SLOVENSKI STANDARD
SIST EN 12159:2025

01-februar-2025

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 12159:2024**

ICS:

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

SIST EN 12159:2025 **en,fr,de**

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 12159

July 2024

ICS 91.140.90

Supersedes 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 European Standard was approved by CEN on 3 June 2024.

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

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Ref. No. EN 12159:2024 E

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European foreword

This document (EN 12159:2024) 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of an identical text or by endorsement, at the latest by January 2025, and conflicting national standards shall be withdrawn at the latest by January 2025.

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 12159:2012.

EN 12159:2024 includes the following significant technical changes with respect to EN 12159:2012:

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

— noise has been 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 according to EN ISO 13849-1:2023;

— modified the definition of overload;

— normative references are updated.

This document has been prepared under a standardisation request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document.

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, Türkiye and the United Kingdom.

Introduction

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

The document is a C-standard relating to safety for builders' hoist for persons and materials

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

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

— machine manufacturers (small, medium and large enterprises);

— health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

— machine users/employers (small, medium and large enterprises);

— machine users/employees (e.g. trade unions, organizations for people with special needs);

— service providers, e.g. for maintenance (small, medium and large enterprises);

— consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

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 specifies 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;

— designed with and / or without support from separate structure.

1.2 This document specifies the significant hazards, hazardous situations or hazardous events relevant to the machine as listed in Annex C which arise during the various phases in the life of the machine and describes methods for the elimination or reduction of these hazards when it is used as intended and under conditions of misuse which are reasonably foreseeable 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;

— emission of airborne noise;

— dual (twin) cage hoists;

— twin masts hoists;

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

— counterweighted hoists, neither by separate counterweight nor counterweighted by another cage.

1.4 This document does not apply to:

— builders' hoists for the transport of goods only EN 12158-1:2021 and EN 12158-2:2000+A1:2010;

— lifts according to EN 81-20:2020, EN 81-3:2000+A1:2008 and EN 81-43:2009;

— work cages suspended from lifting appliances;

— work platforms carried on the forks of fork trucks;

— work platforms according to EN 1495:1997+A2:2009 [1];

— transport platforms according to EN 16719:2018;

— funiculars;

— lifts specially designed for military purposes;

— mine lifts;

— theatre elevators;

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

1.5 This document specifies 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 bolts 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.

1.6 This document does not apply to builders' hoists for persons and material with vertically guided cages which are manufactured before the date of publication of this document by CEN.

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

[1] As impacted by EN 1495:1997+A2:2009/AC:2010.

EN 60529:1991,[2] *Degrees of protection provided by enclosures (IP-Code) (IEC 60529:1989)*

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

EN ISO 13849-1:2023, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2023)*

EN ISO 13849-2:2012, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation (ISO 13849-2:2012)*

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)*

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 ISO 14120:2015, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards (ISO 14120:2015)*

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

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

ISO 6336-1:2019, *Calculation of load capacity of spur and helical gears — Part 1: Basic principles, introduction and general influence factors*

ISO 6336-2:2019, *Calculation of load capacity of spur and helical gears — Part 2: Calculation of surface durability (pitting)*

ISO 6336-3:2019, *Calculation of load capacity of spur and helical gears — Part 3: Calculation of tooth bending strength*

ISO 6336-5:2016, *Calculation of load capacity of spur and helical gears — Part 5: Strength and quality of materials*

[2] 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.

3 Terms and definitions

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

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

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

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

3.1
builders' hoist
temporary lifting machine serving landing levels on sites of engineering and construction with cage 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
positive drive
drive using means other than friction

3.5
rack and pinion hoist
hoist which uses a toothed rack and pinion as the load suspension system

3.6
base frame
lowest framework of the hoist, upon which all other components are mounted

3.7
guide
rigid element which determines the travel way of the cage

3.8
mast
structure that supports and guides the cage

3.9
mast section
indivisible piece of mast, between two adjacent mast joints

3.10
mast tie
connection system between the mast and any building structure, providing lateral support for the mast

3.11
hoistway
total space which is travelled by the cage and its load

3.12
cage
carrier including the floor, walls, gates and roof

3.13
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

3.14
overspeed safety device
mechanical device for stopping and maintaining stationary the cage in the event of overspeed in the downward direction

3.15
slack rope
rope, normally under tension, from which all external loads have been removed

3.16
wire rope termination
adaptation at the end of a wire rope permitting attachment

3.17
landing
level in a building or construction intended for loading and unloading the cage

3.18
safety distance
minimum acceptable distance between any moving part of a hoist and any point of access

3.19
guard rail
fixed equipment, other than gates, which is used to prevent people from falling or from reaching hazardous areas

3.20
normal operation
usual operating conditions for the hoist when in use for carrying loads, but excluding routine maintenance, erection, dismantling, etc.

3.21
in service
condition during use of the hoist when the cage is in any position, laden or unladen, moving or stationary

3.22
out of service
installed condition when the cage is empty and positioned such that it is provided with the most shelter from the wind (normally, but not necessarily, ground level)

3.23
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.

3.24
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 3.23).

4 Safety requirements and/or protective/risk reduction measures

4.1 Design considerations

The design of the hoist shall consider safe use, erection, dismantling, disposal 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 make available suitable lifting equipment. All removable and detachable covers shall be retained by captive fastenings.

The builders' hoist 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.

4.2 Load combinations and calculations

4.2.1 General

The structure of the hoist shall be designed and constructed in such a way that its strength is satisfactory under all intended operating conditions, including erection and dismantling and e.g. temperature of the environment.

The design of the structure as a whole and each part of it shall be based on the effects of any possible combination of loads as specified in this 4.2. The load combinations shall consider the least favourable locations of the cage and load relative to the mast and its ties, both during the vertical passage of the cage and any horizontal movement, e.g. swivelling of the cage. Ties between the mast and the supporting structure are considered to be part of the hoist structure.

In cases not covered by this standard (e.g. where two hoist cages are running on one mast tower or multiple machines are running on one or more mast towers), the load cases may be combined based on state of the art approaches which are taking probabilities of occurrence into consideration.

4.2.2 Calculation of structure

When calculating the hoist structure and every related component, the following forces and loads shall be taken into account:

a) all dead weights with the exception of the cage and equipment which moves together with the cage;

b) dead weights of the unladen cage and all equipment which moves together with the cage;

c) dead weight of landing platforms and gates, if supported by the hoist;

d) rated load in the cage.

The effect of the forces on the cage and mast resulting from the application of the rated load shall be allowed for in one of the two following ways, which reflect the chosen density of loading on the cage floor:

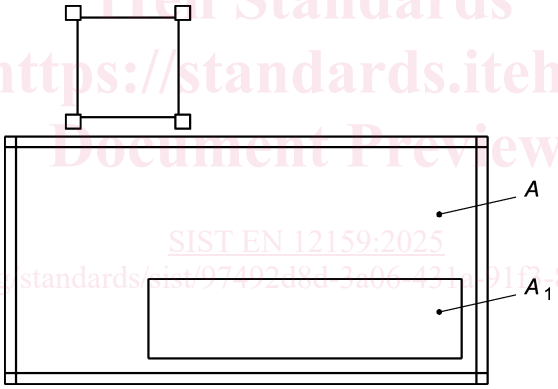
1) if $\frac{m_r}{A \cdot 0,8} < 400 \left[\text{kg} / \text{m}^2 \right]$

where

m_r is the rated load [kg] and

A is the total floor area [m²]

then the rated load shall be assumed to be distributed over a reduced area (A_1) which results in a distribution of 400 kg/m². The format and the location of this area shall be taken as that which gives the least favourable stress for the mast and also for the cage. One example is shown in Figure 1;



Key

A total floor area [m²]

A_1 reduced area [m²] = m_r / 400

Figure 1 — One example of loading according to 4.2.2 d) 1)

2) if

$\frac{\text{m}_r}{A \cdot 0,8} \geq 400 \left[\text{kg}/\text{m}^2 \right]$

then the rated load shall be assumed to be distributed over an area (A_2) equivalent to 80 % of the total floor area of the cage. The format and the location of this area shall be taken as that which gives the least favourable stress for the mast and also for the cage. One example is shown in Figure 2;