



BSI Standards Publication

Safety rules for the construction and installation of lifts — Special lifts for the transport of persons and goods

Part 41: Vertical lifting platforms intended for use
by persons with impaired mobility

National foreword

This British Standard is the UK implementation of EN 81-41:2024. It supersedes BS EN 81-41:2010, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee MHE/4, Lifts, hoists and escalators.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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des personnes et des charges - Partie 41: Plates-formes
élévatrices verticales à l'usage des personnes à
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Sicherheitsregeln für die Konstruktion und den Einbau
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Plattformaufzüge für Personen mit eingeschränkter
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Contents

Page

European foreword.....	6
Introduction	7
1 Scope	9
2 Normative references	10
3 Terms and definitions	12
4 List of significant hazards	17
5 Safety requirements and/or protective measures	20
5.1 General requirements for lifting platforms.....	20
5.1.1 General.....	20
5.1.2 Pattern of use.....	20
5.1.3 Guarding.....	20
5.1.4 Access for maintenance, repair and inspection	21
5.1.5 Speed.....	22
5.1.6 Rated load	22
5.1.7 Load control	23
5.1.8 Carrier dimensions.....	23
5.1.9 Mechanical strength of the carrier	23
5.1.10 Resistance to operating forces	24
5.1.11 Protection of equipment against harmful external influences	24
5.1.12 Degree of protection for outdoor use	25
5.2 Carrier support/guide system (including any scissor mechanism)	25
5.2.1 Horizontal clearance.....	25
5.2.2 Tilting	25
5.2.3 Material.....	25
5.2.4 General provisions concerning guide rails	25
5.2.5 Guide rails for traction drive lifting platform.....	26
5.2.6 Guide rails for positive drive lifting platform.....	26
5.3 Safety gear and overspeed governor.....	27
5.3.1 Safety gear	27
5.3.2 Overspeed governor.....	28
5.4 Driving units and drive systems	29
5.4.1 General requirements	29
5.4.2 Braking system	30
5.4.3 Emergency/manual operation	32
5.4.4 Additional requirements for rack and pinion drive.....	33
5.4.5 Additional requirements for rope, toothed belt, chain suspensions	34
5.4.6 Additional requirements for screw and nut drive	37
5.4.7 Additional requirements for guided chain system	40
5.4.8 Additional requirements for scissors mechanism drive	42
5.4.9 Additional requirements for hydraulic drive	42
5.4.10 Additional requirements for counterweighted traction system.....	50
5.4.11 Additional requirements for rope traction system	51
5.4.12 Traction sheaves, pulleys and sprockets in the liftway.....	51
5.4.13 Ascending carrier overspeed protection means.....	51
5.4.14 Motor run time limiter	52
5.5 Electric installation and equipment.....	53
5.5.1 General.....	53

5.5.2	Conductors of different circuits.....	54
5.5.3	Insulation resistance of the electric installation.....	54
5.5.4	Lighting.....	55
5.5.5	Socket outlet.....	55
5.5.6	Drive contactors.....	55
5.5.7	Electric supply to the motors.....	56
5.5.8	Creepage and clearance distances and enclosure requirements.....	56
5.5.9	Electromagnetic compatibility	57
5.5.10	Protection against electric faults	57
5.5.11	Electric/Electronic safety devices	57
5.5.12	Protection of the driving motor.....	61
5.5.13	Electric wiring.....	62
5.5.14	Additional requirements for battery powered supply	62
5.5.15	Control devices	64
5.5.16	Emergency alarm devices	66
5.5.17	Cable-less controls	66
5.5.18	Control of inspection operation	66
5.6	Specific requirements for lifting platform enclosures.....	67
5.6.1	General	67
5.6.2	Top clearance.....	67
5.6.3	Risks for persons working in the liftway	67
5.6.4	Enclosure construction.....	68
5.6.5	Glass.....	70
5.6.6	Inspection doors and traps	71
5.6.7	Ventilation.....	71
5.7	Fire protection.....	71
5.8	Enclosed liftway entrances	72
5.8.1	General	72
5.8.2	Swing hinged landing doors.....	72
5.8.3	Height of landing doors	72
5.8.4	Construction of landing doors.....	73
5.8.5	Door locking	74
5.8.6	Emergency unlocking.....	75
5.8.7	Protection during door operation	76
5.9	Carrier.....	76
5.9.1	Construction	76
5.9.2	Sensitive edges, photocells and light curtains	76
5.9.3	Toe guard.....	78
5.9.4	Floor covering.....	78
5.9.5	Ceilings	79
5.9.6	Control panel.....	79
5.9.7	Handrail	79
5.9.8	Glass.....	79
5.9.9	Tip up seat.....	79
5.9.10	Structure, floor, wall, ceiling and decorative materials.....	79
6	Verification of safety requirements and/or protective measures.....	80
6.1	Verification of design	80
6.2	Verification tests.....	83
6.2.1	Overspeed safety device.....	83
6.2.2	Ascending overspeed protection	83
6.2.3	Rupture valve/Restrictor	83
6.2.4	Safety gear	83
6.2.5	Self-sustaining system	83
6.2.6	Stopping safety device	83

6.2.7	Landing door locking devices	84
6.2.8	Safety circuits containing electronic components	84
6.2.9	Self-monitoring	84
6.3	Verification tests on each vertical lifting platform before first use.....	84
7	Information for use	85
7.1	Introduction	85
7.2	General.....	85
7.3	Signals and warning devices	85
7.3.1	Information to be displayed.....	85
7.3.2	Rated load	85
7.3.3	Function devices.....	85
7.3.4	Emergency alarm device	85
7.3.5	Disabled persons symbol	85
7.4	Emergency manual operation	86
7.5	Main electric switch	86
7.6	Fragile roof	86
7.7	No goods	86
7.8	Operating instructions.....	86
7.9	Accompanying documents (in particular: Instruction handbook)	87
7.9.1	General.....	87
7.9.2	Instruction manual.....	89
7.9.3	Marking.....	89
7.9.4	Building clearance requirements.....	89
	Annex A (normative) Electronic components: failure exclusion	90
	Annex B (informative) Guidance in selection of lifting platforms.....	96
B.1	Introduction	96
B.2	Selection of lifting platforms.....	96
B.2.1	Suitability	96
B.2.2	Control devices.....	96
B.2.3	Location of the lifting platform	96
B.2.4	Duty cycle	97
B.3	Electric supply and lighting.....	97
B.4	Maintenance.....	97
	Annex C (informative) Recommendations for the provisions and use of specially adapted control devices, switches and sensors.....	98
C.1	Control devices.....	98
C.2	Assistance	98
C.3	Specially adapted switches	98
	Annex D (informative) In-use periodic examination, tests and servicing.....	99
D.1	Periodic examinations and tests	99
D.2	Servicing.....	99
	Annex E (normative) Safety components – Tests procedures for verification of conformity	100
E.1	General provisions.....	100
E.2	Screw and nut (not self-sustaining system) stopping safety device	100

E.2.1 General provisions 100

E.2.2 Check on the characteristic of the stopping safety device 100

E.2.3 Comments..... 102

E.2.4 Test report 103

E.3 Self-sustaining system 103

Annex F (informative) Building interfaces 104

F.1 General provisions 104

F.2 Support of Guide Rails..... 104

F.3 Ventilation of the enclosed liftway 104

F.3.1 General 104

F.3.2 Ventilation of the enclosed liftway 105

Annex ZA (informative) Relationship between this European Standard and the essential requirements of Directive 2006/42/EC aimed to be covered..... 107

Bibliography 111

European foreword

This document (EN 81-41:2024) 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 May 2025, and conflicting national standards shall be withdrawn at the latest by November 2026.

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 81-41:2010.

This document constitutes a full revision of the standard. The main technical changes with respect to EN 81-41:2010 are:

- requirement for a means for detection of a person on the carrier has been added;
- friction roller drive has been removed;
- traction drive requirements have been introduced;
- screw and nut drive requirements have been strengthened (inspection, safety nut, fixing requirements);
- landing door lock release requirements have been revised;
- power door contact forces have been reduced;
- toothed belts drive has been added;
- use of the word “carrier” vs “platform” has been revised;
- all normative references to other standards have been dated;
- a new Annex ZA, including a detailed Table ZA.1, has been developed.

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.

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

The population of Europe is ageing and the prevalence of disability, including disability associated with the ageing process, is increasing. Older people and people with disabilities at present are estimated to number some 80 million people – a large and growing proportion of the European Union population. The changing demography presents both opportunities and challenges for the Union. The economic, social and cultural potential of older people and people with disabilities is underexploited at present. However, there is a growing recognition that society needs to exploit this potential for the economic and social benefit of society generally.

This is one of the reasons that led to this standard on vertical lifting platforms for people with impaired mobility being one means to provide accessibility to buildings.

This standard 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 this 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.

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

When requirements of this type-C standard are different from those which are stated in type-A or type-B standards, the requirements of this type-C standard take precedence over the requirements of the other standards for machines that have been designed and built according to the requirements of this type-C standard.

The lifting platforms defined in this standard are suitable for type-A and type-B wheelchairs as defined in EN 12183:2022 and/or EN 12184:2022. The lifting platforms are equally suitable for persons either with or without impaired mobility.

Those items relevant to lifting platforms referenced within EN 81-70:2021+A1:2022 have been included within this standard.

This standard does not only address the essential health and safety requirements of the Machinery Directive, but additionally states minimum rules for the installation of lifting platforms into buildings/constructions. There may be additional national regulations for the construction of vertical lifting platforms in building, in some countries which cannot be ignored.

It is essential that minimum passageways conform to national building regulations and are not obstructed by any open door or trap and/or any protection means provided for working areas outside of the enclosed liftway where fitted according to the maintenance instructions.

Assumptions

With the aim of clarifying the intentions of the standard and avoiding doubts when applying it, the following assumptions were made when producing it:

- a) Vertical lifting platforms are installed in both new and existing buildings.
- b) Liftways contain only that equipment associated with a specific lifting platform. All counterweights or balance weights are in the same liftway as the carrier.
- c) Drive and control equipment is installed in a machinery space.
- d) General hazards due to hydraulic, pneumatic, etc. equipment are dealt with according to relevant B level standards for common use.
- e) Components are kept in good repair and working order, in accordance with the maintenance manual, so that the required characteristics remain despite wear.
- f) To ensure the safe functioning, the operating temperature range of the equipment will take into account the conditions of the place of use of the machinery, inside the maximum range of ambient temperature between +5 °C and +40 °C. For very hot or cold environments extra requirements may be necessary.
- g) Negotiations have been made between the customer and the manufacturer about:
 - environmental conditions;
 - civil engineering conditions;
 - other aspects related to the place of installation;
 - the use and places of use of the machinery;
 - the place of installation allows a safe use for the machine;
 - any additional fire protection requirements;
 - suitability for the user (see Annex B);
 - pattern of use.

1 Scope

1.1 This document deals with safety requirements for construction, installation, maintenance and dismantling of electrically powered vertical lifting platforms affixed to a building structure intended for use by persons with impaired mobility:

- travelling vertically between predefined levels along a guided path whose inclination to the vertical does not exceed 15°;
- intended for use by persons with or without a wheelchair;
- supported or sustained by rack and pinion, rope traction drive, traction drive, rope positive drive, chains, toothed belts, screw and nut, guided chain, scissors mechanism or hydraulic jack (direct or indirect);
- with enclosed liftways;
- with a rated speed not greater than 0,15 m/s;
- with carrier not completely enclosed.

1.2 This document deals with all significant hazards relevant to lifting platforms, when they are used as intended and under the conditions foreseen by the manufacturer (see Clause 4).

Those hazards have been considered for each component that may be incorporated in a complete lift installation and rules have been drawn up accordingly. Components are:

- a) designed in accordance with the usual engineering practice and calculation codes, including all failure modes;
- b) of sound mechanical and electric construction.

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);
- handling of materials, the nature of which could lead to dangerous situations;
- vertical lifting platforms whose primary function is the transportation of goods;
- vertical lifting platforms whose carriers are completely enclosed;
- vertical lifting platforms prone to vandalism;
- hazards occurring during manufacture;
- earthquakes, flooding;
- firefighting, evacuation and behaviour during a fire;
- noise and vibrations;

- the design of concrete, hard core, timber or other foundation or building arrangement;
- the design of anchorage bolts to the supporting structure;
- type C wheelchairs as defined in EN 12183:2022 and/or EN 12184:2022.

NOTE For the actual type of machinery, noise is not considered a significant nor relevant hazard.

1.4 This document is not applicable to vertical lifting platforms intended for use by persons with impaired mobility which are manufactured before the date of its publication as an 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 81-58:2022, *Safety rules for the construction and installation of lifts - Examination and tests - Part 58: Landing doors fire resistance test*

EN 1993-1-1:2022, *Eurocode 3 - Design of steel structures - Part 1-1: General rules and rules for buildings*

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 12183:2022, *Manual wheelchairs - Requirements and test methods*

EN 12184:2022, *Electrically powered wheelchairs, scooters and their chargers - Requirements and test methods*

EN 12385-5:2021, *Steel wire ropes - Safety - Part 5: Stranded ropes for lifts*

EN 12600:2002, *Glass in building - Pendulum test - Impact test method and classification for flat glass*

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

EN 13411-3:2022, *Terminations for steel wire ropes - Safety - Part 3: Ferrules and ferrule-securing*

EN 13411-6:2004+A1:2008, *Terminations for steel wire ropes - Safety - Part 6: Asymmetric wedge socket*

EN 13411-7:2021, *Terminations for steel wire ropes - Safety - Part 7: Symmetric wedge socket*

EN 13411-8:2011, *Terminations for steel wire ropes - Safety - Part 8: Swage terminals and swaging*

EN 16005:2023+A1:2024, *Power operated pedestrian doorsets - Safety in use - Requirements and test methods*

EN 50214:2006¹, *Flat polyvinyl chloride sheathed flexible cables*

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

EN 60204-32:2008, *Safety of machinery - Electrical equipment of machines - Part 32: Requirements for hoisting machines*

EN 60529:1991², *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage supply systems - Part 1: Principles, requirements and tests*

EN IEC 60747-5-5:2020, *Semiconductor devices - Part 5-5: Optoelectronic devices - Photocouplers*

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

EN 60947-5-1:2017³, *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 61558-1:2019, *Safety of transformers, reactors, power supply units and combinations thereof - Part 1: General requirements and tests*

EN 61800-5-2:2017, *Adjustable speed electrical power drive systems - Part 5-2: Safety requirements - Functional*

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

EN ISO 7010:2020, *Graphical symbols - Safety colours and safety signs - Registered safety signs (ISO 7010:2019, Corrected version 2020-06)*

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)*

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

¹ This document is impacted by EN 50214:2006/Corrigendum Dec. 2007.

² This document is impacted by EN 60529:1991/A1:2000, EN 60529:1991/A2:2013 and EN 60529:1991/AC:2016.

³ This document is impacted by EN 60947-5-1:2017/AC:2020.

ISO 606:2015, *Short-pitch transmission precision roller and bush chains, attachments and associated chain sprockets*

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

ISO 7000:2019, *Graphical symbols for use on equipment — Registered symbols*

ISO 13050:2022, *Synchronous belt drives — Metric pitch, curvilinear profile systems G, H, R and S, belts and pulleys*

IEC 60417:2024, *Graphical symbols for use on equipment*

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:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 balancing weight

mass which saves energy by balancing all or part of the mass of the unloaded carrier

3.2 carrier

part of the lifting platform by which persons are supported in order to be lifted or lowered

3.3 competent person

person, suitably trained and qualified by knowledge and practical experience, and provided with the necessary instructions to enable the required work to be carried out safely

3.4 cord diameter

diameter of a circle that circumscribes the cross section of a cord and is used for evaluating diameter ratio

3.5 cord pitch

spacing between adjacent cord centrelines in the noncircular elastomeric coated steel suspension member

3.6 counterweight

mass which ensures traction

[SOURCE: EN 81-20:2020, 3.8]

3.7 down direction valve

electrically controlled valve in a hydraulic circuit for controlling the descent of the carrier

3.8**drive system**

system that cause the lifting platform to move under power input

3.9**drive unit**

unit, including the motor, that drives and stops the carrier

3.10**electric safety chain**

total of the electric safety devices, which can either be switches or safety circuits, connected in series with each other

3.11**electric safety contact**

contact in which the separation of the circuit breaking elements is made by positive means

3.12**enclosed liftway**

space in which the carrier and any counterweight or balancing weight travels and which is fully bounded by the bottom of the pit and a solid enclosure (but not necessarily a roof) and landing doors

3.13**existing building**

building which is used or was already used before the order for a lifting platform was placed

Note 1 to entry: A building whose internal structure is completely renewed is considered as a new building.

3.14**final limit device**

electric safety device operated by the carrier in the event of over-travel of the normal operation stop

3.15**full load pressure**

static pressure exerted on the piping directly connected to the jack, the carrier with the rated load being at rest at the highest landing level

3.16**full travel**

travel from the lowest landing to the highest landing

3.17**guide rails**

rigid components that provide guiding for the carrier

3.18**guided chain**

chain which can be either fixed or moving, and which is completely guided over its entire length such that it can transmit a force either in thrust or tension

3.19**guided chain system**

carrier supported, raised and lowered by means of one or more guided chain transmission units

3.20

impaired mobility

difficulty in using stairs because of impairment

Note 1 to entry: Examples of persons with impaired mobility include, but are not restricted to: wheelchair users, persons with pushchair, persons with walking difficulties, persons using walking aids, carers for persons with impaired mobility and/or children with impaired mobility and elderly persons.

3.21

lifting platform

device permanently installed to serve predefined landings comprising a guided carrier whose characteristics are primarily intended to permit the access of persons with impaired mobility

3.22

load carrying nut

internally threaded component which carries the load in conjunction with a screw

3.23

machinery space

volume(s) inside or outside of the well where the machinery as a whole or in parts is placed, including the working areas associated with the machinery

Note 1 to entry: A machinery cabinet with its associated working area(s) is considered as a machinery space.

[SOURCE: EN 81-20:2020, 3.29]

3.24

maximum static load

possible static overload based on carrier floor area, or maximum working load, whichever is highest

3.25

maximum working load

rated load + overload of one person (equivalent to 75 kg)

3.26

mechanical blocking device

device that, when set in position, guarantees a minimum safety space beneath the carrier for the purposes of maintenance and inspection

3.27

overspeed governor

device which, when the lift attains a predetermined speed, causes the lift to stop, and if necessary causes the safety gear to be applied

[SOURCE: EN 81-20:2020, 3.33]

3.28

overload

additional load which is permissible based upon one person

3.29

pawl device

mechanical device for stopping involuntary descent of the carrier, and maintaining it stationary on fixed supports

3.30**positive drive**

drive which drives the carrier not reliant on friction by drum and ropes or by sprockets and chains or by positive belts, directly linked to the drive motor

3.31**pressure relief valve**

valve which limits the pressure to a pre-determined value by exhausting fluid

[SOURCE: EN 81-20:2020, 3.39]

3.32**public access**

location where the users are unpredictable

3.33**rated load**

load which is intended to be carried in normal operation

3.34**rated speed**

design speed of the lifting platform

3.35**re-levelling**

operation, after the carrier has stopped, to permit stopping position to be corrected during loading or unloading

3.36**restrictor**

valve in which the inlet and outlet are connected through a restricted passageway

[SOURCE: EN 81-20:2020, 3.47]

3.37**rupture valve**

valve designed to close automatically when the pressure drop across the valve, caused by the increased flow in a pre-determined flow direction exceeds a pre-set amount

[SOURCE: EN 81-20:2020, 3.48]

3.38**safety circuit**

circuit containing contacts and/or electronic components which is regarded to fulfil demands of an electric safety device

[SOURCE: EN 81-20:2020, 3.49]

3.39**safety factor**

ratio, either of the yield load (proof stress $R_{p0,2}$), or the ultimate tensile load to the load that can be imposed upon a member by the rated load for a particular material under static or dynamic conditions

3.40

safety gear

mechanical device for stopping in the down direction, and maintaining stationary on the guide rails, the carrier, counterweight or balancing weight in case of overspeeding or breaking of the suspension

[SOURCE: EN 81-20:2020, 3.51, adapted]

3.41

safety nut

internally threaded component which is linked to the load carrying nut but is unloaded during normal service which is capable of carrying the load if the load carrying nut should break

3.42

safety rope

auxiliary rope attached to the carrier, the counterweight or balancing weight for the purpose of tripping a safety gear in case of suspension failure

3.43

screw

external threaded component which carries the load in conjunction with the load carrying nut and in certain circumstances the load imposed by the safety nut

3.44

self-sustaining system

system that, under free running conditions, ensure that the speed of the carrier decreases

3.45

sensitive edge

device attached to an edge to provide protection against trapping, shearing or crushing hazards

3.46

shut-off valve

manually operated two-way valve which can permit or prevent flow in either direction

3.47

slack rope/chain device

device, or combination of devices, arranged to stop the carrier, should any suspension rope or chain slacken by a pre-determined amount

3.48

steel cord

assembly of steel strands each comprising steel wires, helically laid around a central core strand

3.49

stopping safety device

mechanical device for stopping the relative rotation between screw and nut in case of overspeeding and stopping the carrier and maintaining it stationary

3.50

toe guard

vertical component extending downwards from the carrier entrance

3.51

traction system

system whose suspension ropes are driven by friction of the driving sheave of the machine

3.52**transmission unit**

assembly comprising the chain or toothed belt, and its associated elements, sprocket wheel, return housing, guided elements

3.53**unintended movement**

non-commanded movement of the carrier with landing doors open within the unlocking zone, excluding movements resulting from loading/unloading operation and re-levelling movements

3.54**unlocking zone**

zone, extending above and below a landing, in which the carrier floor needs to be positioned to enable the corresponding landing door(s) to be unlocked

3.55**user**

person making use of the services of the lifting platform

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 document, identified by risk assessment as significant for this type of machinery and which require action to eliminate or reduce the risk.

Table 1 shows the hazards which have been identified and where the corresponding requirements have been formulated in this document, in order to limit the risk or reduce these hazards in each situation.

The significant hazards are based upon EN ISO 12100:2010. Also shown are the subclause references to the safety requirements and/or protective measures in this document.

Before supplying any lifting platform, it is important to review the risks in Table 1 to check that all site-specific hazards have been identified in this clause.

Table 1 — Significant hazards relating to the general design and construction of lifting platforms

Group	Significant hazard in accordance with EN ISO 12100:2010, Table B.1	Relevant clauses in this document
1	Mechanical hazards	
1.1	Due to machine parts or workpieces, e.g. — by potential energy (falling objects, height from the ground, gravity)	5.1.6, 5.3, 5.4.1, 5.4.6, 5.6.4, 5.6.5, 5.6.6, 5.8.2, 5.8.3
	— by kinetic energy (acceleration, deceleration, moving/rotating elements)	5.1.5, 5.3, 5.4.2
	— by mechanical strength (break-up)	5.1.2, 5.1.6, 5.1.10, 5.3, 5.4.1, 5.4.2, 5.4.4, 5.4.5, 5.4.6, 5.4.7, 5.4.8, 5.4.9
1.2	by stored energy, e.g.: — elastic elements (springs)	5.4.9
1.3	Crushing	5.1.3, 5.1.4.1.2, 5.1.4.2.1, 5.6.2, 5.6.4, 5.9
1.4	Shearing	5.1.3, 5.6.4, 5.8.4, 5.9
1.5	Cutting or severing	5.1.4.1.2, 5.1.4.4.1, 5.6.4, 5.6.6, 5.8.2, 5.9
1.6	Entanglement	5.1.3, 5.1.4.1.2, 5.1.4.4.1, 5.4.1.6, 5.5.5, 5.6.4, 5.9

Group	Significant hazard in accordance with EN ISO 12100:2010, Table B.1	Relevant clauses in this document
1.7	Drawing-in or trapping	5.1.3, 5.1.4.1.2, 5.1.4.4.1, 5.1.11.3, 5.4.5, 5.4.5.4.4, 5.5.5, 5.6.6, 5.8.4, 5.9
1.8	Impact	5.1.4.1.2, 5.1.4.4.1, 5.8.7
1.9	Stabbing or puncture	5.1.4, 5.9
1.10	Friction or abrasion	5.1.3, 5.6.4, 5.9
1.11	Injection	5.1.4.4.1, 5.4.9
1.12	Slipping, tripping and falling	5.1.3, 5.1.4.1.2, 5.1.4.2.3, 5.1.4.3, 5.1.6, 5.1.7, 5.2.1, 5.3, 5.4.1, 5.4.2, 5.4.4, 5.4.5, 5.4.6, 5.4.7, 5.4.8, 5.4.9, 5.5.4, 5.5.15.7, 5.6.4, 5.6.5, 5.6.6, 5.8.2, 5.8.3, 5.8.4, 5.8.4.6, 5.8.4.7, 5.8.5, 5.9, 7.6
1.13	Instability	5.1.5, 5.1.7, 5.2.1, 5.2.2, 5.4.2, 5.4.3, 5.6.4
2	Electric hazards	
2.1	Touching live parts	5.1.4.4.1, 5.5.1, 5.5.2, 5.5.3, 5.5.8, 5.5.13
2.2	Parts which have become live under fault conditions	5.5.1, 5.5.3
3	Thermal hazards	
3.1	Burn, scald	5.1.4.4.1, 5.1.5, 5.5.12, 5.5.14
6	Radiation hazards	
6.1	Low frequency electromagnetic radiation	5.5.9
7	Material/ substance hazards	
7.2	Fire	5.5.14.9
7.3	Explosion	5.5.14.9
8	Ergonomic hazards	
8.1	Unhealthy postures or excessive effort	5.1.4.2.2, 5.1.8, 5.4.3, 5.5.15, 5.8.2, 5.8.7
8.2	Inadequate consideration of anatomy	5.4.3, 5.5.14, 5.8.7
8.4	Inadequate local lighting	5.5.3, 5.5.4
8.5	Design or location of indicators and visual displays units	5.5.15
8.6	Design, location or identification of control devices	5.5.15
8.9	Human error during operation	5.4.3, 5.5.15, 7.3
9	Hazards associated with the environment in which the machine is used	
9.4	Snow, water, wind, temperature	5.1.4, 5.1.11
10	Combination of hazards	
10.1	Failure/disorder of the control system and control circuits	5.1.11, 5.1.12, 5.4.2, 5.4.3, 5.4.4.6, 5.4.5.7, 5.4.6.3, 5.4.7.3, 5.4.10.5, 5.5, 5.5.1.1, 5.5.6, 5.5.7, 5.5.8, 5.5.11, 5.5.11.3, 5.5.11.5, 5.5.13, 5.5.14, 5.5.17

Group	Significant hazard in accordance with EN ISO 12100:2010, Table B.1	Relevant clauses in this document
10.2	Restoration of energy supply after an interruption	5.5.11
10.3	Software error	5.5.11, 5.5.14, 5.5.15.4, 5.5.15.5
10.4	Failure of the power supply	5.4.2, 5.5.6.4, 5.5.11, 5.5.13
12	Hazards due to: — assembly and installation — setting — cleaning — fault-finding — maintenance	5.1.10, 5.3, 5.5.13, 5.8.4.7, 5.8.5
12.1	Maintenance operation	5.5.1, 5.5.5, 5.5.6.3, 5.5.6.4, 5.5.11, 5.5.13
12.4	Being trapped in a machine	5.4.3, 5.5.4, 5.5.11, 5.5.14, 5.5.16, 5.8.6
<i>Supplementary, due to the mobility of machinery</i>		
16	Hazards related to travelling function	
16.2	Movement without a driver at the driving position	5.4.2, 5.4.4.6, 5.4.5.7, 5.4.6.3, 5.4.7.3, 5.4.10.5, 5.5.1.1, 5.5.6, 5.5.7, 5.5.8.2, 5.5.11.5, 5.5.12, 5.5.13, 5.5.17
16.5	Insufficient ability of machinery to be slowed down, stopped and immobilized	5.5.15.4, 5.5.15.6
17	Hazards linked to work position (including driving station) on the machine	
17.1	Fall of persons during access to or at/from the work position	5.1.4.1.2, 5.1.4.2.3, 5.1.6, 5.3, 5.4.1, 5.4.2, 5.4.4, 5.4.5, 5.4.6, 5.4.7, 5.4.8, 5.4.9
17.3	Mechanical hazards at the work position, such as: — contact with the wheels — rollover and overturning — slipping during access — fall of objects, penetration by objects — contact of persons with machine parts or tools (pedestrian controlled machines)	5.1.6, 5.1.7, 5.3
22	Mechanical hazards caused by load falls, collisions, machine tipping	
22.3	Uncontrolled amplitude of movements	5.1.5, 5.4.2, 5.4.4.6, 5.4.5.7, 5.4.6.3, 5.4.7.3, 5.4.10.5, 5.5.7
22.5	Inadequate holding devices/accessories	5.9.7
22.7	Access of persons to load support	5.3, 5.4.4, 5.4.5, 5.4.6, 5.8
22.8	Derailment	5.1.10, 5.2.1
22.9	Insufficient mechanical strength of parts	5.1.2, 5.1.10, 5.4.4, 5.4.5, 5.4.6, 5.4.7, 5.4.8, 5.4.9, 5.6.4.3, 5.6.4.4, 5.8.4.7, 5.9
22.10	Inadequate design of pulleys and drums	5.4.5.4
22.11	Inadequate selection of chains, ropes,	5.4.5, 5.4.7

Group	Significant hazard in accordance with EN ISO 12100:2010, Table B.1	Relevant clauses in this document
	lifting and accessories and their inadequate integration into the machine	
22.12	Lowering of the load under the control of friction brake	5.4.2, 5.4.3
22.13	Abnormal conditions of assembly/use/maintenance	6.3, Clause 7
22.14	Effect of load on persons (impact by load or counterweight)	5.8.5, 5.8.7
27	Mechanical hazards	
27.1	Due to: — inadequate mechanical strength — inadequate working coefficients — failing of loading control	5.1.6, 5.1.7, 5.1.8, 5.1.10, 5.4.4, 5.4.5, 5.4.6, 5.4.7, 5.4.8, 5.4.9, 5.6.4, 5.9
27.2	Failing of controls in person carrier (function, priority)	5.4.4.6, 5.4.5.7, 5.4.6.3, 5.4.7.3, 5.4.10.5, 5.5.7, 5.5.11, 5.5.15.3
27.3	Overspeed of person carrier	5.1.5, 5.3, 5.4.2
27.4	Falling of persons from person carrier	5.6.4.3, 5.6.4.4, 5.8.5

5 Safety requirements and/or protective measures

5.1 General requirements for lifting platforms

5.1.1 General

Machinery shall comply with the safety requirements and/or protective measures of this clause. In addition, the machinery shall be designed according to the principles of EN ISO 12100:2010 for hazards relevant but not significant, which are not dealt with in this document (e.g. sharp edges).

It shall be ensured that the dimensions specified in this document are maintained, despite wear. Consideration shall also be given to the need for protection against the effects of corrosion. The lifting platform shall not emit vibrations which could be harmful to the user.

All materials shall be asbestos free.

5.1.2 Pattern of use

The mechanical design of the lifting platform shall take account of the frequency of usage to which it will be subjected.

NOTE See Assumptions – negotiations in the Introduction of this document.

5.1.3 Guarding

Components (for example gearing of the drive unit) shall be guarded to prevent the risk of personal injury. Access panels shall be secured by means requiring the use of a tool or key for their release. Their fixing systems shall remain attached to the guards or to the machinery when the guards are removed.

Guarding shall be designed and constructed in accordance with EN ISO 14120:2015, EN ISO 13857:2019 and EN ISO 13854:2019.

5.1.4 Access for maintenance, repair and inspection

5.1.4.1 Working areas on the floor of the carrier

5.1.4.1.1 Where machinery is to be maintained or inspected from the floor of the carrier and if this work requires movement of the carrier or is likely to result in uncontrolled or unexpected carrier movement, the clauses from 5.1.4.1.2 to 5.1.4.1.4 apply.

5.1.4.1.2 To prevent any kind of uncontrolled or unexpected movement of the carrier resulting from maintenance/inspection that can be dangerous to persons carrying out maintenance/inspection work the lifting platform shall be equipped with a mechanical device having manual activation/deactivation. Such device shall ensure a minimum 300 mm clear space between the parts of the carrier and rigid parts of the liftway where there is a risk of crushing. An electric safety device in accordance with 5.5.11 shall monitor to ensure that the device is in the passive position before normal operation.

5.1.4.1.3 Any necessary devices for emergency operation and for dynamic tests (such as brake tests, traction tests, safety gear tests) shall be arranged so that they can be operated from outside of the enclosed liftway.

5.1.4.1.4 If an inspection door/panel is located in the walls of the carrier, it shall:

- a) be provided with a key-operated lock, capable of being reclosed and relocked without a key;
- b) be provided with an electric safety device in conformity with 5.5.11, checking the closed position.

5.1.4.2 Working areas under the carrier

5.1.4.2.1 Where the lifting platform is to be maintained or inspected from underneath the carrier the following applies:

- a) If a clear distance of 500 mm minimum is not available under the carrier when at its lowest position, a manually positioned mechanical blocking device shall be provided to enable the carrier to be held in a raised position and to create a free distance of at least 500 mm between the floor of the working area and the lowest parts of the carrier. The device shall be able to stop the carrier travelling downwards at rated speed with maximum working load.
- b) The mechanical blocking device shall be positioned in active position from outside the pit and shall be provided with an electric safety device in accordance with 5.5.11 that detects the correct positioning and which shall disable the carrier and landing controls and enable any inspection control station; visible information shall be available if the blocking device is not in its active position. The function shall be clearly marked with its intended purpose and position.
- c) The opening of any door providing access to the pit shall be by use of a key, see 5.8.6, and prevent operation of the lifting platform by an electric safety device according to 5.5.11.
- d) The return of the lifting platform to normal operation shall only be made by action of a reset device placed outside of the liftway and accessible to authorized persons only.
- e) Where it is necessary to move the carrier from the pit, an inspection control station according to 5.5.18 shall be available for use.
- f) Areas of the pit that are accessible to persons shall be able to support at any position the mass of 2 persons, each counting for 1 000 N, without permanent deformation.

5.1.4.2.2 When the carrier is in the position according to 5.1.4.2.1 a), it shall be possible to leave the working area easily and safely.

5.1.4.2.3 Any necessary devices for emergency operation and for dynamic tests, such as brake tests, traction tests, safety gear tests, shall be arranged so that they can be operated from outside of the enclosed liftway.

5.1.4.3 Working areas outside of the enclosed liftway

If the machinery is in the enclosed liftway and is intended to be maintained/inspected from outside of the enclosed liftway, access to this equipment shall only be possible by a door/trap in conformity with 5.6.6.

5.1.4.4 Machinery outside of the enclosed liftway

5.1.4.4.1 If any part of machinery is located outside of the liftway, e.g. control panel, drive machine, it shall be located inside a cabinet.

5.1.4.4.2 The machinery cabinet shall consist of imperforate walls, floor, roof and door(s).

The door(s) shall:

- a) not open towards the inside of the cabinet;
- b) be provided with a key-operated lock;
- c) be capable of being re-closed and re-locked without a key.

In addition, the following openings are also permitted:

- d) necessary openings for the functioning of the lifting platform between the liftway and the machinery cabinet;
- e) vent openings for escape of gases and smoke in the event of fire. These openings when accessible to non-authorized persons shall comply with the following requirements:
 - protection according to EN ISO 13857:2019, Table 5, against contact with danger zones;
 - IP2XD according to EN 60529:1991;

5.1.5 Speed

Carrier speed in normal operation shall not exceed 0,15 m/s.

5.1.6 Rated load

The rated load shall be calculated at not less than 250 kg/m² of the clear loading area, measured at the floor level.

NOTE 1 250 kg/m² takes into account the surface and the load of a person alone using electrically powered class A or B wheelchairs.

The maximum permissible rated load shall be 500 kg.

The minimum values shall be as follows:

- a) lone user either standing or in a type A wheelchair: 250 kg;
- b) user in a type A or B wheelchair with an attendant: 315 kg.

Type A or type B wheelchairs are as defined in EN 12183:2022 and/or EN 12184:2022.

NOTE 2 See Table 2.

5.1.7 Load control

The lifting platform shall be fitted with a device to prevent normal starting, excluding re-levelling of hydraulic drives in the event of overload on the carrier. The overload is considered to occur when the rated load is exceeded by 75 kg or more.

In the event of overload:

- a) users shall be informed by an audible and visible signal on the carrier;
- b) landing door(s) shall remain unlocked, when the carrier is in that unlocking zone.

5.1.8 Carrier dimensions

5.1.8.1 The clear loading area of the carrier including any sensitive edge, photocell or light curtain, shall not exceed 2 m², measured at the floor level.

5.1.8.2 For new buildings with public access the plan dimensions of the carrier floor, including any sensitive edge, photocells or light curtain, to accommodate a standard type A or type B wheelchair according to EN 12183:2022 and/or EN 12184:2022, shall be equal to or greater than those given in Table 2. Handrail projections shall not be included in the dimension calculation.

For existing buildings and buildings without public access, other dimensions may be considered.

Table 2 — Minimum dimensions of carrier floor

Dimensions in millimetres

Principal use	Minimum plan dimensions (width × length)	Minimum rated load kg
Type A and B wheelchairs with an attendant and adjacent entrances	1 100 × 1 400	385
Type A and B wheelchairs	900 × 1 400	315
Lone user, either standing or in a type A wheelchair	800 × 1 250	250

5.1.9 Mechanical strength of the carrier

Mechanical strength of the carrier shall be such that foreseeable misuse (e.g.: too many persons) is taken into consideration. Therefore, the carrier and its associated suspension attachments, shall be designed to support the load as determined in Table 3, or maximum working load, whichever is highest, plus an additional load of 25 % i.e. giving a static test coefficient of 1,25.

Table 3 —Maximum load and maximum available carrier area

Maximum load, mass kg	Maximum available carrier area m ²	Maximum load mass kg	Maximum available carrier area m ²
100	0,37	525	1,45
180	0,58	600	1,60
225	0,70	630	1,66
300	0,90	675	1,75
375	1,10	750	1,90
400	1,17	800	2,00
450	1,30		
For intermediate loads the area is determined by linear interpolation.			

5.1.10 Resistance to operating forces

5.1.10.1 The complete lifting platform installation shall resist, without permanent deformation, the forces imposed on it during normal operation, during the application of the safety devices and at impact on mechanical stops when travelling at the rated speed. However, local deformation that does not affect the operation of the lifting platform arising from the safety gear gripping device is permissible.

5.1.10.2 Guiding components, their attachments and joints shall withstand deflections due to uneven loading without affecting normal operation.

5.1.10.3 All load bearing components and joints, which are critical to fatigue shall withstand the fatigue stress produced by minimum 25 000 load cycles, considering them 33,33 % without load, with 33,33 % half of the rated load and 33,33 % at rated load plus 10 %.

Each load cycle shall be at the worst-case condition and at least consist of one start (acceleration from rest to rated speed), 5 m travel and one stop (deceleration from rated speed) and return.

The degree of stress fluctuation and the number of stress cycles, which can be a multiple of the number of load cycles shall be taken into account.

Fixings shall be specified to ensure that integrity of load bearing components and joints is maintained during normal operation.

5.1.11 Protection of equipment against harmful external influences

5.1.11.1 General

All mechanical and electric components shall be protected from the harmful and hazardous effects of external influences that will be encountered at the proposed installation site, e.g.:

- the ingress of water and solid bodies;
- the effects of humidity, temperature, corrosion, atmospheric pollution, solar radiation, etc.;
- the actions of flora, fauna, etc.

5.1.11.2 Protection

Moisture shall be prevented from entering the liftway or drainage shall be provided.

The protection shall be designed and constructed, and the lifting platform shall be installed in such a manner that the influences mentioned in 5.1.11.1 do not prevent the lifting platform from operating safely and reliably.

It shall not be possible for moisture to accumulate on the enclosed liftway floor.

5.1.11.3 Guarding of equipment from mechanical damage

Guarding shall be designed and constructed in accordance with EN ISO 14120:2015, EN ISO 13857:2019 and EN ISO 13854:2019.

5.1.12 Degree of protection for outdoor use

For outdoor use, lifting platforms shall have a sufficient degree of protection for electric equipment depending on site conditions, see assumptions, which is not less than IP54 as defined in EN 60529:1991.

5.2 Carrier support/guide system (including any scissor mechanism)

5.2.1 Horizontal clearance

Carrier support/guide system shall be provided to retain and guide the carrier throughout its travel. The system shall ensure that a maximum horizontal clearance of 20 mm between the inner surface of the enclosed liftway enclosure and carrier components, on its accessible open sides, is maintained throughout the entire travel of the carrier, under maximum working load conditions.

5.2.2 Tilting

Carrier support/guide system shall ensure that the carrier edges cannot tilt more than ± 10 mm from the horizontal when:

- a) the rated load is distributed over the most unfavourable half of the length of the carrier floor; and
- b) the rated load is distributed over the most unfavourable half of the width of the carrier floor.

5.2.3 Material

Carrier support/guide system structural members shall be made of metal.

5.2.4 General provisions concerning guide rails

5.2.4.1 The guide rails, their joints and attachments shall be sufficient to withstand the loads and forces imposed on them in order to ensure a safe operation of the lifting platform.

The aspects of safe operation of the lifting platform concerning guide rails are:

- a) carrier, as well as counterweight or balance weight guidance shall be ensured; and
- b) deflections shall be limited to such an extent, that due to them:
 - 1) unintended unlocking of the doors shall not occur; and
 - 2) operation of the safety devices shall not be affected; and
 - 3) collision of moving parts with other parts shall not be possible.

5.2.4.2 The permissible stresses shall be determined by:

$$\sigma_{perm} = R_m / S_t$$

where

σ_{perm} is the permissible stress in newtons per square millimetre;

R_m is the tensile strength in newtons per square millimetre;

S_t is the safety factor.

The strength values shall be taken from the manufacturer.

The safety factor shall be taken from Table 4.

Materials with elongations less than 8 % are regarded as too brittle and shall not be used.

Table 4 — Safety factors for guide rails

Load cases	Elongation (A5)	Safety factor
Normal operation and loading/unloading	A5 > 12 %	2,25
	8 % ≤ A5 ≤ 12 %	3,75
Safety device operation	A5 > 12 %	1,8
	8 % ≤ A5 ≤ 12 %	3,0

5.2.4.3 For T-profile guide rails and their fixings (brackets, separation beams) the maximum calculated permissible deflections δ_{perm} shall be:

- $\delta_{perm} = 5$ mm in both directions for carrier, counterweight or balancing weight guide rails on which safety gears are operating;
- $\delta_{perm} = 10$ mm in both directions for guide rails of counterweight or balancing weight without safety gears.

5.2.4.4 Guide rails shall be calculated according to:

- EN 81-50:2020, 5.10; or
- EN 1993-1-1:2022; or
- Finite Element Method (FEM).

NOTE An example for a calculation based on the method in EN 81-50:2020, 5.10 is given in EN 81-50:2020, Annex C.

5.2.5 Guide rails for traction drive lifting platform

When the carrier or counterweight is at its highest position of travel, including over travel, its guide rail lengths shall be such as would accommodate a further guided travel of at least 0,05 m.

5.2.6 Guide rails for positive drive lifting platform

5.2.6.1 When the carrier is at its highest position of travel, including over travel and end stop stroke, its guide rail lengths shall be such as would accommodate a further guided travel of at least 0,05 m.

5.2.6.2 When the balancing weight, if there is one, is at its highest position of travel, including over travel, its guide rail lengths shall be such as would accommodate a further guided travel of at least 0,05 m.

5.3 Safety gear and overspeed governor

5.3.1 Safety gear

5.3.1.1 General

The lifting platform carrier shall be provided with a safety gear. The safety gear shall operate in the downward direction to stop and sustain the carrier with the maximum static load as defined in Table 3. The safety gear is not required in case of lifting platform driven by:

- a) direct acting hydraulic jack (see 5.4.9.12);
- b) self-sustaining rotating screw or nut, together with a safety nut (see 5.4.6);
- c) screw and nut with an overspeed governor according to 5.3.2 or 5.4.6.1.5 and a brake system according to 5.4.2.2 or stopping safety device according to 5.4.6.1.3.

The safety gear shall be fitted on the carrier, except on lifting platforms driven by guided chain where the safety gear may be fitted remote from the carrier.

When the safety gear is applied, no decrease in the tension of any rope or chain or other mechanism used for applying the safety gear shall release the safety gear.

The safety gear shall be capable of stopping and sustaining the carrier, carrying its maximum static load, within a distance of 150 mm from where the safety gear is engaged by an actuation in accordance with 5.3.1.2.

The safety gear shall be designed to grip the guide rail, or equivalent element, securely.

Any shaft, jaw, wedge or support that forms part of the safety gear and that is stressed during its operation shall be made of metal.

The application of the safety gear shall not cause the floor of the carrier to change inclination by more than 5°.

On traction drive systems a safety gear which has the additional function of operating in upward direction shall be used in accordance with EN 81-20:2020, 5.6.2.1.1.1.

5.3.1.2 Actuation

The safety gear shall be mechanically tripped before the carrier exceeds a speed of 0,3 m/s by:

- a) an overspeed governor; or
- b) a safety rope which is independent of the means of suspension or by slackening or breaking of a suspension rope or chain on indirectly suspended hydraulic system, counterweight or balancing weight. The safety rope shall be in accordance with 5.3.2.2.

If the overspeed governor derives its drive from a main suspension chain, belt, rope or similar, the safety gear shall also be operated by a mechanism actuated by breaking or slackening of the means of suspension.

5.3.1.3 Release

When a safety gear has tripped its release and return of the lifting platform to normal operation, shall require the intervention of a competent person.

Release of the safety gear on the carrier, counterweight or balancing weight shall only be possible by moving the carrier, counterweight or balancing weight in the opposite direction of engagement.

5.3.1.4 Access for inspection

The safety gear shall be accessible for inspection and testing.

5.3.1.5 Electric checking

When the safety gear is engaged, an electric safety device conforming to 5.5.11 and activated by the safety gear shall immediately initiate stopping and shall prevent the starting of the machine.

5.3.2 Overspeed governor

5.3.2.1 General

Any traction drive to the overspeed governor shall be independent of the suspension means on traction system lifting platforms.

Overspeed governors using only traction to produce the tripping force shall have grooves which:

- a) have been submitted to an additional hardening process; or
- b) have an undercut in accordance with EN 81-50:2020, 5.11.2.3.1.

The direction of rotation, corresponding to the operation of the safety gear, shall be marked on the overspeed governor.

If the overspeed governor is adjustable, the final setting shall be sealed in such a way to prevent re-adjustment without breaking the seal.

The overspeed governor or another device shall, by means of an electric safety device in accordance with 5.5.11, initiate the stopping of the drive unit at the latest at the moment the tripping speed of the overspeed governor is reached.

If after release of the safety gear (see 5.3.1.3) the overspeed governor does not automatically reset itself, an electric safety device in accordance with 5.5.11 shall prevent the starting of the lifting platform while the overspeed governor is not in the working position.

The breakage or excessive rope stretch of the governor rope shall cause the machine to stop by means of an electric safety device in accordance with 5.5.11.

The tensile force in the overspeed governor rope produced by the governor, when tripped, shall be at least the greater of the following two values:

- twice that necessary to engage the safety gear; or
- 300 N.

In order to ensure tripping of the overspeed governor before a dangerous speed can be reached (see EN 81-50:2020, 5.3.2.3.1), the maximum distance between tripping points on the governor shall not exceed 250 mm related to the movement of the governor rope.

5.3.2.2 Overspeed governor rope, safety rope

The rope shall be a wire rope designed for that purpose.

The minimum breaking load of the rope shall be related by a safety factor of at least 8:

- a) to the tensile force produced in the rope of the overspeed governor or the safety rope when tripped taking into account a friction factor $\mu_{\max}$ equal to 0,2 for traction type overspeed governor;
- b) to the force required to operate the safety gear or clamping device for safety ropes.

The ratio between the pitch diameter of the pulleys for the overspeed governor rope and the nominal rope diameter shall be at least 25.

5.3.2.3 Accessibility

- a) The overspeed governor shall be accessible and reachable for inspection and maintenance;
- b) If located in the liftway the overspeed governor shall not be accessible to the user;
- c) If located in the liftway the overspeed governor shall be accessible and reachable from outside the liftway;
- d) The above requirement does not apply if the following three conditions are fulfilled:
 - 1) the tripping of the overspeed governor for test is effected by means of a remote control, except cableless, from outside the liftway whereby an involuntary tripping is not effected and the actuation device is not accessible to unauthorized persons; and
 - 2) the overspeed governor is accessible for inspection and maintenance from the carrier or from the pit; and
 - 3) the overspeed governor for the carrier, respectively the counterweight or balancing weight returns after tripping automatically into the normal position, as the carrier, respectively the counterweight or balancing weight is moved in the upward direction.

5.4 Driving units and drive systems

5.4.1 General requirements

5.4.1.1 Drive system

The selected drive system shall be in accordance with one of the systems specified in 5.4.4 to 5.4.11.

5.4.1.2 Direction of travel

All types of drive systems, except hydraulic, shall be powered in both directions of travel.

5.4.1.3 Geared drive units

Safety factors used in the design of geared drive units shall be maintained, even after taking full account of the effects of wear, calculated using the designed life of the lifting platform.

Unless forming an integral part of its shaft or driving unit every sheave, rope drum, spur gear, worm and worm wheel or brake drum or disk shall be fixed to its shaft or other driving unit by one of the following methods:

- a) sunk keys;
- b) splines;
- c) cross pinning;

Gearing shall be guarded using imperforate material.

5.4.1.4 Intermediate drives

If chain or belt intermediate drives are employed, then the following conditions shall be met:

- a) the output drive gearing shall be on the load side of the chain or belt intermediate drive and either;

b) the output drive gearing shall be self-sustaining;

or

c) the brake shall be on the load side of the chain or belt intermediate drive and a minimum of 2 belts or chains shall be used. The integrity of each chain or belt shall be monitored by an electric safety device in accordance with 5.5.11 that disconnects the supply to the motor and the brake in the event of breakage.

5.4.1.5 Protection for abnormal extension

Protection in the case of abnormal extension, slack rope or slack chain/toothed belt shall be provided as follows:

- a) In the case of two ropes or two chains/toothed belts suspension of the carrier an electric safety device in accordance with 5.5.11 shall cause the machine to stop in case of abnormal relative extension of one rope or chain/toothed belt;
- b) For positive drive lifts and hydraulic lifts, if the risk of slack rope (or chain/toothed belt) exists, an electric safety device in accordance with 5.5.11 shall cause the machine to stop when slack occurs.

After stopping, normal operation shall be prevented.

For hydraulic lifts with two or more jacks this requirement applies for each suspension set.

5.4.1.6 Protection for sheaves, pulleys and sprockets

For sheaves, pulleys, chain wheels, sprockets and overspeed governors, provisions shall be made to avoid:

- a) bodily injury;
- b) the ropes/ chains/ toothed belts leaving the pulleys/sprockets, if slack;
- c) the introduction of objects between ropes/ chains/ toothed belts and pulleys/sprockets.

The devices used shall be constructed so that the rotating parts are visible, and do not hinder examination and maintenance operation. If they are perforated the gaps shall comply with EN ISO 13857:2019, Table 4.

The dismantling of these devices shall be necessary only in the following cases:

- d) replacement of a rope/chains/toothed belts;
- e) replacement of a pulley/sprocket;
- f) re-cutting of the sheaves, pulleys or sprockets.

5.4.2 Braking system

5.4.2.1 General

An electro-mechanical friction brake shall be fitted (except on hydraulically driven lifting platforms which conform to 5.4.9) which operates automatically in the event of loss of:

- a) The power supply;
- b) The supply to the control circuits.

The brake shall be capable of bringing the carrier smoothly to rest and holding it firmly in position with maximum working load and capable of holding the carrier firmly with the maximum static load. The brake shall be mechanically applied and electrically held off. The brake shall not be released in normal operation unless the electric supply is simultaneously applied to the lifting platform motor. Band brakes shall not be used.

5.4.2.2 Electro-mechanical brake

5.4.2.2.1 General

Brake linings shall be of incombustible material and shall be so secured that normal wear will not weaken their fastenings. Residual magnetism shall not prevent the brake from being applied when the electric supplies to the driving motor and to the brake are interrupted.

5.4.2.2.2 All the mechanical components of the brake which take part in the application of the braking action on the drum or disk shall be installed in two sets. If one of the components is not working due to failure of a component a sufficient braking effort to slow down, stop and hold the carrier, travelling downwards at rated speed and with rated load and upward with empty carrier shall continue to be exercised.

Any solenoid plunger is considered to be a mechanical part, any solenoid coil is not.

5.4.2.2.3 In the case of self-sustaining drive systems, 5.4.2.2.2 may be omitted.

5.4.2.2.4 The release of the brake during emergency operation shall be:

- a) effected by hand with a mechanical auxilium (e.g. lever) requiring a constant effort to keep the brake held off; or
- b) electrically powered by an automatically rechargeable emergency supply.

5.4.2.2.5 In the case of traction drive, the brake manually released and the carrier loaded with:

- less than or equal to $(q-0,1) \cdot Q$
- or
- greater than or equal to $(q+0,1) \cdot Q$,

where:

q is the balance factor indicating the amount of counterbalance of the rated load by the counterweight, and

Q is the rated load,

it shall be possible to move the carrier to an adjacent floor by:

- a) either natural movement due to gravity; or
- b) manual operation consisting of:
 - 1) mechanical means, present on site, or
 - 2) electric means present on site, powered by supply independent from the mains.

5.4.2.2.6 The brake shoe or pad pressure shall be exerted by guided compression springs or weights.