considered situation of use. Such superimpositions are called load combinations. Basic load combinations are given in 5.2.

When establishing load combinations, consideration shall be given to the use of the hoist, taking into account its control systems, its normative instructions for use, and any other inherent conditions, where they relate to the specific aim of the proof of competence.

Magnitude, position and direction of all loads which act simultaneously in the sense of a load combination, shall be chosen in such a way that extreme load effects occur in the component or design detail under consideration. Consequently, in order to establish the extreme stresses in all the design critical points, several loading events shall be studied within the same load combination, e.g. different positions of the hoist and wind directions.

For the proof of fatigue strength, the number and magnitude of significant stress cycles shall be specified.

4.1.4 Limit states

During analysis of the of the hoist, its components or materials, two different limit states need to be considered. Ultimate limit state which concerns safety of people and structure. Service limit state which concerns function and appearance of the structure as well as the comfort of the user.

There is a distinction between ultimate limit states and serviceability limit states as follows:

a) ultimate limit states, given by:

1) plastic deformations from the effect of nominal stresses or sliding of frictional connections;

2) failure of components or connections (e.g. static failure, failure by fatigue or formation of critical cracks);

3) elastic instability of the hoist or its parts (e.g. buckling, bulging);

4) rigid body instability of the hoist or its parts (e.g. tilting, shifting).

b) serviceability limit states, examples of which are:

1) deformations which impair the intended utilization of the hoist (e.g. function of moving components, clearances of parts);

2) exceeding temperature limits (e.g. overheating of motors and brakes).

4.1.5 Proof of competence

The limit states applicable to the combination of material selection, manufacturing techniques and the specified service conditions shall be stated in the proof of competence. For the verification that the ultimate limit states are not exceeded, the following proofs shall be established: