

English Version

Safety requirements for lifting tables - Part 1: Lifting tables serving up to two fixed landings

Prescriptions de sécurité des tables élévatrices - Partie 1 :
Tables élévatrices desservant jusqu'à deux niveaux définis

Sicherheitsanforderungen an Hubtische - Teil 1: Hubtische,
die bis zu zwei feste Haltestellen anfahren

This European Standard was approved by CEN on 17 September 2011 and includes Amendment 1 approved by CEN on 11 August 2014.

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Foreword

This document (EN 1570-1:2011+A1:2014) has been prepared by Technical Committee CEN/TC 98 "Lifting tables", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by April 2015, and conflicting national standards shall be withdrawn at the latest by April 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document includes Amendment 1 approved by CEN on 11 August 2014.

This document supersedes A1 EN 1570-1:2011 A1.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

The revisions to the standard are based mainly on the following points:

- the incorporation of essential health and safety requirements of the relevant EU Directives;
- the elimination of obvious errors;
- the incorporation of proposals resulting from interpretation requests dealing with the improvement relative to the progress in technology;
- the improvement of references to other standards according to improvements in the field.

The revision of this standard is needed because of the change of the relevant scope and relationship of the machinery and lift Directives.

Part 1 of this standard deals with the protection at landings and safety requirements of lifting tables serving up to two fixed landings. Part 2 will deal with slow lifting tables serving more than 2 fixed landings for accessible only goods lifts and Part 3 will deal with slow lifting tables serving more than 2 fixed landings for operator carrying lifts.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This European Standard is a Type C standard as stated in EN ISO 12100.

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

As lifting tables are used in a wide range of applications it is also essential to make individual risk assessments in accordance with EN ISO 12100 for the actual operating conditions.

Products sold indirectly to end users should be made for all the risks, which are related to the use and conditions foreseen by the manufacturer, as described in the instruction manual.

While producing this standard, it was assumed that:

- only trained operators using the equipment in accordance with manufacturers instructions operate the lifting tables and that the working area is adequately lit;
- lifting tables are operating on substantially firm, smooth, even and prepared surfaces. It is not necessary to consider centrifugal forces specifically as the current requirements consider all lateral forces;
- where there is a special requirement for a low noise level, e.g. hospital applications, theatre applications etc. this will be specified by the customer and appropriate measures taken by the manufacturer.

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.

1 Scope

1.1 This European Standard specifies the safety requirements for industrial lifting tables for raising and/or lowering goods and the operator(s):

- where the lifting table does not pass a fixed landing;
- serving not more than 2 fixed landings.

1.2 This European Standard deals with all significant hazards pertinent to lifting tables when they are used as intended by the operating instructions and under the conditions foreseen (including foreseeable misuse) with the operating instructions (see Clause 4). This European Standard specifies the appropriate technical measures to eliminate or reduce the risks arising from the significant hazards.

1.3 Both power operated and manually operated lifting tables are included whether stationary or mobile.

1.4 This European Standard does **not** apply to the following equipment:

- lifting tables, serving more than 2 fixed landings of a building, for lifting goods with a vertical travel speed not exceeding 0,15 m/s (EN 1570-2);
- lifting tables, serving more than 2 fixed landings of a building for lifting operators, with a vertical travel speed not exceeding 0,15 m/s (EN 1570-3);
- lifting tables carrying operators and installed in full enclosures (EN 1570-3);
- permanently and temporarily installed lifting tables, serving specific levels of a building for lifting operators, with a vertical travel speed exceeding 0,15 m/s (EN 81-1 and EN 81-2);
- lifting tables with flat or toothed belts lifting systems for the carrying of operators;
- lifting tables whose vertical travel speed exceeds 0,15 m/s (unless safe by position and non person carrying);
- power operated lifting platforms for persons with impaired mobility (EN 81-41);
- mobile lifting tables for airport ground support equipment (EN 1915-2 and EN 12312-1);
- lifting tables which are designed as part of a lift according to Directive (95/16/EC);
- lifting tables used on ships;
- mobile elevating work platforms (EN 280);
- static elevating work platforms;
- vehicle lifts for maintenance (EN 1493);
- mobile lifting tables used for fire fighting (EN 1777);
- mobile lifting tables used as fork lift trucks and order pickers;
- mobile lifting tables with a horizontal travelling speed of more than 1,6 m/s;
- rail dependent storage and retrieval equipment (EN 528);

- theatre stage lifts intended to move performers;
- scissor lift pallet trucks (EN ISO 3691-5);
- suspended lifting tables;
- lifting tables operated by pushing chains.

1.5 This standard does not establish the additional requirements for:

- electromagnetic compatibility;
- operation in severe conditions (e.g. extreme climates, freezer applications, strong magnetic fields);
- operation subject to special rules (e.g. potentially explosive atmospheres, mines);
- handling of loads, the nature of which could lead to dangerous situations (e.g. molten metal, acids, radiating materials, especially brittle loads);
- hazards occurring during construction, transportation and disposal;
- equipment installed on the load platform or replacing it;
- integration into systems or other machines, control from more than two control stations, etc.;
- cable-less controls;
- lifting tables where the hydraulic pressure is derived directly from gas pressure;
- the power supply to the lifting table by internal combustion engine.

2 Normative references

The following referenced documents are indispensable for the application 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 1088:1995+A2:2008, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*

EN 13241-1:2003+A1:2011, *Industrial, commercial and garage doors and gates — Product standard — Part 1: Products without fire resistance or smoke control characteristics*

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

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

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

EN 60947-5-3, *Low-voltage switchgear and control gear — Part 5-3: Control circuit devices and switching elements — Requirements for proximity devices with defined behaviour under fault conditions (PDF) (IEC 60947-5-3:1999)*

EN 61310-1, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals (IEC 61310-1:2007)*

EN 61310-2, *Safety of machinery — Indication, marking and actuation — Part 2: Requirements for marking (IEC 61310-2:2007)*

EN 61310-3, *Safety of machinery — Indication, marking and actuation — Part 3: Requirements for the location and operation of actuators (IEC 61310-3:2007)*

EN 61496-1, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests (IEC 61496-1:2004, modified)*

CLC/TS 61496-2:2006, *Safety of machinery — Electro-sensitive protective equipment — Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs) (IEC 61496-2:2006)*

EN ISO 4413, *Hydraulic fluid power — General rules and safety requirements for systems and their components (ISO 4413:2010)*

EN ISO 4414, *Pneumatic fluid power — General rules and safety requirements for systems and their components (ISO 4414:2010)*

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

EN ISO 13849-1:2008, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)*

EN ISO 13850:2008, *Safety of machinery — Emergency stop — Principles for design (ISO 13850:2006)*

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

EN ISO 14122-3:2001, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails (ISO 14122-3:2001)*

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

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

ISO 4301-1, *Cranes and lifting appliances — Classification — Part 1: General*

ISO 4308-1, *Cranes and lifting appliances — Selection of wire ropes — Part 1: General*

ISO 4308-2, *Cranes and lifting appliances — Selection of wire ropes — Part 2: Mobile cranes — Coefficient of utilization*

ISO 11228-1, *Ergonomics — Manual handling — Part 1: Lifting and carrying*

ISO 11228-2, *Ergonomics — Manual handling — Part 2: Pushing and pulling*

3 Terms and definitions

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

3.1**lifting table**

load lifting device with a load supporting platform rigidly guided throughout its travel (e.g. guided by its own mechanism)

3.2**fixed lifting table**

lifting table where the place of installation is not intended by the manufacturer to be changed

3.3**movable lifting table**

lifting table installed so that the place of installation may be readily changed

3.4**mobile lifting table**

lifting table which is mobile by one or more integrated devices (e.g. wheels, air cushions etc.)

3.5**guided mobile lifting table**

lifting table which runs on a pre-set route, (e.g. on rails, in tracks etc.)

3.6**self-propelled lifting table**

lifting table, other than vehicle mounted, which is capable of horizontal movement under its own power

3.7**automatic programme controlled lifting table**

lifting table designed for the lifting of goods only where movement takes place that is not initiated by hold-to-run manual controls (e.g. self levelling, etc.)

3.8**platform**

part of the lifting table (including connecting/bridging plate) designed to accommodate the working load and/or persons; fork arms are considered as a load platform for goods only

3.9**vertical travel**

vertical distance between the highest and the lowest working position for which the lifting table is designed

3.10**rated load**

load that the manufacturer has guaranteed that the machine will lift when used in accordance with the instruction handbook

3.11**guard**

part of the machine specifically used to provide protection by means of a physical barrier

3.12**safe by position**

condition when a lifting table or part of a lifting table is sufficiently shielded from access to avoid any hazard to persons or goods

3.13**emergency stop control**

component of emergency stop equipment which generates the emergency stop signal when the associated manual control (actuator) is operated

3.14

operator carrying lift table

lifting table whose platform is entered by operator(s) for the purpose of loading or unloading or on which an operator may travel and is provided with controls on the platform

3.15

maximum working pressure

highest pressure in the hydraulic or pneumatic system or part of system at which it is intended to operate under normal working conditions with rated load

3.16

operator

person who is trained to operate the lifting table safely according to the manufacturer's instructions

3.17

remote control

cable-connected control that is not situated on the platform of the lifting table

3.18

restricted area

area to which access is restricted only to persons who are authorized to be in that area and not accessible to the general public

3.19

travel zone

space through which the lifting mechanism and load, platform and any attachment to it moves

3.20

public areas

areas to which the public have access

3.21

hinged connecting plate

plate mounted to the edge of the platform by a hinge to connect the platform to a landing

3.22

unassisted hinged connecting plate

hinged connecting plate that is entirely manually operated

3.23

assisted hinged connecting plate

hinged connecting plate that is counterbalanced by spring force or weights to reduce the manual effort of operating the plate

3.24

power actuated hinged connecting plate

hinged connecting plate that requires no manual effort to operate

3.25

split hinged connecting plate

hinged connecting plate that is divided into two or more sections

3.26

full enclosure

where the whole of the travel zone of the lifting table is protected with rigid panels to make the lifting table inaccessible whilst in operation

4 List of hazards

The list of hazards according to the following table is based on EN ISO 12100.

The table has been formulated to show the hazards, hazardous situations and hazardous events which have been identified by risk assessment to be relevant for this type of machinery and which require action to eliminate or reduce risk.

Table 1a — List of hazards

No.	Type group or	Examples of hazards		Clause number in this standard
		Origin ^a	Potential consequences ^b	
1	Mechanical hazards	Acceleration, deceleration (kinetic energy)	Being run over Being thrown	5.1.2.6, 5.1.2.7, 5.3.2,
		Angular parts	Crushing	5.2.1, 5.2.5, 5.2.10.1
		Approach of a moving element to a fixed part	Cutting or severing Drawing-in or trapping Entanglement	5.2.1, 5.2.2.2.3, 5.2.2.3.1, 5.2.2.5, $\overline{A_1}$ 5.2.3/5.2.4/5.2.5 $\overline{A_1}$, 5.2.10.3, 5.2.10.6
		Cutting parts	Friction or abrasion	5.2.5
		Elastic elements	Impact	5.9.7, 7.2.6
		Falling objects	Injection	5.2.9, 5.2.10.11, 5.2.12, 5.4.2
		Gravity (stored energy)	Shearing	5.1.2.7
		Height from the ground	Slipping, tripping and falling	5.2.9, $\overline{A_1}$ 5.2.11/5.2.12 $\overline{A_1}$
		High pressure	Stabbing or puncture Suffocation	$\overline{A_1}$ 5.8.2/5.8.3 $\overline{A_1}$, 5.8.4.1, 5.8.8, $\overline{A_1}$ 5.9.3/5.9.4/5.9.5/5.9.6/5.9.7/5.9.9 $\overline{A_1}$, 7.3.5, 7.5.7
		Machinery mobility		5.3.2, 5.5.1, 5.6
		Moving elements		$\overline{A_1}$ 5.2.2.2/5.2.2.3/5.2.2.4/5.2.2.5/5.2.2.6 $\overline{A_1}$, $\overline{A_1}$ 5.2.5/5.2.6/5.2.7 $\overline{A_1}$, 5.6
		Rotating elements		5.2.11, 5.2.12.2, $\overline{A_1}$ 5.2.13.3/5.2.13.4 $\overline{A_1}$, 5.3.3, 5.4.4
		Rough, slippery surface		5.2.5, 5.4.1, 5.4.4
		Sharp edges		5.2.5, 5.2.10.13, 5.7.5.4, D.4 d)
Stability		5.1.3, 6.2		
Vacuum		Not applicable		
2	Electrical hazards	Arc	Burn	Not applicable
		Electromagnetic phenomena	Chemical effects	5.10.2
		Electrostatic phenomena	Effects on medical implants	5.10.2

		Live parts	Electrocution	5.10.2, 6.6, 7.3.6
		Not enough distance to live parts under high voltage	Falling, being thrown	5.10.2
		Overload	Fire	5.7.2.2, 5.7.3.2, 5.7.4.2, 5.7.5.6, 5.7.6.5
		Parts which have become live under fault conditions	Projection of molten particles	Ⓐ 5.10.1/5.10.2 Ⓐ
		Short-circuit	Shock	Ⓐ 5.10.1/5.10.2 Ⓐ
		Thermal radiation		5.2.14
3	Thermal hazards	Explosion	Burn	Not applicable
		Flame	Dehydration	Not applicable
		Objects or materials with a high or low temperature	Discomfort	5.2.14, 5.9.12
		Radiation from heat sources	Frostbite	Not applicable
			Injuries by the radiation of heat sources	
			Scald	
4	Noise hazards	Cavitation phenomena	Discomfort	Not applicable
		Exhausting system	Loss of awareness	Not applicable
		Gas leaking at high speed	Loss of balance	Not applicable
		Manufacturing process (stamping, cutting, etc.)	Permanent hearing loss	7.4.2.3, Annex B
		Moving parts	Stress	7.4.2.3
		Scraping surfaces	Tinnitus	
		Unbalanced rotating parts	Tiredness	
			Any other (e.g. mechanical, electrical) as a consequence of an interference with speech communication or with acoustic signals	Not applicable
		Whistling pneumatics		Not applicable
		Worn parts		Not applicable
5	Vibration hazards	Cavitation phenomena	Discomfort	Not applicable
		Misalignment of moving parts	Low-back morbidity	Not applicable
			Neurological disorder	
		Mobile equipment	Osteo-articular disorder	Not applicable
		Scraping surfaces	Trauma of the spine	Not applicable
		Unbalanced rotating parts	Vascular disorder	Not applicable

		Vibrating equipment		Not applicable
		Worn parts		Not applicable
6	Radiation hazards	Ionising radiation source	Burn	Not applicable
		Low frequency electromagnetic radiation	Damage to eyes and skin	
		Optical radiation (infrared, visible and ultraviolet), including laser	Effects on reproductive capability Genetic mutation	Not applicable
		Radio frequency electromagnetic radiation	Headache, insomnia, etc.	Not applicable
7	Material substance hazards /	Aerosol	Breathing difficulties, suffocation	Not applicable
		Biological and microbiological (viral or bacterial) agent	Cancer	Not applicable
		Combustible	Corrosion	Not applicable
		Dust	Effects on reproductive capability	Not applicable
		Explosive	Explosion	Not applicable
		Fibre	Fire	Not applicable
		Flammable	Infection	
		Fluid	Mutation	7.5.4/7.5.6
		Fume	Poisoning	Not applicable
		Gas	Sensitization	Not applicable
		Mist		Not applicable
		Oxidizer		Not applicable
8	Ergonomic hazards	Access	Discomfort	5.2.15
		Design or location of indicators and visual displays units	Fatigue	5.8.4.2
		Design, location or identification of control devices	Musculoskeletal disorder	
		Effort	Stress	Annex D, 5.2.12.1, 5.2.12.4, 5.5.1, 5.5.6, 5.7.7.1, 7.4.2.14
		Flicker, dazzling, shadow, stroboscopic effect	Any other (e.g. mechanical, electrical) as a consequence of human error	5.2.11 d), 5.6.4, 5.6.12, 5.8.11
		Local lighting		Not applicable
		Mental overload/underload		Introduction
		Posture		
		Repetitive activity		5.6.4, 5.6.11, 5.8.11
		Visibility		7.1, Table 3, 5.2.2.2.4, 5.2.2.5, 5.2.12.1, 5.5.1, 7.4.2.14

9	Hazards associated with environment in which the machine is used	Dust and fog	Burn	Not applicable	
		Electromagnetic disturbance	Slight disease		
		Lightning	Slipping, falling	Not applicable	
		Moisture	Suffocation	Not applicable	
		Pollution	Any other as a consequence of the effect caused by the sources of the hazards on the machine or parts of the machine	5.8.5, 7.5.6	
		Snow		Not applicable	
		Temperature		5.9.12, E.1.2, 5.2.14	
		Water		Not applicable	
		Wind		5.1.2.3	
		Lack of oxygen		Not applicable	
10	Combination of hazards	e.g. repetitive activity + effort + high environmental temperature		e.g. dehydration, loss of awareness, heat stroke	Not applicable

Examples of hazards according to EN ISO 12100:2010, A.1:

a One origin of hazards can have several potential consequences.

b For each type or group of hazards, some potential consequences can be related with several origins of hazards.

Table 1b — Examples of hazardous situations according to EN ISO 12100:2010, A.3

Phases of machine life cycle	Examples of tasks	Clause in this standard
Transport	Lifting	7.3.4
	Loading	7.3.7
	Packing	7.4.1
	Transportation	7.4.1.3
	Unloading	7.4.2.1
	Unpacking	7.4.2.1
Assembly and installation Commissioning	Adjustments of the machine and its components	7.4.2
	Assembly of the machine	7.4.2.1
	Connecting to disposal system (e.g. exhaust system, waste water installation)	Not applicable
	Connecting to power supply (e.g. electric power supply, compressed air)	7.3.6, 7.5.11
	Demonstration	
	Feeding, filling, loading of ancillary fluids (e.g. lubricant, grease, glue)	7.5.9
	Fencing	Not applicable

	Fixing, anchoring	7.4.2.6
	Preparations for the installation (e.g. foundations, vibration isolators)	E.1.2, 7.4.2.1
	Running the machine without load	Annex C
	Testing Trials with load or maximum load	Annex C
Setting Teaching/programming and/or process changeover	Adjustment and setting of protective devices and other components	Annex C
	Adjustment and setting or verification of functional parameters of the machine (e.g. speed, pressure, force, travelling limits)	Annex C
	Clamping/fastening the work piece	
	Feeding, filling, loading of raw material	
	Functional test, trials	Annex C
	Mounting or changing tools, tool-setting	Not applicable
	Programming verification	Annex C
	Verification of the final product	Clause 6
	Operation	Clamping/fastening the work piece
Control/inspection		5.5.4
Driving the machine		5.5.4
Feeding, filling, loading of raw material		Not applicable
Manual loading/unloading		Annex C
Minor adjustments and setting of functional parameters of the machine (e.g. speed, pressure, force, travel limits)		Annex C
Minor interventions during operation (e.g. removing waste material, eliminating jams, local cleaning)		Not applicable
Operating manual controls		Annex D
Restarting the machine after stopping / interruption		5.5.3
Supervision		7.4.1
Verification of the final product		6.7
Cleaning Maintenance	Adjustments	7.4.1
	Cleaning, disinfection	7.4.1
	Dismantling/removal of parts, components, devices of the machine	7.5
	Housekeeping	7.5
	Isolation and energy dissipation	
	Lubrication	7.5.9
	Replacement of tools	Not applicable
	Replacement of worn parts	7.5
	Resetting	7.5.8

	Restoring fluid levels	7.5, 7.5.5, 5.8.9
	Verification of parts, components, devices of the machine	7.5.8

Table 1c — Examples of hazardous events according to EN ISO 12100:2010, A.4

Origin related to	Hazardous event	Clause in this standard
Shape and/or superficial finishing of accessible parts of the machine	Contact with rough surfaces	5.2.5
	Contact with sharp edges and corners, protruding parts	5.2.5
Moving parts of the machine	Contact with moving parts	5.2.1, 5.2.2.2.3, 5.2.2.3.1, 5.2.2.5, A1 5.2/5.2.4/5.2.5/5.2.6 A1 , 5.2.10.3, 5.2.10.6
	Contact with rotating open ends	
Kinetic energy and/or potential energy (gravity) of the machine, parts of the machine, tools and materials used, processed, handled	Falling or ejection of objects	5.3, 5.4.2
Stability of the machine and/or parts of the machine	Loss of stability	6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 5.1.2.7, 5.1.3, 5.1.3.4
Mechanical strength of parts of the machine, tools etc.	Break-up during operation	5.1.2
Pneumatic, hydraulic equipment	Displacement of moving elements	
	Projection of high pressure fluids	A1 5.8.1/5.8.2/5.8.3/5.8.4 A1 , 7.5.6
	Uncontrolled movements	5.6.3, 5.8.10, 5.9.11
Electrical equipment	Direct contact	A1 5.10.1/5.10.2 A1
	Disruptive discharge	
	Electric arc	Not applicable
	Fire	Not applicable
	Indirect contact	A1 5.10.1/5.10.2 A1
	Short-circuit	A1 5.10.1/5.10.2 A1
Control system	Dropping or ejection of a moving part of the machine or of a work piece clamped by the machine	Not applicable
	Failure to stop moving parts	5.5.5, 5.6.2, 5.6.8, A1 5.7.8.1/5.7.8.2/5.7.8.4 A1 , 5.8.8, 5.9.9, 5.11.2, A1 7.4.1.6 A1
	Machine action resulting from inhibition (defeating or failure) of protective devices	
	Uncontrolled movements (including speed change)	5.6.3, 5.8.10, 5.9.11
	Unintended/unexpected start-up	5.2.11

	Other hazardous events due to failure(s) or poor design of the control system	5.2.12.1, $\overline{A_1}$ 5.2.12.4 g), 5.2.13.3 c), 5.2.13.4 c) $\overline{A_1}$, 5.2.17, 5.3.2, 5.5.1
Materials and substances or with physical factors (temperature, noise, vibration, radiation and environment)	Contact with objects with high or low temperature	5.2.14, 5.9.12
	Emission of a substance that can be hazardous	$\overline{A_1}$ 5.8.2/5.8.3 $\overline{A_1}$, 7.5.6
	Emission of a level of noise that can be hazardous	Annex B
	Emission of a level of noise that can interfere with a speech communication or with acoustic signals	Annex B
	Emission of a level of vibration that can be hazardous	Not applicable
	Emission of radiation fields that can be hazardous	Not applicable
	Harsh environmental conditions	Not applicable (see Clause 1)
Workstation and/or work process design	Excessive effort	$\overline{A_1}$ 5.2.11 d) $\overline{A_1}$, 5.6.4, 5.6.12, $\overline{A_1}$ 5.8.11/5.8.12 $\overline{A_1}$
	Human errors / misbehaviour (unintentional and/or deliberately induced by the design)	$\overline{A_1}$ 5.5.2/5.5.3/5.5.4/5.5.5/5.5.6 $\overline{A_1}$, 5.7.7, Clause 7
	Loss of direct visibility of the working area	Not applicable
	Painful and tiring postures	5.6.12, 5.6.4, $\overline{A_1}$ 5.8.11/5.8.12 $\overline{A_1}$
	Repetitive handling at high frequency	Not applicable

5 Safety requirements and/or protective measures

5.1 General

5.1.1 Introduction

Machinery 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 for relevant but not significant hazards, which are not dealt with by this standard.

5.1.2 Calculations

Calculations for stress shall meet the following requirements:

5.1.2.1 The lifting table shall be designed in accordance with usual calculation codes and good engineering practice and all failure modes of the material shall be considered including fatigue failure.

5.1.2.2 The stresses in any part of the lifting table using the permissible stress method, under normal working conditions, shall not exceed the lower of the following unless stated otherwise:

a) 0,66 times the yield stress of the material used or

b) 0,5 times the ultimate tensile stress of the material used.

5.1.2.3 The stresses shall be calculated for the condition of the lifting table carrying its rated load and being used in accordance with the manufacturer's instructions.

The loads shall include all actual static and dynamic forces both vertical and horizontal, all wind forces, and all forces applied to the platform during loading and unloading.

5.1.2.4 The minimum dynamic forces to be used for the calculations of 5.1.2.3 shall result from

- the total vertical load (this includes the rated load and the self weight of the moving parts of the structure) increased by the dynamic factor for the category of lift shown in Table 2 and
- the horizontal load coefficient for the category of lift shown in Table 2 taken as acting horizontally at the platform level, in the direction causing the maximum stress in the part being considered.

NOTE 1 If barriers prevent loading or unloading across a side, or other means prevent movement of the platform in a particular direction, the horizontal load coefficient in this direction need not be considered.

Table 2 — Load factors for lifting tables

Lift category	Dynamic factor	Horizontal load coefficient [in % of the rated load]	Lifetime ^b minimum load cycles under full load [x10 ³]	Examples of use (informative)
1	1,4	10 %	128 ^a	Lifting tables for general purpose.
2	1,1	2,5 %	8	Lifting tables with a clearly defined lifting load and where other forces can be excluded; height adjustment without systematic lateral forces.
3	1,2	5,0 %	32	Lifting tables suited for the use of manual work; e.g. adjustable height work station.
4	1,3	10 %	128	Lifting tables suited for crossing with, e.g. manually operated industrial trucks, electric pallet-stacking trucks with a maximum braking of 10 %. Lifting tables with mounted gravity conveyors.
5	1,4	10 %	512	Lifting tables suited for a high number of cycles

When a lifting table is crossed by vehicles, or is integrated in a handling device, the lateral forces have to be verified in individual cases. Higher horizontal load coefficients have to be established if required.

^a This minimum number of cycles shall be increased by the manufacturer according to the purpose of use of the lifting table.

^b When used (load cycle) according to lifting categories lifetime of lifting tables is generally 10 years when maintained in accordance with the manufacturers instructions.

NOTE 2 If barriers prevent loading or unloading across a side, or other means prevent movement of the platform in a particular direction, the horizontal load coefficient in this direction need not be considered.

5.1.2.5 If operators are to be carried on the platform, their load shall be taken as 80 kg, concentrated in an area of 0,2 m by 0,2 m for each operator, spaced apart at 0,5 m centre to centre and placed in the most unfavourable position on the platform for stress calculations.

5.1.2.6 It shall be possible for the forces produced when the safety device is operated, to be accepted without permanent deformation of the normal load bearing parts, when used in accordance with the manufacturer's instructions.

5.1.2.7 Platform deflection

5.1.2.7.1 When the lifting table is not designed for a specific loading, it shall be designed to meet the following requirements:

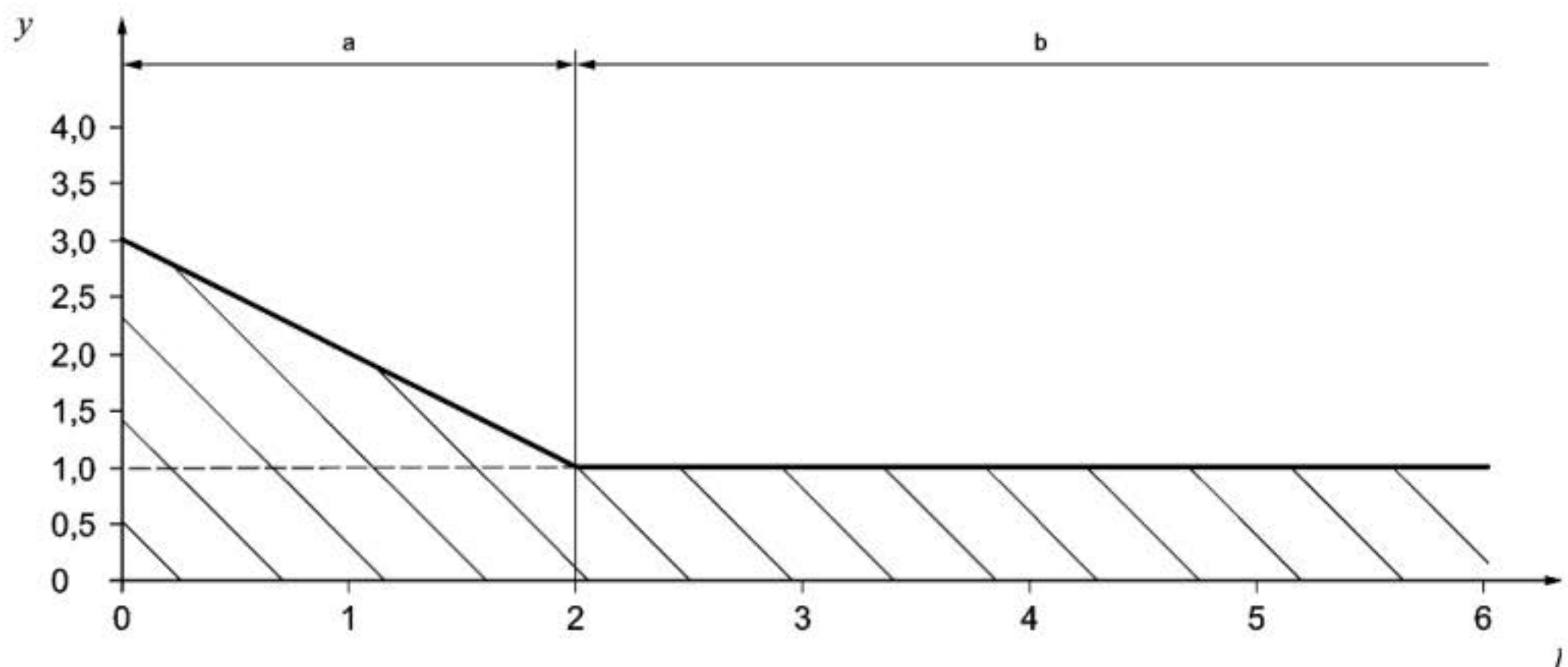
- in one case lift half the rated load distributed over half the length or longest side of the platform;
- and in another case lift one third of the rated load distributed over half the width or shortest side of the platform.

In neither case shall hazardous tilting or deflection take place when used as intended by the manufacturer. The maximum tilting or deflection shall not exceed that shown in Figure 1 where;

a) is the maximum tilting or deflection (y) of any side up to 2,0m (l) long and is $y = 1 + (2 - l) \%$

b) is the maximum tilting or deflection (y) of any side above 2,0m (l) long and is $y = 1,0 \%$

Dimensions in metres



Key

- y percentage tilting or deflection of a side l
- l length of the side of a lifting table platform (in metres)
- a maximum tilting or deflection of any side up to 2,0 m
- b maximum tilting or deflection of any side above 2,0 m

Figure 1 — Deflection of platform

5.1.2.7.2 When the lifting table is designed for a known specific loading, there shall be a sign or instruction on the lifting table, clearly readable from the control position, indicating the safe intended load distribution.

5.1.3 Stability

5.1.3.1 Lifting tables shall be stable (i.e. will not overturn) in all conditions of the platform or table, whether stationary or moving.

The calculated factor of safety shall not be less than 1,3. This shall be calculated by dividing the sum of all the stabilizing moments by the sum of all the overturning moments including the relevant horizontal load coefficient as defined in 5.1.2.4. The overturning moments are to include all dynamic forces and all externally imposed forces including those caused by transfer on and off the platform and those caused by operators. For this calculation the rated load shall be evenly distributed over an area half the length times half the width of the platform, in any overturning position.

5.1.3.2 Where operators are to be carried on the platform, the worst overturning movement of these persons shall be taken into account in these calculations. Manual forces applied by operators on the platform shall be multiplied by a factor of 1,1 and taken to be acting in the direction creating the greater overturning moment.

5.1.3.3 If the lifting table is capable of tilting, the worst overturning position shall include the maximum tilt.

5.1.3.4 In the case of mobile lifting tables, it shall be assumed that they are raising and lowering on a slope of 2,5 % (1 in 40) in the worst direction for stability.

5.1.3.5 For these calculations it shall be assumed that outriggers or stabilizers are correctly set.

5.2 Safeguarding

5.2.1 Crushing and shearing

Generally crushing and shearing shall be avoided by the following minimum gaps between moving parts and between moving and fixed parts which are in reach of persons (see EN ISO 13857) on the platform or standing adjacent to the travel zone:

- for fingers, 25 mm;
- for toes, 50 mm;
- for hands, 100 mm;
- for arms and closed hands, 120 mm;
- for feet, 120 mm;
- for the body, 500 mm.

5.2.2 Protection for the travel zone

5.2.2.1 General

As an alternative to minimum gaps defined in 5.2.1, the travel zone below the platform may be protected by the following measures which are summarised in Table 3.

These are minimum measures and should not be considered as the only method of protection, alternative methods offering an equivalent or higher level of safety may be used.

Table 3 — Lift installation safeguard requirement

Ⓐ₁ Group Ⓐ₁	G1	G2	G3	G4	G5	G6	G7	G8
One fixed landing above the lowest landing	No	No	Yes	Yes	No	Yes	Yes	No impact
Restricted area	No	Yes	Yes	No impact	No impact	Yes	Yes	No
Operator has a clear view of the whole of the travel zone from remote position	No	Yes	No	No	No	Yes	No	No
Operator carrying and controls on the platform (no clear view)	No	No	No impact	No impact	No impact	No	No impact	No impact
More than 500 mm travel	Ⓐ₁ No impact Ⓐ₁	No impact	No	No impact	No impact	Not relevant	Not relevant	Not relevant
More than 1,6 m travel	No impact	No impact	Not relevant	No	No	No	Yes	Yes
Automatic	No impact	No	No	No	No	No	No	No
Relevant clause to meet minimum requirement ^a	5.2.2.2	5.2.2.5 ^a	5.2.2.5	5.2.2.6	5.2.2.6	5.2.2.5 ^a	5.2.2.6 or 5.2.2.3 or 5.2.2.2 ^b	5.2.2.2 ^b or (5.2.2.6 and 5.2.2.3)

^a Where there is a danger of falling into a pit more than 500 mm deep, barriers shall be provided to protect against falling.

^b Operator carrying lifts in full enclosures are not covered by this standard (see EN 1570-3).

5.2.2.2 Screens

5.2.2.2.1 Screens that protect the travel zone of the lifting table shall make it inaccessible whilst in operation.

5.2.2.2.2 Panels to provide access to the travel zone for maintenance purposes shall:

- either be interlocked to prevent operation of the lifting table unless closed and locked; or
- shall be opened only with a dedicated tool.

When it is foreseen (e.g. maintenance) that fixed panels will be removed regularly then the fastenings shall remain attached to the panel or to the lifting table.

5.2.2.2.3 Any screen shall:

- be imperforate, unless in zones not accessible to the public;
- meet the requirements of EN ISO 13857; and

- be positioned so that the maximum horizontal distance between the screen and any part of the moving load carrying platform shall not exceed 120 mm for tables whose upper fixed landing is more than 1,6 m above the lower landing.

NOTE If the lifting table is in an area enclosed by rigid screen guards and access is prevented during the operation (e.g. fully automatic systems, with robots), then no other protection is required.

5.2.2.2.4 Lifting tables that serve fixed landing above 1,6 m above the lowest landing in restricted areas may be provided with screen guarding in accordance with EN ISO 13857 to protect the travel zone.

Where the operator has a clear view of all of the travel zone from a remote control i.e. not operator carrying, then the requirements of 5.2.2.4 are sufficient protection.

5.2.2.2.5 Lifting tables that serve fixed landings above 1,6 m above the lowest landing in public areas shall be provided with imperforate screen guarding in accordance with EN ISO 13857 to protect the travel zone.

NOTE Operator carrying lifts in full enclosures are not covered by this standard (see EN 1570-3).

5.2.2.3 Travel zone protection barriers

5.2.2.3.1 Where lifting tables serve fixed landings above 1,6 m above the lowest landing, unless provided with screen guarding in accordance with 5.2.2.2.4, or flexible guarding in accordance with 5.2.2.6, guard rails in accordance with 5.2.10, 5.2.12 and 5.2.12.7 shall be provided at the lowest landing.

A trip device complying with 5.2.2.5 shall be fitted to the underside of the load carrying platform.

The maximum horizontal distance between the barrier and any part of the moving load carrying platform shall not exceed 120 mm.

5.2.2.3.2 Guard rails to protect against falling shall meet the requirements of 5.2.10, 5.2.11, 5.2.12 and 5.2.12.7.

5.2.2.3.3 When it is foreseen (e.g. maintenance) that fixed guard rails will be removed regularly then the fastenings shall remain attached to the guard rail or to the lifting table.

5.2.2.4 **Deflectors**

Where moving parts of the lifting table pass fixed parts with unguarded projections within the minimum gaps required in 5.2.1 those projections shall be protected by deflectors at an angle no greater than thirty degrees to the vertical and provide 100 mm gap for hands as a minimum.

5.2.2.5 **Trip device**

Where trip devices are fitted to the outer edges of the underside of the platform the trip device, if mechanically actuated, shall comply with PL c of EN ISO 13849-1. The trip device, if non-mechanically actuated, shall comply with EN 61496-1 and category 2 of CLC/TS 61496-2:2006.

It is necessary only to maintain clearance of 25 mm (for fingers) between elements of the platform and the lifting mechanism within the area protected by the device.

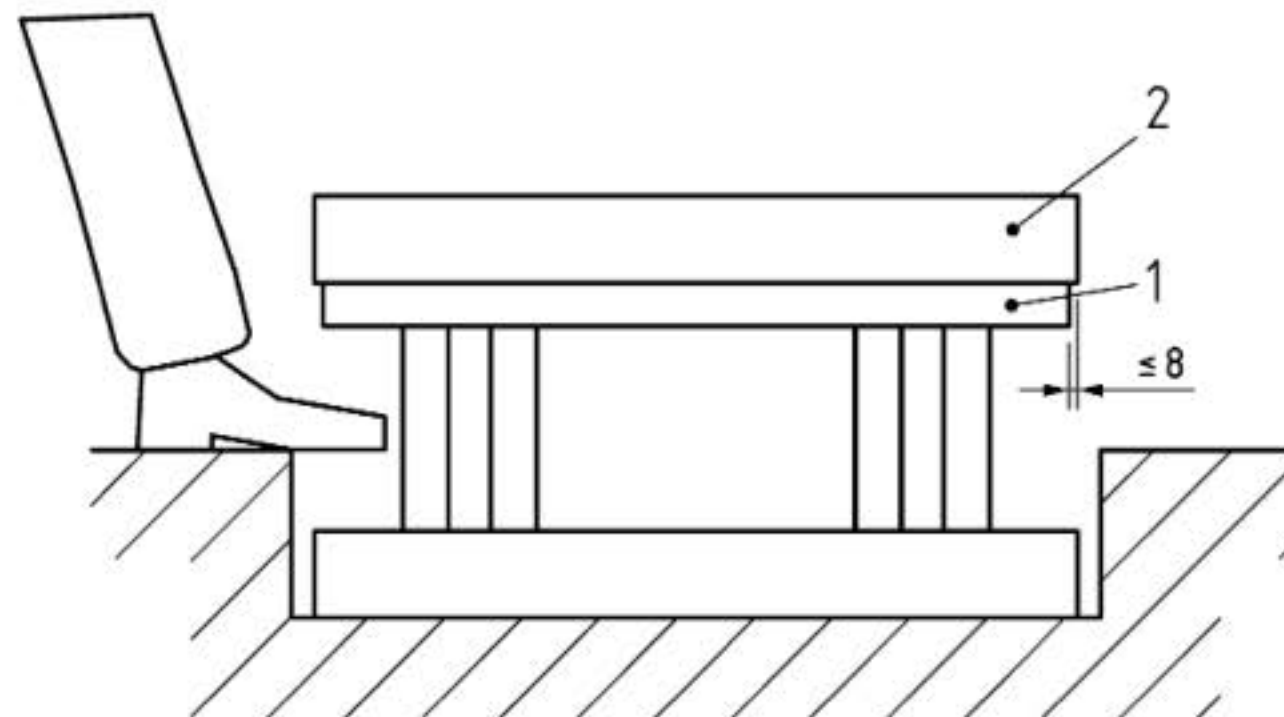
The outer surface of the device shall not be more than 8 mm from the outer edge of the platform as shown in Figure 2.

The device shall operate so that the moving part causing the hazard comes to a stop before injury is caused. It shall not create another hazard.

The trip device when operated shall stop all movements of the platform downwards and hold it stopped until the down control has been released, the obstruction removed, the device reset (either manually or automatically) and the down control re-operated.

Lifting tables that do not serve a fixed landing higher than 1,6 m above the lowest landing, are not operator carrying and where the operator has a clear view of the whole of the travel of the lift then the trip device is sufficient protection.

Dimensions in millimetres



Key

- 1 trip device
- 2 lifting table platform

Figure 2 — Arrangement of mechanically actuated trip device

5.2.2.6 Flexible guards

5.2.2.6.1 Unless provided with either

- screen guarding in accordance with 5.2.2.2.4; or
- lift way protection barriers in accordance with 5.2.2.3.

The travel zone below the platform shall be protected from access by rigid or flexible guards e.g. roller blinds or concertina bellows that expand and contract as the platform moves.

Where flexible guards are fitted, either a trip device complying with 5.2.2.5 shall be fitted or minimum gaps as defined in 5.2.3 and 5.2.4 shall be met.

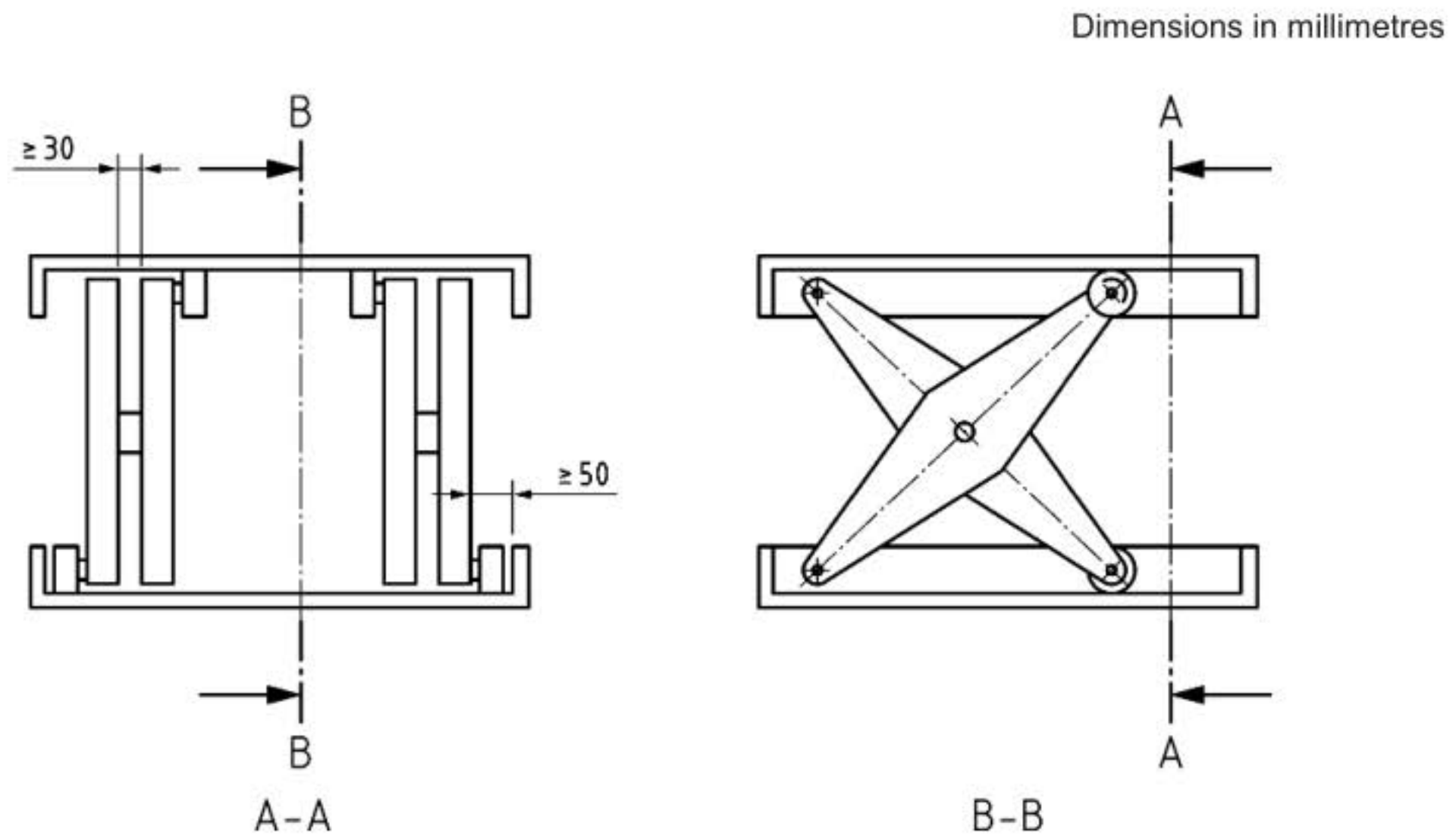


5.2.2.6.2 ^{A1} Any gaps between adjacent sections of flexible guards shall not exceed 100 mm.

5.2.3 Gaps between lifting table arms and between arms and base

In scissor type lifting tables, the minimum safety gaps between the scissor legs shall be not less than 30 mm and the distance between scissor leg and the inside of the base-frame member shall not be less than 50 mm, unless rigid or flexible protection is fitted (see Figure 3).

For lifting tables whose lowered height is less than 100 mm and platform dimensions less than 2 m x 1,5 m, the requirement for safeguarding the pinching and shearing points between platform and floor is also satisfied, providing the lowering of the platform is performed using a hold-to-run control which is connected to the lifting table in a way that the hazard zone can be observed totally each time.



- Key**
- A-A section through end of lifting table
 - B-B section through side of lifting table

Figure 3 — Gaps between lifting table arms and between arms and base

5.2.4 When lowering a minimum of free space for the feet shall be provided between the underside of the platform and the base frame or the ground in accordance with Figure 4 to prevent crushing and shearing of the feet.

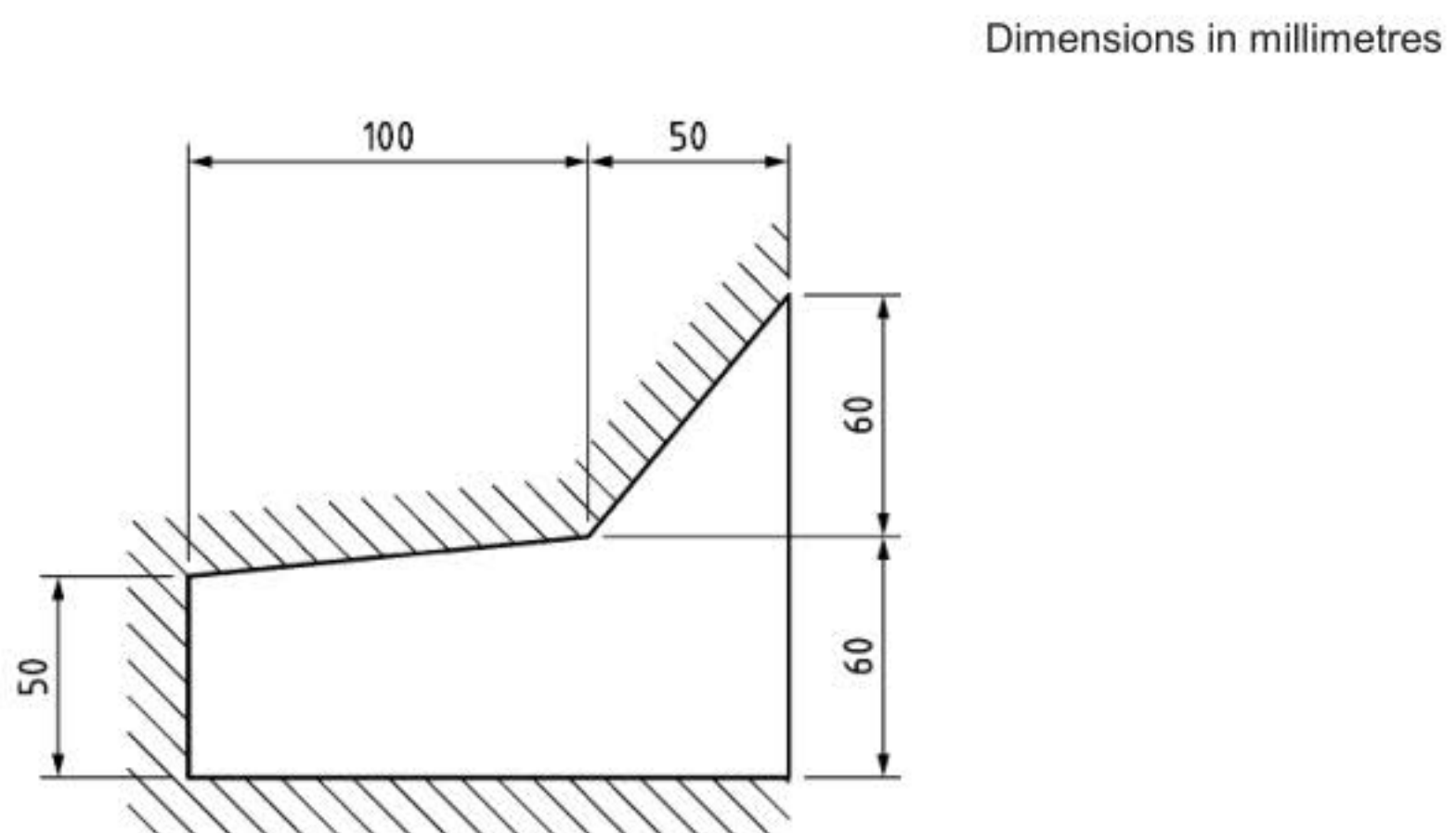


Figure 4 — Minimum foot clearances when lowering

5.2.5 Moving parts which pass each other or fixed structures and which persons may contact shall have no sharp edges, no sharp angles (see 5.2.2.3) and no rough surfaces.

5.2.6 All moving parts which could entangle a person or their clothing shall be avoided by design or, where this is not possible, they shall be guarded.

5.2.7 All nip points (e.g. belts, chains, ropes passing over pulleys, flexible couplings, elements of telescopic guides) shall be safeguarded to prevent drawing-in or injury to any persons. Care shall be taken so that the guard itself does not form a hazard.

5.2.8 Not used.

5.2.9 Prevention of falling from the platform

5.2.9.1 Lifting tables which are designed to be entered by operators, shall be provided with guard rails complying as a minimum with 5.2.10 and 5.2.11, to prevent persons falling more than 0,5 m from the platform.

On platforms where the risk of falling is less than 1,6 m, the side adjacent to the vehicle intended for loading and unloading needs not to be fitted with guard rails.

5.2.9.2 On sides of lifting tables whose travel zone is enclosed by rigid screen guarding complying with the requirements of 5.2.2.2.4 then the requirement of 5.2.10 is not necessary on those sides.

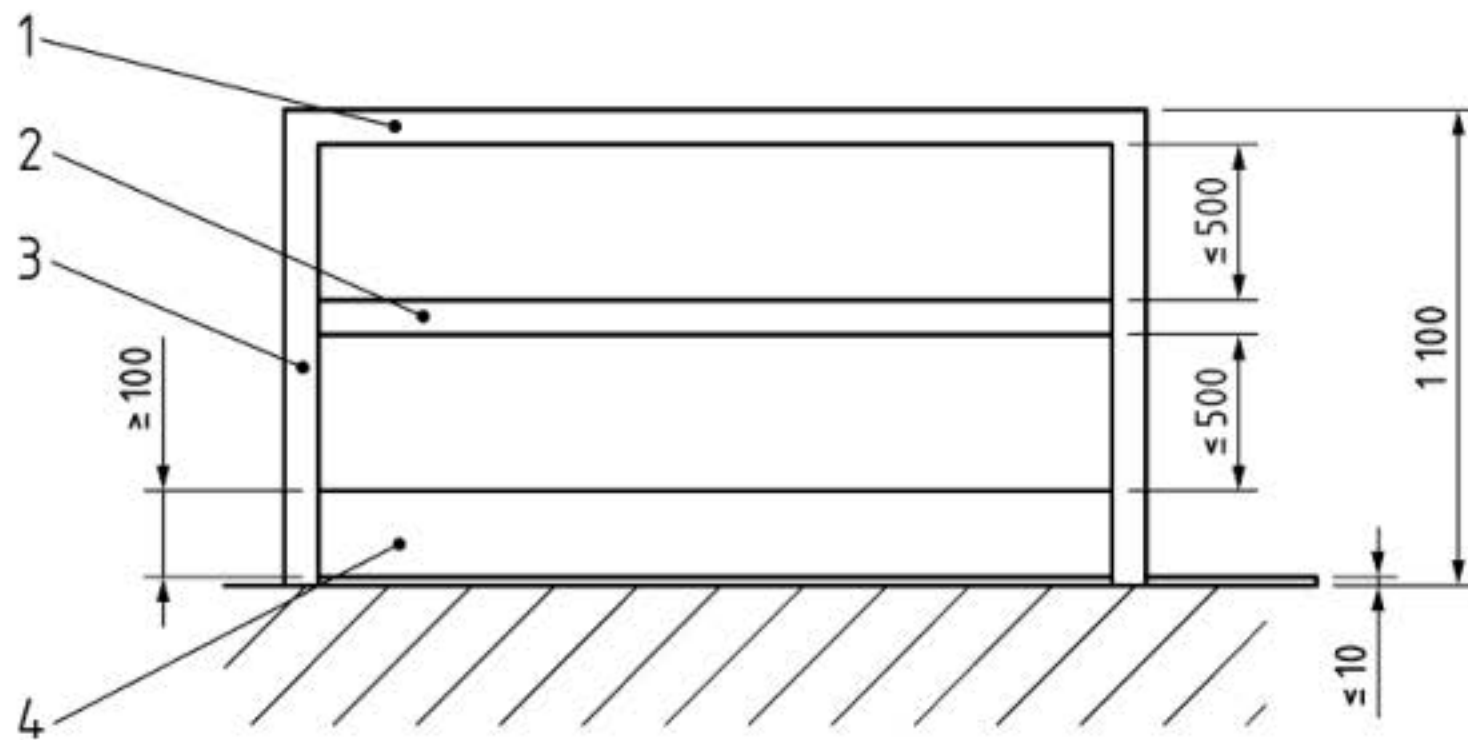
These screen guards on the side facing the platform shall be smooth and imperforate with no projections and not more than 30 mm from the edge of the platform.

5.2.10 Requirements for guard-rails

5.2.10.1 Guard-rails to prevent operators falling from the platform shall be designed as described below. Figures 5a and 5b show the minimum height and spacing requirements for such guard-rails.

NOTE Guard rails are not primarily intended to restrain goods. Goods should be prevented from falling from the platform and the method described in the instruction for use. See also 5.4.2.

Dimensions in millimetres



Key

- 1 top hand rail
- 2 intermediate knee rail
- 3 vertical upright
- 4 toe-plate

Figure 5a — Horizontal guard rail

Dimensions in millimetres

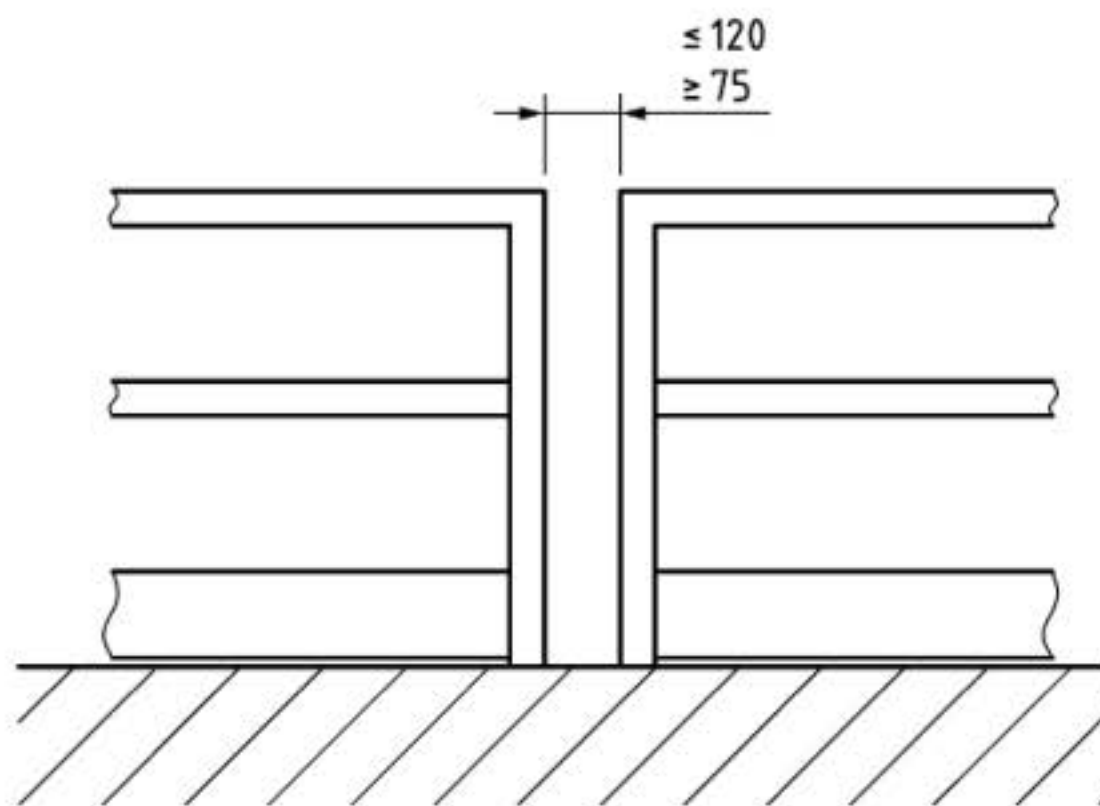


Figure 5b — Clear space between two guard rail segments

5.2.10.2 A guard-rail shall be provided when the gap between a lifting table platform and structure of a machine or wall is greater than 30 mm.

5.2.10.3 The minimum clear horizontal distance between a guard-rail and structure of a machine or wall shall be 100 mm.

5.2.10.4 The minimum height of the guard-rail shall be 1 100 mm.

5.2.10.5 The guard-rail shall include at least one intermediate knee-rail or any other equivalent protection. The clear space between the handrail and the knee-rail, as well as the knee-rail and the toe-plate, shall not exceed 500 mm.

5.2.10.6 To protect against trapping where horizontal bars pass members closer than 120 mm, $\overline{A_1}$ the whole $\overline{A_1}$ of the guard rail shall be surfaced with rigid material conforming to EN ISO 13857.

5.2.10.7 When vertical uprights are used instead of a knee-rail the clear horizontal distance between those uprights shall be 180 mm maximum.

5.2.10.8 A toe-plate with a minimum upstand of 100 mm shall be placed 10 mm maximum above the platform.

5.2.10.9 The distance between the axes of the upright stanchions is preferred to be limited to 1 500 mm but, if this distance is exceeded, special attention shall be paid to the stanchion anchoring strength and the fixing devices.

5.2.10.10 In the case of an interrupted guard-rail, to prevent hand traps the clear space between the two segments shall be not less than 75 mm and not greater than 120 mm (see Figure 5b). Where any gap is less than 8 mm, the guard-rail may be considered as continuous.

5.2.10.11 Where access through the guard-rail is required, a gate meeting the requirements of 5.2.11 shall be used. A gate shall have the hand-rail, knee-rail and toe-plate positioned at the same level as that of the guard-rail that it extends. Where required, the underside clearance of outward opening gates may be increased to suit environmental conditions.

5.2.10.12 The maximum deflection of the guard-rail shall not exceed 30 mm when supporting a minimum horizontally applied load of 300 N/m in any position without any perceivable permanent deformation.

Where the guard-rail is subjected to dynamic loading due to impact it shall be able to withstand, without any perceivable permanent deformation, this increased loading without exceeding the above maximum deflection.

5.2.10.13 The ends of the handrails shall be designed in such a manner as to eliminate any risk of harm caused by sharp edges of the product or by catching of the user's clothing.

5.2.11 Gates and doors on the platform

If gates or opening parts of the protection means are fitted, they shall be either:

- a) Inward opening only: The gate(s)/door(s) shall be constructed to either return automatically to the closed position, or be interlocked by a safety device to prevent operation of the lifting table until it is closed and fastened. Inadvertent opening shall not be possible; or
- b) Outward opening: They shall be mechanically interlocked such that they can only be opened when the platform is level with a permanent landing. Any failure of the locking system shall not lead to unintended opening of the gate(s)/door(s). Interlocks and the guard lock shall comply with 3.3 of EN 1088:1995+A2:2008 with a required performance level:
 - $PL_r = b$ where the height of the fixed landing above the lowest travel position of the platform is $0,5 < h \leq 1,6$ m;
 - $PL_r = d$ where the height of the fixed landing above the lowest travel position of the platform is $h > 1,6$ m

according to EN ISO 13849-1:2008.

It shall not be possible for the lift platform to move

- unless the opening parts or protection means are closed; and
- more than 150 mm from a landing unless the opening parts of the protection means are mechanically locked.

The strength of the gate/door or opening parts of the entrance protections shall at least comply with the requirements given in 7.3 of EN ISO 14122-3:2001; or

- c) connecting plates (according to 5.2.13): Where the platform is provided with a hinged plate to connect the platform with the vehicle, then gates are not necessary in that position. Protection against falling from the connecting plate shall be provided when the platform travel exceeds 1,6 m; or
- d) vertically hinged: they shall comprise a barrier member, horizontal in the closed position and 1,1 m above the platform, pivoted at one end to allow the member to rotate to the vertical open position. The barrier member shall be designed to meet the requirements of 5.2.10.12 and not require effort greater than 150 N to operate at the end furthest from the pivot. The barrier member shall be self-supporting in the vertical position.

They shall be interlocked such that the lifting table can only move when the barrier member is horizontal. Interlocks shall comply with 3.2 of EN 1088:1995+A2:2008 with a required performance level: $PL_r = b$ according to EN ISO 13849-1:2008.

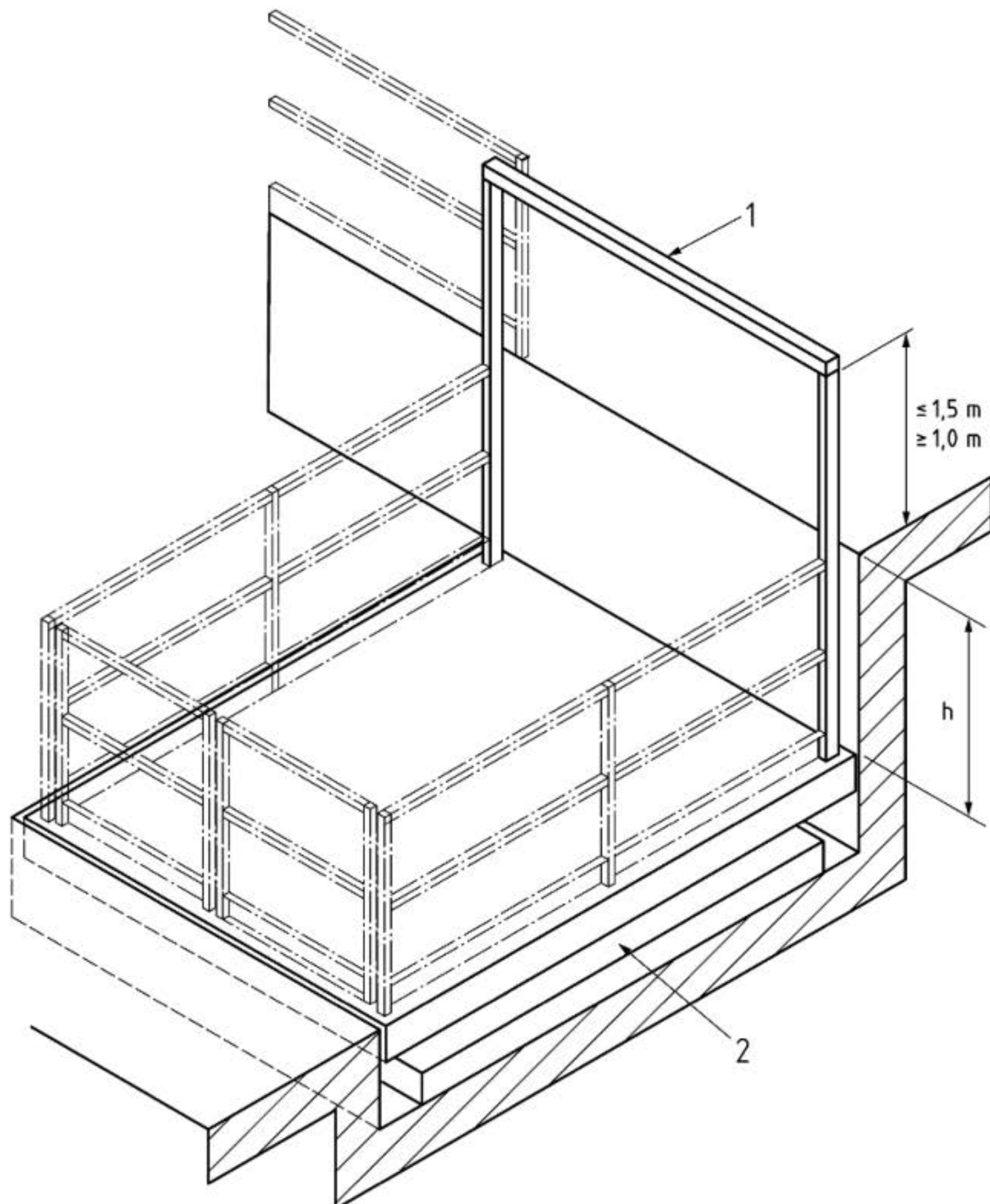
They shall not be fitted where the risk of falling from the platform is $> 1,6$ m.

5.2.12 Landing entrances

5.2.12.1 In restricted areas and in situations where the operator at the control has clear view of the landing entrance and where only one fixed landing exists, at a height above 0,5 m but less than 1,6 m above the lowest travel position of the platform, and above which the platform does not travel, a goal post (see Figure 6a) may be provided as an alternative to the barriers described in 5.2.12.2, to warn operators about the position of the platform.

The goal post shall be fixed to the platform. In the lowest position of the platform the upper-part of the goal post acts as prevention against people falling from the upper fixed landing, and the clearance between the underside of the upper-part and the landing shall be between 1 m and 1,5 m.

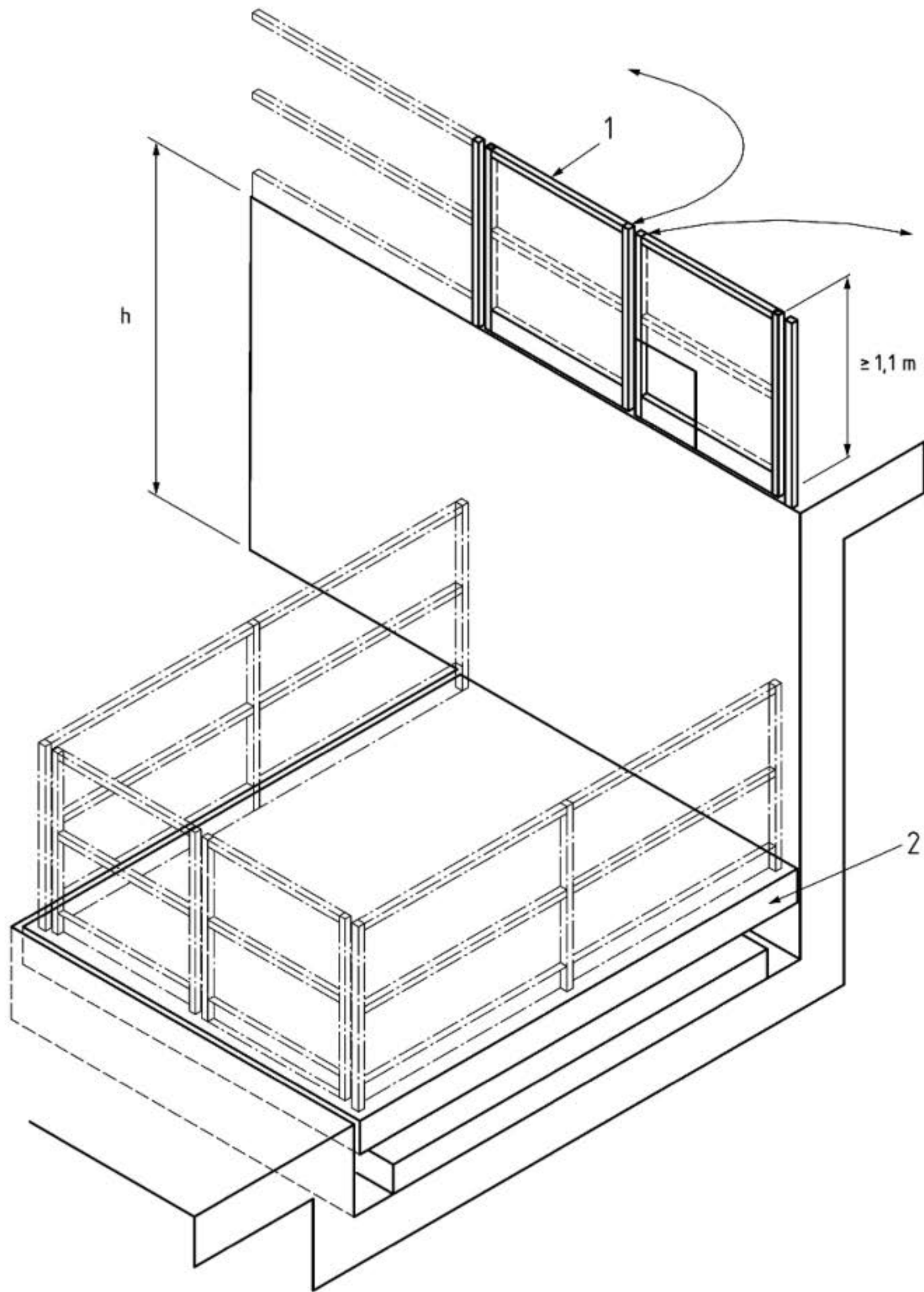
Dimensions in metres

**Key**

- 1 barriers at upper landing
- 2 platform at lowest landing
- h height of landing above lowest landing

Figure 6a — Landing entrance above 0,5 m and up to 1,6 m

5.2.12.2 Where fixed landings exist that are not provided with a goal-post complying with 5.2.12.1 or are greater than 1,6 m above the lowest travel position of the platform, guard rails or gates (see Figure 6b) shall be provided to prevent persons or goods falling into the travel zone when the platform is not present at a landing.



Key

- 1 barriers at upper landing
- 2 platform at lowest landing
- h height of landing above lowest landing

Figure 6b — Landing entrances above 1,6 m

These entrance protections shall meet the requirements of 5.2.10 and where necessary 5.2.1, 5.2.2 and 5.2.12.7 to avoid the possibility of crushing or shearing whilst the lifting table is in operation.

5.2.12.3 Gates or opening parts of the entrance protections described in 5.2.12.2 shall not open into the travel zone and shall be interlocked.

Interlocks and the guard lock shall comply with:

- 3.2 of EN 1088:1995+A2:2008 with a required performance level $PL_r = b$ according to EN ISO 13849-1:2008 where the height of the fixed landing above the lowest travel position of the platform is $0,5 < h \leq 1,6$ m; the lifting platform shall not move unless the entrance protection is closed;
- 3.3 of EN 1088:1995+A2:2008 with a required performance level $PL_r = d$ according to EN ISO 13849-1:2008 where the height of the fixed landing above the lowest travel position of the platform is $h > 1,6$ m; the entrance protections can only be opened when the platform is present at the landing.

It shall not be possible for the lift platform to depart from the landing unless the opening parts of the entrance protections are closed.

5.2.12.4 Roller shutter gates/doors

Where roller shutter gates/doors are provided as landing protection lift tables, they shall:

- a) be installed in accordance with 5.2.12.7;
- b) be power operated;
- c) be interlocked as defined in 3.2 of EN 1088:1995+A2:2008 with a required performance level:
 - $PL_r = b$ where the height of the fixed landing above the lowest travel position of the platform is $0,5 < h \leq 1,6$ m;
 - $PL_r = d$ where the height of the fixed landing above the lowest travel position of the platform is $h > 1,6$ m.

according to EN ISO 13849-1:2008;
- d) open only when the lifting table platform is stationary at that level. It shall not be possible for the lift to depart unless the door/gate is closed;
- e) only be able to be opened manually with a dedicated tool not accessible without a key;
- f) be protected by emergency stop device complying EN ISO 13850 which also will stop the lifting table when operated;
- g) be operated only by a control situated adjacent to that door;
- h) meet the requirements of EN 13241-1:2003+A1:2011, 4.2.8;
- i) the bottom leading edge of the door shall be provided with a trip device to stop downward movement which, if mechanically actuated, shall comply with PL c of EN ISO 13849-1. The trip device, if non-mechanically actuated, shall comply with EN 61496-1 and category 2 of CLC/TS 61496-2:2006.

5.2.12.5 It shall not be possible for the lifting table platform to move more than 150 mm from the landing unless the gates or opening parts of the entrance protections are locked. Any failure of the locking system shall not lead to an unsafe condition.

5.2.12.6 Means shall be provided to limit the clearance between the platform and the landing to less than 30 mm when loading and unloading.

5.2.12.7 The surface of the gates facing the lifting table shall be smooth, flush and imperforate and be flush with the vertical surface below the landing.

5.2.13 Connecting plates

5.2.13.1 Lifting tables designed to serve landings, fixed or temporary, e.g. the bed of a vehicle, for the transfer of goods and/or operators between the platform and the landing, where the horizontal distance between the platform and landing exceeds 30 mm shall be provided with a hinged connecting plate mounted to the edge of the platform on the side adjacent to the landing.

5.2.13.2 Unassisted hinged connecting plates shall:

- a) when above the platform rotate a minimum of 15° past the vertical;
- b) provide a minimum of 25 mm gap between the plate and any part of the lifting table platform and guard-rails;
- c) not require a manual force of more than 300 N to operate them if it can be done in an ergonomic way. If not the forces shall be reduced so that it can be handled in an ergonomic way. In addition to that, manual connecting plates shall fulfil the ergonomic requirements as stated in ISO 11228-1 and ISO 11228-2;
- d) when hanging vertically below the hinge be protected against shearing.

NOTE Unassisted hinged connecting plates are not suited to meet the requirements of 5.4.2 unless they are locked in the raised position.

5.2.13.3 Assisted hinged connecting plates shall:

- a) be supported vertically above the hinge by the assisting mechanism to prevent it lowering without deliberate effort of the operator;
- b) when lowered be able to rotate a minimum of 15° below the horizontal;
- c) be electrically interlocked with the control system to prevent the platform rising unless the connecting plate is positioned vertically above the platform.

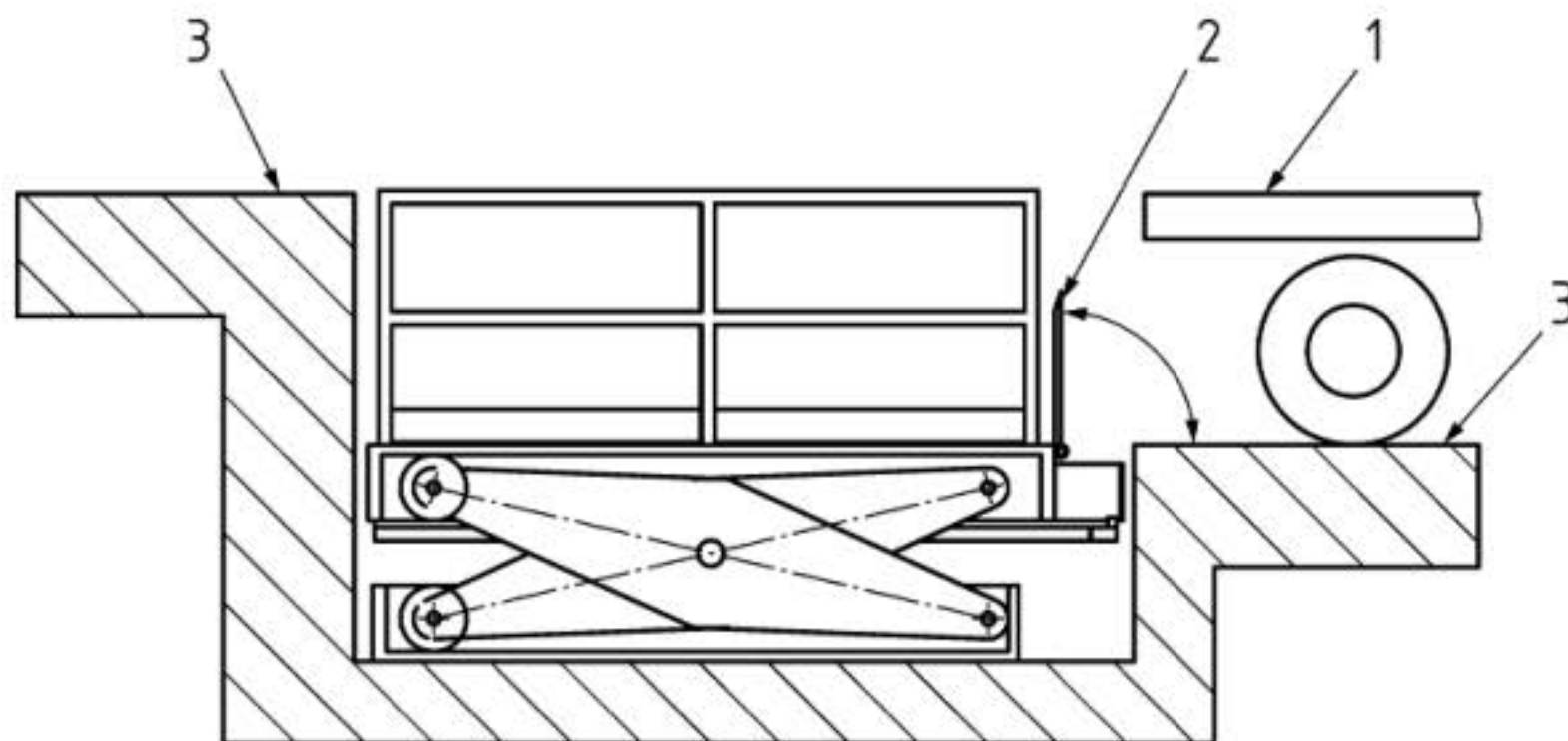
5.2.13.4 Power actuated hinged connecting plates shall:

- a) be held locked vertically above the hinge to prevent unintentional lowering of the connecting plate;
- b) when horizontal, not be able to rise with more than 20 kg weight placed along the edge of the plate furthest from the hinge;
- c) be electrically interlocked with the control system to prevent any rise or lower of the platform, using the control devices unless the connecting plate is positioned vertically above the platform;
- d) have operating controls which are clearly marked as to their function and not be confused with the lifting table functions (see Annex D);
- e) when the connecting plate rests on a vehicle be free to rotate 15° above and below the horizontal;
- f) not exceed a speed of tilting of 0,15 m/s at the end of the connecting plate even under fault conditions.

5.2.13.5 Any part of the underside of a connecting plate and its mechanism shall be considered as part of the platform for the protection of the travel zone as required in 5.2.1 or 5.2.2.

5.2.13.6 When a hinged connecting plate is intended to provide protection against goods falling from the platform as required in 5.4.2 the connecting plate shall be held vertically to prevent unintentional lowering of the connecting plate.

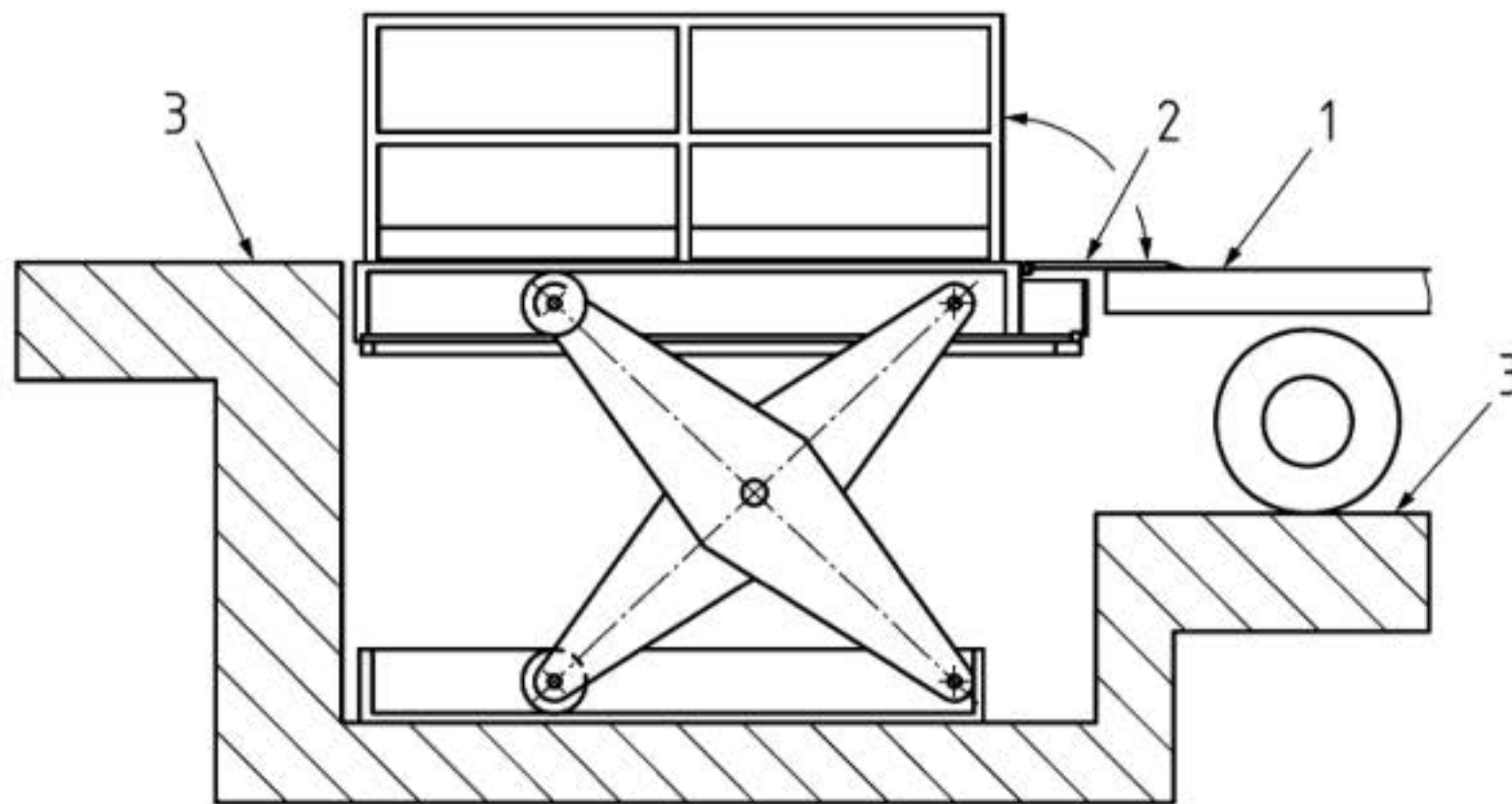
5.2.13.7 Where the risk of falling is more than 1,6 m above the lowest landing then protection against falling shall be provided.



Key

- 1 vehicle bed
- 2 connecting plate
- 3 fixed landings

Figure 7a — Connecting plate vertical on stowed lifting table



Key

- 1 vehicle bed
- 2 connecting plate
- 3 fixed landings

Figure 7b — Connecting plate horizontal on elevated lifting table

5.2.14 High temperature

If any parts of the driving system can operate at a temperature of above 55 °C during intended use, these parts shall be protected to avoid contact of persons (e.g. by covering or positioning).

5.2.15 Blocking device

A blocking device shall be fitted to all lifting tables to allow maintenance and repair work to be carried out below the platform in safety. This device shall be capable of supporting the platform with its rated load, and of being operated by one person from a safe position.

It shall not be possible to remove the blocking system unless the platform is supported by the lifting mechanism or other means (e.g. a crane).

For powered blocking systems it is required to clearly indicate the blocking system is correctly positioned.

5.2.16 Retractable outriggers

All lifting tables fitted with retractable outriggers shall:

- permit by design lifting and lowering movements only if the outriggers are in a correct position;
- permit by design the release of powered outriggers only if the lifting platform is in the lowest position;
- prevent any horizontal travel of the lifting table unless the lifting platform is in the lowest position.

5.2.17 Programme controlled lifting tables

In normal operation, it shall not be possible to enter the danger zone of a programme controlled lifting table before switching off the control system. Reconnection of the control system has to be prevented as long as any person is standing on the platform or within the danger zone.

To fulfil the needs of repair and service, such programme controlled lifting tables may be fitted with a switch to select a "maintenance mode". This switch shall be protected with a security device (e.g. a code, a key) to prevent persons who are not in possession of this device selecting the maintenance mode position. The selection of this maintenance mode shall render ineffective all normal controls other than emergency stop buttons and shall give full control to the maintenance operator control panel. This control panel shall be fitted with both:

- hold to run controls only;
- emergency stop complying with EN ISO 13850.

NOTE When the programme controlled lifting table is functioning in conjunction with other programme controlled machinery, manufacturer may consider EN ISO 11161.

5.2.18 Over speed protection

Devices shall be fitted to all lifting tables (except lifting tables which are safe by position) to stop the descent of the platform if the speed of the platform exceeds the maximum design speed. The platform shall be stopped before the descent speed exceeds 0,25 m/s.

NOTE This does not apply to structural failure.

5.3 Speeds

5.3.1 The average lifting and lowering speed of the platform shall not exceed 0,15 m/s when measured throughout its normal travel range except where the platform is automatically programme controlled and "safe by position".

NOTE Accessible goods only lifts (AGOLS) with a speed exceeding 0,15 m/s are not dealt with in this standard (see EN 81-31).

5.3.2 Single horizontal speed pedestrian controlled lifting tables operating on level ground shall not exceed a travel speed of 1,1 m/s and acceleration of $0,5 \text{ m/s}^2$, with the platform fully lowered.

For any other lifting table, the horizontal speed shall not exceed 1,6 m/s on level ground, when travelling with the platform fully lowered.

When the platform is not fully lowered, the horizontal travelling speed shall be automatically limited to not more than 0,6 m/s, except where platform is "safe by position".

5.3.3 Where a platform is designed to be tilted or rotated, the peripheral speed of the platform shall be limited to not more than 0,15 m/s, except where platform is "safe by position".

5.3.4 Non operator carrying lifting tables which are safe by position and have a nominal descent speed exceeding 0,15 m/s, may reach not more than 1,5 times the nominal descent speed in case of leakage in the hydraulic system.

5.4 Platform

5.4.1 Platforms which are entered by operators shall be fitted with an anti-slip surface (e.g. tear-drop profile tread plate, grit surface, anti-slip mats).

5.4.2 A_1 Where a platform or parts of a platform is designed to be tilted, it shall have an automatic and fixed method of preventing the intended load, or any part thereof, falling unintentionally from the platform when tilted. A_1

Platforms that are designed to carry wheeled loads (or where wheeled trucks enter the platform for the purpose of loading or unloading) shall be shaped or have a device that will prevent the intended load (or truck) from unintentionally rolling off. This device shall retract only when the platform is in a safe position for the transfer of the load. This also applies to rolling loads (reels, cylinders etc.).

5.4.3 Emergency lowering devices, where fitted, shall be of the hold-to-run type. These devices shall be fitted in a safely accessible position and shall not be capable of unauthorized operation.

5.4.4 Where the platform surface, or part of it (e.g. a turntable), can rotate, and it can be walked on at bottom level, an arrangement shall be present which prevents unintentional rotation when lowered.

5.5 Operator position

5.5.1 The operator's position shall give the operator a clear view of the hazardous parts of the platform and its load at all times throughout its vertical movement or protective measures according to 5.2.2 shall be provided.

NOTE 1 If the operator's position is not determined by the manufacturer see 7.4.2.12.

On lifting tables intended to carry operators, there shall be provided:

- an area of at least 50 cm x 60 cm for each operator;
- a control device on the platform.

In the case of self-propelled lifting tables, the operator shall have a clear view of the horizontal travel of the lifting table.

NOTE 2 In some cases more than one operator position will be required to meet this requirement.

Control devices shall be designed and arranged so that they are within easy reach of the operator.

5.5.2 Except for automatically controlled movements of the lifting table, all controls shall be of the hold-to-run type.

The hazard zones of automatically controlled lifting tables shall be totally safeguarded with suitable protective devices (see 5.2.2.2).

5.5.3 A device shall be fitted to all power operated lifting tables to prevent unauthorized use.

5.5.4 The control devices shall be designed so that the movement of the control and its location are consistent with its effect (see Annex D).

NOTE Levers of hand or foot pumps which are only used to lift the platform are not controls in the sense of this clause.

5.5.5 All controls except emergency stops shall be designed to prevent unintentional operation (see Annex D).

5.5.6 Where alternative controls are fitted at two different positions they shall be wired so that only one movement can be initiated at any one time, excluding the emergency stop.

Where operators are intended to travel on the platform, one set of controls shall be mounted on the platform. When operating the controls on the platform, the controls at landings (except emergency stop) shall be deactivated (e.g. by use of a selector, a key switch or automatically...) until reactivated by a voluntary action.

5.5.7 For power-operated lifting tables, emergency stop controls in accordance with EN ISO 13850:2008, category 0, shall be provided at each control position. If there is only a control position on the platform, there shall be at least one additional emergency stop control not on the platform and in a convenient accessible position. If this control position is not determined by the manufacturer see 7.4 and 7.4.2.6.

5.5.8 Where the platform is capable of tilting more than five degrees from the horizontal, the operator position shall not be on the platform.

5.5.9 If it is necessary to use more than one control device simultaneously to operate one motion of the lifting table then it is sufficient if only one of them is protected against unintentional operation.

5.5.10 Where the operator can be locked in the platform at heights more than 1,6 m from a fixed landing, means shall be provided to rescue him or to allow him to raise an alarm to a place where help can be achieved.

5.6 Mobile lifting tables

5.6.1 All manually operated mobile lifting tables shall be fitted with a device to prevent unintentional movements of the lifting table (e.g. parking brake, truck lock).

In the case of self-propelled lifting tables the operator shall have a clear view of the horizontal travel of the lifting table.

5.6.2 Self-propelled mobile lifting tables shall have fitted an automatic service brake for the horizontal driving movement which is normally held on and which is released only by application of power. Operation is also instigated automatically by releasing the travelling controls and by interruption of the power supply. This applies whether the horizontal movement is controlled by an operator or by automatic programming. Maintaining the braking (holding) effect shall not depend upon an exhaustible energy supply source.

The service brake shall be dimensioned such that they can stop a lifting table loaded with rated load travelling at its maximum speed stated by the manufacturer and on a slope two degrees greater than that stated by the manufacturer.

Mobile lifting tables shall have a parking brake dimensioned such that it can hold a lifting table loaded with rated load on a slope two degrees greater than that stated by the manufacturer. This brake may be the same brake as the service brake.

Alternatively, the braking effect can be supplied by a hydrostatic driving system if this gives an equivalent effect.

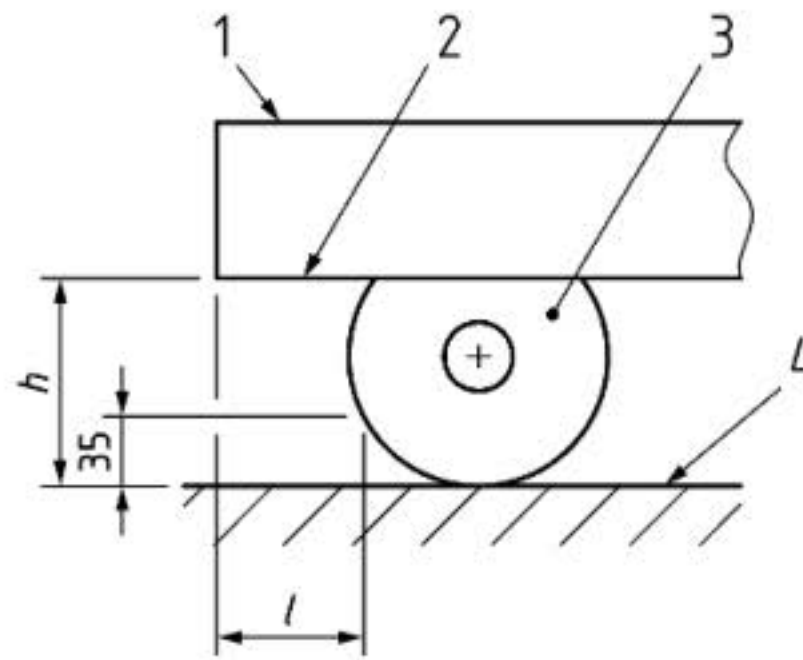
5.6.3 On self-propelled mobile lifting tables, switching on or starting the motor shall not produce any uncontrolled movements of the table.

5.6.4 Manually driven lifting tables shall be fitted with handles for pulling or pushing, unless the table structure can safely be used for this purpose. These handles should be so mounted that injuries, especially to the hands or feet, are minimized during movement.

5.6.5 To ensure the operators safety, the wheels on the lifting table shall be positioned in accordance with Figures 8a and 8b, where

- either h is less than 35 mm and l is a minimum of 10 mm; or
- $h = 35$ mm to 70 mm and l is a minimum of $2,57 h - 80$ mm; or
- $h = 70$ mm to 120 mm and l is a minimum of $1,60 h - 12$ mm.

Dimensions in millimetres



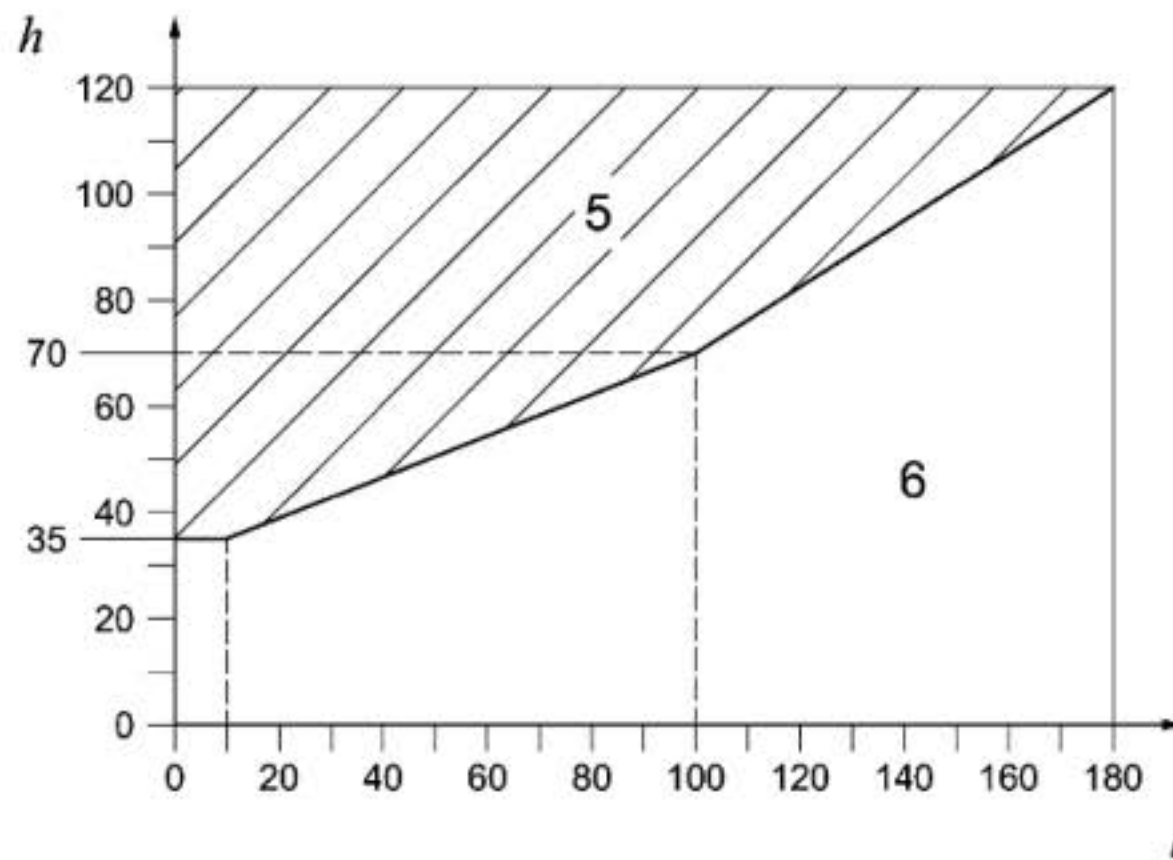
Key

- 1 end of truck frame or deflector
- 2 truck frame or deflector
- 3 wheel
- 4 floor
- h* height of truck frame above floor
- l* distance of wheel 35 above floor to end of truck frame

A1

Figure 8a — Arrangement of wheel to deflector

Dimensions in millimetres

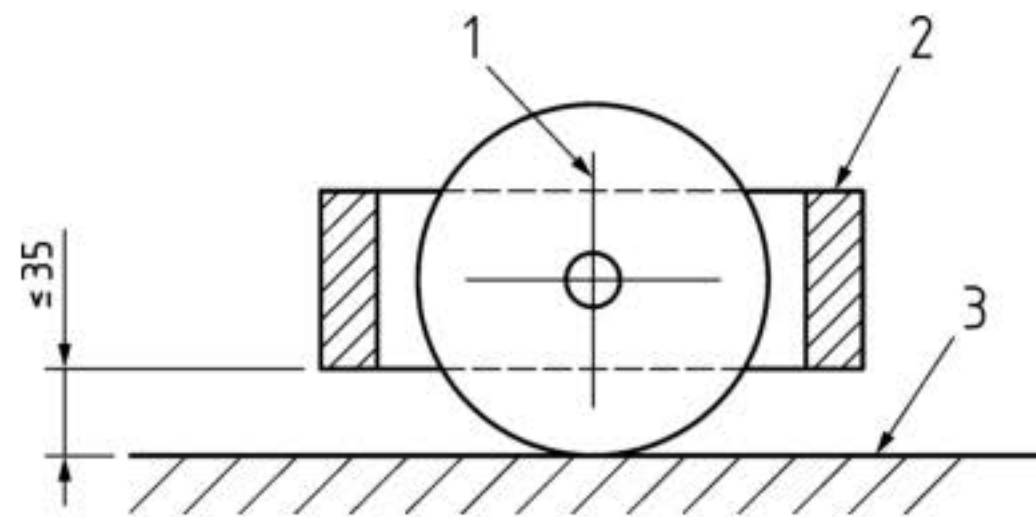


Key

- 5 height of frame above floor (*h*)
- 6 free space for feet (*l*)

Figure 8b — Free space for feet

Dimensions in millimetres

**Key**

- 1 wheel
- 2 deflector
- 3 floor (ground)

Figure 9 — Foot protection

5.6.6 Where wheels cannot safely be arranged in accordance with 5.6.5, a wheel guard (deflector) as shown in Figure 9 shall be provided. For castors, the deflector need only be mounted on the side on which the conditions specified in 5.6.5, are not achieved.

5.6.7 When a tow bar is supplied as part of a mobile lifting table it shall not be possible for the tow-bar to become unintentionally detached. If the tow-bar, when not in use, is raised to a vertical position, an automatic device shall be provided to hold the bar in this position; unintentional release shall not be possible.

5.6.8 The paths of horizontally guided mobile lifting tables shall be limited at the ends by suitable buffers, unless the lifting tables are designed to leave the guiding system.

If the lifting tables are power-driven, their travel shall be stopped before the end points of the guiding system are reached, by interruption of the driving power. If switches are used for this purpose, they shall consist of:

- a first switch, which allows reverse movement of the lifting table;
- a final limit switch which does not allow reverse movement and is intended for use when the first switch fails. This switch shall comply with 5.11.2.

This final switch is not required if other equally effective means of avoiding structural overloading when the end points are reached are provided.

5.6.9 If rails or tracks are sunk into the ground, a track cleaning device shall be fitted unless this is inherent in the design.

5.6.10 In the case of rail guided lifting tables, when in operation the wheels shall be prevented from leaving the rails or tracks.

5.6.11 Self propelled lifting tables that are manually controlled shall be fitted with an audible warning device controlled from the operating position.

If the automatically controlled lifting table is intended to be used in an area from which persons are not excluded, persons shall be automatically protected from impact of the lifting table (e.g. by pressure sensitive buffers or photo-electric devices) and an acoustic and/or visual warning device (e.g. flashing lamp) shall operate whenever movement takes place.

5.6.12 The maximum manual forces required for mobile lifting tables operations shall not exceed the following figures:

- a) to start an unloaded lifting table moving from rest: 300 N (see Annex E for force measurement methods);
- b) to maintain the movement of the lifting table: 200 N (see Annex E for force measurement methods).

5.7 Mechanical driving system

5.7.1 Rope drives

5.7.1.1 They shall be dimensioned in accordance with the calculations given in ISO 2408, ISO 4301-1, ISO 4308-1 and ISO 4308-2, except as detailed below.

The safety factor, calculated as the total of the minimum guaranteed breaking loads of all the ropes divided by the maximum static supported load, shall not be less than 10 for lifting tables intended to carry persons (including operators and loaders) and not less than 5 for other lifting tables.

The rope terminations shall be able to resist at least 80 % of the minimum guaranteed breaking load of the rope.

On the lifting tables intended to carry operators there shall be at least two independent supporting ropes.

A device shall be provided to give approximate equal tension in all supporting ropes. When ropes are reeved, the number of ropes to be taken into account shall be the number of independent ropes, not the number of falls.

5.7.1.2 The ratio of the drum pitch diameter or pulley pitch diameter to the diameter of the wire rope shall in no case be less than 18:1. At least two turns of rope shall remain on the drum at all times.

The rope shall be prevented from becoming tangled on the drum (e.g. by the provision of a single continuous spiral groove).

Means shall be provided to prevent the wire rope from leaving the ends of the drum, e.g. flanges extending to a height of at least twice the wire rope diameter above the highest layer.

5.7.1.3 For pulleys the following requirements shall be fulfilled:

5.7.1.3.1 The grooves shall be circular with a radius not more than 7,5 % and not less than 5 % in excess of half the nominal diameter of the wire rope. The depth shall be not less than 1,5 times the nominal diameter of the wire rope.

5.7.1.3.2 Pulleys having wire ropes leading upwards shall be protected against the penetration of foreign objects.

5.7.1.3.3 Effective precautions shall be taken to avoid wire ropes leaving their grooves.

5.7.1.4 All lifting tables using a mechanical drive system with ropes for lifting shall be fitted with a load limiting device which will prevent any movement in overload condition.

5.7.2 Chain drives

5.7.2.1 If chains are used as suspension elements, they shall be leaf or roller type only. They shall be dimensioned in accordance with ISO 606.

The safety factor, calculated as the guaranteed total breaking load of all the chains divided by the maximum static support load, shall not be less than 8 for lifting tables intended to carry persons (including operators and loaders) and not less than 4 for other lifting tables.

Where chains are reeved, the number of chains to be taken into account shall be the number of independent chains not the number of falls.

5.7.2.2 All lifting tables using a mechanical drive system with chains for lifting shall be fitted with a device which will only allow a motor torque to be developed of 135 % of the motor torque that is developed when raising the rated load.

5.7.3 Screw drives

5.7.3.1 The design shear stress of lead-screws and nuts shall be not more than $\frac{1}{6}$ of the ultimate tensile stress of the material used. All other parts shall be designed to be stressed at not more than $\frac{1}{4}$ of the ultimate tensile stress of the material. The lead screw mechanism shall be designed to prevent separation of the platform from the mechanism during normal use.

Failure due to buckling shall be considered by using a minimum safety factor of 3.

The requirement of 5.7.8.1 may be met if each lead-screw has a load-bearing nut and an unloaded safety nut. The safety nut shall only be loaded if the load-bearing nut fails. It shall not be possible to raise the platform from its access position when the safety nut is under load.

It shall be easy to determine the wear of the load-bearing nut without major dismantling, e.g. more than removing a cover.

Lead-screws shall be fitted with devices at both ends to prevent the load-bearing nut and safety nut from leaving the lead-screws.

The lead-screw material shall have a higher abrasive resistance than the load-bearing nut material.

For drives using recirculating ball systems other criteria for the materials involved are valid.

5.7.3.2 All lifting tables using a mechanical drive system with screws for lifting shall be fitted with a device which will only allow a motor torque to be developed of 150 % of the motor torque that is developed when raising the rated load.

5.7.4 Rack and pinions drives

5.7.4.1 Each rack and pinion drive shall be equipped with a driving pinion and a safety gear pinion to meet the requirement of 5.7.8.1. The design shear stress of racks and pinions shall not be more than $\frac{1}{6}$ of the ultimate tensile stress of the material used. In addition to the normal lifting table guide rollers, positive and effective means shall be provided to prevent any driving or safety device pinion from coming out of engagement with the rack. These devices shall ensure that axial movement of the pinion is so limited that a minimum of $\frac{2}{3}$ of the tooth width is always in engagement with the rack. They shall also restrain radial movement of the pinion from its normal meshing position by more than $\frac{1}{3}$ of the tooth depth.

Visual examination of the pinions shall be possible without the removal of the pinions or major dismantling of structural components of the lifting table, e.g. more than removing a cover.

5.7.4.2 All lifting tables using a mechanical drive system with rack and pinions for lifting shall be fitted with a device which will only allow a motor torque to be developed of 150 % of the motor torque that is developed when raising the rated load.

5.7.5 Flat belt drives

5.7.5.1 Where flat belt drives are used as load supporting devices, there shall be at least 2 independently adjustable belts.

5.7.5.2 The safety factor calculated as the guaranteed total breaking load of all load supporting belts divided by the maximum static supported load shall not be less than 6.

NOTE This value is required to be 6 due to the properties of the material covering the flat belt.

5.7.5.3 The design and the dimension of the belt drives (e.g. diameter of the drum, diameter of the pulleys, remaining windings on the drum) shall be chosen according to the recommendations of the belt manufacturer.

5.7.5.4 The attaching of the belts to the lifting device shall ensure even load distribution and shall not have any sharp edges that may damage the belts. The anchorage of the belt shall be able to resist at least 80 % of the breaking load of the belt.

5.7.5.5 A device shall be provided to give approximate equal tension in all supporting belts.

5.7.5.6 All lifting tables using a mechanical drive system with flat belts for lifting shall be fitted with a device which will only allow a motor torque to be developed of 150 % of the motor torque that is developed when raising the rated load.

5.7.6 Toothed belt drives

5.7.6.1 Where toothed belt drives are used as load supporting devices, there shall be at least 2 independently adjustable belts.

5.7.6.2 The safety factor calculated as the guaranteed total breaking load of all load supporting belts divided by the maximum static supported load shall not be less than 5.

5.7.6.3 The design and the dimension of the belt drives (e.g. diameter of the drum or of the pulleys) shall be chosen according to the recommendations of the belt manufacturer.

5.7.6.4 The attaching of the belts to the lifting device shall be designed according to the recommendations of the belt manufacturer.

The anchorage of the belt shall be able to resist at least 80 % of the breaking load of the belt.

5.7.6.5 All lifting tables using a mechanical drive system with flat belts for lifting shall be fitted with a device which will only allow a motor torque to be developed of 150 % of the motor torque that is developed when raising the rated load.

5.7.7 Manually driven drives

5.7.7.1 Control mechanisms of manually operated lifting tables shall be designed in such a way that:

- a) winding handles, levers or wheels cannot turn back under load more than 15 cm measured at the greatest radius of the control (reversal security). Reversal security shall not be necessary for hand-wheels if these take the form of completely smooth discs without any handles;
- b) the direction of rotation of winding handles remain the same regardless of gearing;

- c) removable winding handles, levers and hand wheels shall be secured against slipping and unintentional removal from the drive shaft, e.g. by fitting securing mechanism such as snap-in latches or locking springs;
- d) it shall not be possible for the drive to become disengaged during gearing changes;
- e) the maximum manual forces shall not exceed 200 N for hands or 300 N for feet.

5.7.7.2 Drive systems that are both motor-driven and manually driven shall be designed so that neither drive can put the other drive into motion.

5.7.8 Additional requirements

5.7.8.1 Lifting tables where the travel zone below the platform is not sufficiently shielded from access and those which are intended to lift the operator shall be fitted with a device to stop the descent of the platform within 100 mm and hold the platform, in the event of a breakage of the load bearing part. The breaking of lifting screws does not need to be considered. When actuated, the device shall also stop the drive motor and keep it stopped (see also Clause 7).

5.7.8.2 A safety device (e.g. a slack-rope/chain switch) shall be fitted to all lifting tables where slack rope, chain or belt can occur and then to stop the drive motor and keep it stopped.

5.7.8.3 Power-driven lead screws, racks and gears of the load carrying device shall be protected against pollution and damage (see 5.2.10).

5.7.8.4 A braking system shall be fitted on all drives. The braking system shall be automatically applied when the drive is no longer energized. This braking system shall ensure that the loaded platform can be stopped and held at any position under all possible conditions of operation. Unintentional release of this device shall not be possible.

5.7.8.5 All drives used for lifting shall be of a positive type (e.g. gear/chain transmission). Friction drives (e.g. friction clutches) shall not be used.

5.8 Hydraulic system

5.8.1 The hydraulic system shall conform to the requirements of EN ISO 4413.

5.8.2 All hydraulic cylinders, pipes, valves, fittings, etc. shall be designed to withstand a static pressure equal to twice the maximum working pressure without permanent deformation.

5.8.3 All hydraulic hoses and their fittings shall be designed for a bursting pressure of at least three times the maximum working pressure.

5.8.4 Load control

5.8.4.1 To prevent lifting when overloaded, a pressure relief valve shall be fitted in all systems and shall be positioned and set so that not more than 110 % of the maximum working pressure can be achieved. Where adjustable, the adjustment of this valve shall require the use of tools.

It shall be positioned so that it will not cause the platform to descend out of control if an overload is placed on the raised platform.

5.8.4.2 Lifting tables

A1 Hydraulically actuated lifting tables which:

- serve fixed landings above 1,6 m above the lowest landing, and either
- carry an operator, or
- whose rated capacity exceeds 1 t

shall be fitted with a device, i.e. a pressure switch, to prevent lowering from its raised position when overloaded by more than 10 % of the rated capacity; see Annex A.

The overload sensing device may be deactivated during movement of the load carrier.

The overload shall be indicated by both an audible and a visible signal. The sound level of the audible signal shall not be less than 75 dB(A).

The audible and visual indicator of overload when the platform is in the raised position shall be provided in a position to alert the operator (see 7.4.2.14).

When the rated load has been exceeded by more than 100 kg or 10 % of its rated load, it shall not be possible for the platform to start from rest. \square_{A1}

5.8.5 It shall not be possible for the hydraulic fluid to drain out of the cylinders if the platform descent is blocked and the lowering control still actuated.

5.8.6 On all hydraulic circuits it shall be easily possible to connect a device to measure the hydraulic pressure in the circuit. This fitting shall be specified in the manufacturer's maintenance instructions.

5.8.7 All hydraulically driven lifting tables shall be equipped with a pipe rupture protection device to prevent unintentional lowering of the platform to 100 mm before the downward speed of the platform reaches the max speed defined in 5.2.18.

5.8.8 Where pipe rupture valves are used to stop the platform on hydraulic multi-cylinder driven lifting tables, it shall be impossible for any hydraulic cylinder to be overloaded by more than 100 % of the maximum working pressure (e.g. by use of a balance system).

This pipe rupture valve need not be fixed directly to the cylinder if between the valve and cylinder only rigid steel pipe with "security swaged" fittings or similar connections are used

When the lifting table is lifted by more than one cylinder, if one cylinder fails, other cylinder(s) shall be able to support the lifting table with its nominal load without failure, but it is not required that they are able to lift the platform.

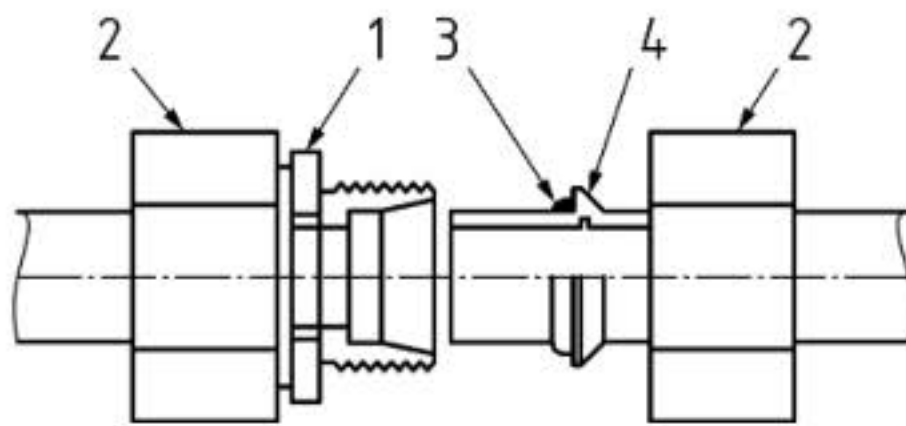
Under failure conditions, the level of the platform shall be maintained to a maximum tilt of 5°.

5.8.9 The minimum fluid level in the tank shall be clearly indicated for a particular platform height, e.g. this could be either a sight glass on the tank or a dip stick, with a level marked on it for a platform height.

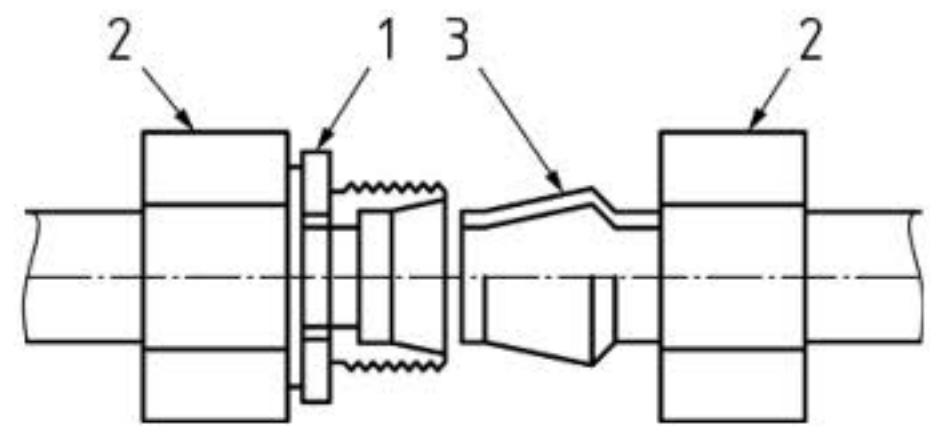
5.8.10 Where descent due to hydraulic leak could produce a hazard for persons, e.g. where the elevated platform forms part of a floor, safety devices (e.g. mechanical locking bolts or a pawl device) shall be fitted to prevent uncontrolled descent.

5.8.11 When a hand pump is used to operate the lifting table, the operating force on the handle provided, measured at the end of the handle when raising the rated load, shall not exceed 200 N when operating according to the manufacturer's instructions.

5.8.12 This figure (200 N) may be increased to 300 N for foot pumps (see Annex E for force measurement methods).

**Key**

- 1 fitting body
- 2 nut
- 3 captive seal
- 4 security swaged pipe

Figure 10a — Security swaged fitting type 1**Key**

- 1 fitting body
- 2 nut
- 3 security swaged pipe

Figure 10b — Security swaged fitting type 2**5.9 Pneumatic system**

5.9.1 The pneumatic system shall conform to the requirements of EN ISO 4414.

5.9.2 Pneumatic lifting tables shall not be operator-carrying.

5.9.3 All pneumatic cylinders, pipes, valves, fittings, etc. shall be designed to withstand a static pressure equal to twice the maximum working pressure without permanent deformation.

5.9.4 All pneumatic hoses and their fittings shall be designed for a bursting pressure of at least three times the maximum working pressure.

5.9.5 A pressure relief valve shall be fitted in all systems and shall be positioned and set so that not more than 110 % of the maximum working pressure can be achieved. Where adjustable, the adjustment of this valve shall require the use of tools.

It shall be positioned so that it will not cause the platform to descend out of control if an overload is placed on the raised platform.

5.9.6 On all pneumatic circuits it shall be easily possible to connect a device to measure the pneumatic pressure in the circuit. This fitting shall be specified in the manufacturer's maintenance instructions.

5.9.7 Protection shall be provided against the hazard caused by the platform raising and lowering without a control action when a load is placed on or removed from the platform, thus varying the pneumatic pressure in the cylinder.

5.9.8 All pneumatically driven lifting tables shall be equipped with a pipe-break protection device to prevent unintentional lowering of the platform to 100 mm where the rated downward speed of the platform is exceeded.

5.9.9 Where pipe rupture valves are used to stop the platform on pneumatic multi-cylinder driven lifting tables, it shall be impossible for any pneumatic cylinder to be over loaded by more than 100 % of the maximum working pressure (e.g. by use of a balance system) multiplied by the dynamic factor according to the lift category (see Table 2).

This pipe rupture valve need not be fixed directly to the cylinder if between the valve and cylinder only rigid steel pipe with "security swaged" fittings or similar connections are used

When the lifting table is lifted by more than one cylinder, if one cylinder fails, other cylinders shall be able to support the lifting table with its nominal load without failure, but it is not required that they are able to lift the platform.

5.9.10 Under failure conditions the level of the platform shall be maintained to a maximum tilt of 5°.

5.9.11 Where descent due to pneumatic leak could produce a hazard for persons, e.g. where the elevated platform forms part of a floor, safety devices (e.g. a normally closed pneumatic valve(s) in the pneumatic system which opens only under control) shall be fitted to prevent uncontrolled descent.

5.9.12 Lifting tables which are designed to be used at a temperature below 10 °C shall be designed so that ice formation is prevented.

5.10 Electrical system

5.10.1 General

The electrical installation and equipment of lifting tables shall conform to the requirements of EN 60204-1.

5.10.2 IP code

The IP code according to EN 60529 shall be at least IP54. Components in systems less than 48 V do not need to meet this specification if disconnection or malfunction does not lead to an unsafe situation.

5.11 Safety devices

5.11.1 All safety devices shall be designed so that they cannot be rendered inoperative by simple means (e.g. insertion of a wedge or block).

5.11.2 For drives other than hydraulic or pneumatic, end of travel limit switches shall be provided at the upper end of the travel of the platform and shall be set to operate as close as possible to the upper terminal stop.

End of travel limit switches shall be either mechanically actuated with positive opening contacts (see EN 60947-5-1) or proximity switches with defined behaviour under fault conditions (see EN 60947-5-3). They shall, when operated, cause the lifting table to stop and remain stopped.

6 Verification of the safety requirements and/or measures

6.1 General

Table 4 indicates the method(s) by which the safety requirements and measures described in Clause 5 shall be verified, together with a reference to the corresponding sub-clauses in this European Standard.

The test shall consist of 6.2, 6.3, 6.4, 6.5 and 6.6. Where the lifting table is assembled on site, testing shall consist of 6.7.

The result of the examinations and tests shall be documented in a report.

Table 4 — Means of verification of the safety requirements and measures

Subclause	Safety requirements and measures	Inspection	Function test	Measurement
5.1.2.7	Deflection		X	
5.1.3	Stability		X	
5.2.1	Crushing and shearing			X
5.2.2.2	Screens	X		
5.2.2.2.1	Accessibility	X		
5.2.2.2.2	Removable guards	X	X	
5.2.2.2.3	Screen properties	X		X
5.2.2.2.4/5.2.2.2.5	Screens for travel above 1,6 m	X		X
5.2.2.2.1/5.2.2.2.2	Liftway barriers	X		X
5.2.2.4	Deflectors			X
5.2.2.5	Trip device		X	X
5.2.2.6.1/5.2.2.6.2	Flexible guards	X		X
5.2.3	Gaps			X
5.2.4	Foot clearance			X
5.2.5	Moving parts surface	X		
5.2.6	Entanglement	X		
5.2.7	Nip points	X		
5.2.9	Prevention of falling from platform	X		X
5.2.10	Requirements for guard rails	X		X
5.2.11	Gates and doors		X	X
5.2.12.1	Goalpost			X
5.2.12.2	Landing barriers		X	X
5.2.12.3	Interlocked gates		X	
5.2.12.4	Roller shutters		X	
5.2.12.5	Locking zone		X	X
5.2.12.6	Landing clearance			X
5.2.12.7	Gate surface	X		
5.2.13.1	Connecting plates clearance			X
5.2.13.2	Unassisted connecting plates		X	X
5.2.13.3	Assisted connecting plates		X	X
5.2.13.4	Powered connecting plates		X	X
5.2.13.5	Underside protection of connecting plates	X		
5.2.13.6	Connecting plate locking		X	

5.2.13.7	Falling from connecting plate	X		
5.2.14	High temperatures	X		
5.2.15	Blocking device	X	X	
5.2.16	Retractable outriggers		X	
5.2.17	Programme controlled lift tables		X	
5.2.18	Over speed protection		X	
5.3.1	Vertical speed			X
5.3.2	Horizontal speed			X
5.3.3	Peripheral speed			X
5.3.4	Speed of lifting tables, safe by position			X
5.4.1	Anti slip platform	X		
5.4.2	Load security		X	
5.4.3	Emergency lowering device		X	
5.4.4	Turntable lock	X		
5.5.1	Operators position	X		
5.5.2	Hold to run controls		X	
5.5.3	Unauthorized use	X		
5.5.4	Control mode		X	
5.5.5	Unintentional operation	X		
5.5.6	Alternative controls		X	
5.5.7	Stop controls	X		
5.5.8	Tilting platform	X		
5.5.9	Unintentional operation		X	
5.5.10	Entrapment	X		
5.6.1	Mobile manual lifting table brake		X	
5.6.2	Self propelled mobile lifting table		X	
5.6.3	Starting self propelled lifting tables		X	
5.6.4	Pushing handles	X		
5.6.5	Wheel guards			X
5.6.6	Alternative wheel guard			X
5.6.7	Tow bar	X		
5.6.8	Rail mounted lifting tables	X		
5.6.9	Rail cleaning	X		
5.6.10	Track retainers	X		
5.6.11	Audible warning for mobile lifts		X	
5.6.12	Manual effort for mobile lifts			X

5.7.1	Ropes drives	X		X
5.7.2	Chain drives	X		X
5.7.3	Screw drives	X		
5.7.4	Rack and pinion	X		
5.7.5	Flat belt drives	X		
5.7.6	Toothed belt drives	X		
5.7.7	Manually driven drives	X		X
5.7.8	Additional requirements	X	X	
Ⓐ 5.8.1/5.8.2/5.8.3 Ⓐ	Hydraulic system	X		
5.8.4	Load control		X	
5.8.5	Anti-drain	X		
5.8.6	Pressure measurement	X		
5.8.7	Pipe-break protection		X	
5.8.9	Fluid level	X		
5.8.10	Uncontrolled movement, hydraulic		X	
5.8.11	Manual effort			X
5.9.1	Pneumatic system	X		
5.9.3	Maximum pressure	X		
5.9.4	Pipe pressure	X		
5.9.5	System pressure control		X	
5.9.6	System pressure measurement	X		
5.9.7	Uncontrolled movement		X	
5.9.8	Pipe-break protection		X	
5.9.9	Cylinder overload		X	
5.9.10	Platform tilt			X
5.9.11	Uncontrolled pneumatic movement,		X	
5.9.12	Low temperature	X		
5.10	Electrical system	X		
5.11.1	Safety device blocking	X		
5.11.2	Upper level limit	X	X	

6.2 Design check

The design check shall verify that one type of lifting table has been designed in accordance with this standard. It shall be checked that:

- a) the drawings give the main dimensions of the lifting table;
- b) description of the lifting table with the necessary information about its capabilities;

- c) information is given concerning the manufacturing processes (e.g. welding), materials and proprietary components used;
- d) diagrams of the hydraulic, pneumatic and electrical circuits are available;
- e) the instruction manual is complete.

The documents shall give all the necessary information to enable:

- f) the structural calculations to be checked;
- g) the stability calculations to be checked.

6.3 Manufacturing check

The manufacturing check shall verify that:

- a) the lift table has been manufactured in accordance with the checked documents and drawings;
- b) required test certificates are available (e.g. for wire ropes, chains);
- c) all welding has been carried out by a qualified welder according to the drawings and specifications.

6.4 Visual inspection

It shall be visually checked that:

- a) all the markings specified in Clause 7 have been affixed to the lifting table;
- b) the lifting table is in accordance with all the documentation provided by the manufacturer.

6.5 Practical tests

Practical tests shall be carried out as described in Annex C.

6.6 Electrical tests

The electrical tests shall be carried out in accordance with EN 60204-1, where applicable.

6.7 Individual final verification before putting into service

Where the lifting table is assembled on site, verification shall show that the lifting table satisfies the safety requirements of this standard. This verification shall be made in accordance with Annex C at the place of use before the lifting table is put into service, and a record made of the results.

7 Information for use

7.1 General

The manufacturer shall provide with each lifting table such information as to enable its safe use, installation and maintenance (see EN ISO 12100).

All labels, notices and operating instructions shall be legible and readily understandable (if necessary aided by signs or symbols). They shall be untearable, of durable material, and permanently fixed, (e.g. metal or plastic

stuck or riveted to the table). They shall be in a visible, readable position and written in the language of the country where the lifting table is to be installed.

7.2 Marking

7.2.1 All lifting tables shall have a warning notice permanently fixed, in letters at least 15 mm high, as follows:

DO NOT ENTER UNDER THIS PLATFORM UNLESS IT IS MECHANICALLY LOCKED

Together with the pictogram F2.

7.2.2 Lifting tables which are designed to carry operators, shall clearly exhibit a notice prohibiting carriage of passengers, see EN 61310-1, -2 and -3.

7.2.3 Fully manually operated lifting tables with outriggers, shall have a warning notice stating that the outriggers shall be correctly set before lifting or lowering.

7.2.4 For lifting tables a warning notice shall be provided stating "Danger. Do not put hands or feet under the platform", with the appropriate pictogram (see Annex F).

7.2.5 Lifting tables which are not designed to carry persons shall be clearly marked with a notice and/or a symbol prohibiting this (see Annex F).

7.2.6 Systems with an accumulator shall have a warning label on the accumulator e.g. "Caution: Disconnect from the system or depressurize before maintenance".

7.3 Signs

7.3.1 The direction of movement shall be marked with pictograms or other easily recognizable signs on, or alongside, all control buttons, levers and hand-wheels (see Annex D).

7.3.2 Each lifting table shall be provided with a clear instruction of the method necessary to safely isolate all the power sources to the lifting table.

7.3.3 All lifting tables shall be marked with the following information preferably on a single plate:

- a) rated load and distribution;
- b) designation of machinery (e.g. lifting table);
- c) manufacturers business name and full address;
- d) series or type;
- e) serial number (if any);
- f) IP code;
- g) lift category according to Table 2 of 5.1.2.4;
- h) year of construction (the year in which manufacture was completed).

This information described in 7.3.3 shall be written in one of the official Community languages, and not necessarily in the language of the country where the lifting table is to be installed.

7.3.4 Mobile or movable lift tables shall be marked with their own mass (self weight).

7.3.5 Lifting tables operated by an external hydraulic or pneumatic supply shall be marked with the maximum operating pressure.

7.3.6 All electrically operated lifting tables shall be clearly and permanently marked with the permissible supply voltage and the nominal power in kilowatt.

7.3.7 The rated load and the permitted number of operators of operator controlled lifting tables shall be clearly and permanently marked on the working platform of the actual machine and should be readable from the control position(s).

7.4 Accompanying documents

7.4.1 Instructions for use

7.4.1.1 General

The manufacturer shall supply with each lifting table a set of instructions sufficient for the safe operation of the lifting table, in a language of the country where the lifting table is to be installed. The words "Original instructions" shall appear on the language version(s) verified by the manufacturer or his authorised representative. Where no "Original instructions" exist in the official language(s) of the country where the lifting table is to be used, a translation into that/those language(s) shall be provided by the manufacturer or his authorised representative or by a person bringing the lifting table into the language area in question. The translation shall bear the words "Translation of the original instructions".

These operating instructions shall include;

- a) all the notices installed on or at the lifting table;
- b) the intended use of the lifting table, together with warning against common misuses;
- c) loading conditions and distribution;
- d) commissioning and de-commissioning instructions;
- e) operation of the controls and the emergency stop device (in 5.5.7) with a statement that after an emergency stop device has been operated the reason for the operation shall be investigated before continuing to operate the lifting table;
- f) safety conditions for opening of the barrier gates where applicable;
- g) the lift category according to 5.1.2.4, Table 2;
- h) loading and securing the load, including possible misuses;
- i) details of the safety devices;
- j) instructions for moving the lifting table, where applicable, including the use of personal protective equipment, i.e. safety shoes, when moving manually;
- k) procedure in the event of a malfunction;
- l) the intended environment use.

7.4.1.2 These instructions shall mention the residual hazards present during the use of the lifting table, e.g. risks when handling heavy loads, or related to intensive load handling on mobile tables, or to excessive forces needed to move mobile tables where floor conditions are poor.

7.4.1.3 A statement that only authorized operators are allowed to operate the lifting table.

7.4.1.4 The installation instructions shall state that after the excess speed device (in 5.2.18) has operated, the reason for the operation shall be investigated before continuing to operate the lifting table.

7.4.1.5 If a turntable is fitted, the instruction manual shall include the method of operating and of locking this turntable.

7.4.1.6 The instructions shall include instructions as to the measures to be taken if permanent deformation occurs in a safety gear after operation, e.g. replacement of the part, removal of burr, etc.

7.4.2 Instructions for installation

7.4.2.1 General

The manufacturer shall supply with each lifting table a set of instructions for the safe assembly, installation and dismantling of the lifting table.

These instructions shall mention the residual hazards present during the use of the lifting table, e.g. risks when handling heavy loads, or related to intensive load handling on mobile tables, or to excessive forces needed to move mobile tables where floor conditions are poor.

NOTE It is assumed in this standard that lifting tables operate on substantially firm, smooth, even and prepared surfaces.

7.4.2.2 A statement that a notice shall be permanently fixed in a visible position at the control position(s), stating that only authorized persons are allowed to operate the lifting table (see 7.2.2).

7.4.2.3 The installation instructions shall state that during installation care should be taken to avoid mounting the lifting table in a position where the noise of the table is magnified.

7.4.2.4 The installation instructions shall require that the user assesses the possible hazards of overloading the lifting table and takes appropriate measures.

7.4.2.5 The installation instructions shall state the need to comply with the applicable Building and Safe Use Regulations.

7.4.2.6 The installation instruction shall give the characteristics of the supports, anchors and characteristics of the tracks where appropriate.

7.4.2.7 The installation instructions shall state that the rated load of operator controlled lifting tables shall be clearly and permanently marked on the load carrying platform and should be easily readable from the control position(s).

7.4.2.8 A statement that all emergency stop devices shall clearly identify to which lifting table they belong.

7.4.2.9 These instructions shall include a list of the excluded machines environments, etc. as given in 1.4 and 1.5 of this standard.

7.4.2.10 The installation instructions shall specify the safety clearances needed between the moving parts of the lifting table and any adjacent walls or other objects, either fixed or moving (see 5.2).

7.4.2.11 The instructions shall include the need to site the control position in accordance with 5.5.1.

7.4.2.12 These instructions shall state the need to comply with 5.5.7, the positioning of emergency stop controls and 7.4.2.8 to clearly identify which lifting table they belong.

7.4.2.13 The installation instructions shall state the need for the emergency lowering valve to be positioned to give the operator full control and visibility over the platform at all times.

7.4.2.14 These instructions shall specify that the acoustic warning device (as required in 5.8.4.2) shall be set or adjusted to a level at least 75 dB(A) and at least 10 dB higher than the surrounding noise level, without exceeding 110 dB(A).

7.5 Instructions for maintenance and inspection

7.5.1 General

The manufacturer shall supply with each lifting table a set of instructions sufficient to inspect, maintain and repair the lifting table safely including access methods and replacement periods of parts.

The instructions for use shall include a logbook, if not supplied separately in which is contained the preventive maintenance operations required to be carried out by the user and their periodicity.

7.5.2 Full instructions shall be given as to the measures to be taken if permanent deformation occurs in a safety gear after operation, e.g. replacement of the part, removal of burr, etc.

7.5.3 These instructions shall state that any replacement parts required for the lifting table shall be obtained from the original manufacturer of the lifting table or be at least of equivalent quality and safety if original parts are not available.

7.5.4 The maintenance instructions shall include the specifications of the replacement hydraulic hoses used on the lifting table.

7.5.5 The maintenance instructions of hydraulically actuated lifting tables shall include the type and characteristics of the hydraulic fluid recommended for the system (not solely by the manufacturer's trade name).

7.5.6 The maintenance instructions of hydraulically actuated lifting tables shall include a warning against the possible leakage of hydraulic fluid and the possible consequences.

7.5.7 The maintenance instructions of hydraulically actuated lifting tables shall include the method of installing the pressure gauge required in 5.8.6.

7.5.8 A statement that when a major repair or replacement to a load supporting member of the lifting table has been carried out it shall be re-tested according to Annex C.

7.5.9 The maintenance instructions shall include a recommended lubrication schedule and drawing showing lubrication points.

7.5.10 The maintenance instructions should include a recommended list of items and areas to be examined during the periodic inspection.

7.5.11 Electrical and hydraulic/pneumatic circuit diagrams, sufficient for safe maintenance, shall be supplied where applicable.

Annex A (informative)

Overloading

The requirements of a load control device for these lifting tables cannot be fully met in this standard.

The examples given in Table A.1, show that in the majority of cases, hazards cannot be fully avoided by using a load control device.

For hydraulic and pneumatic lifting tables pressure relief valves (see 5.8.4 and 5.9.5) can prevent excessive overload when lifting loads from "down" position.

This pressure normally varies during the ascent and cannot be used as an accurate, and all height, load control device.

With the present "state of art" an accurate, cost effective and reliable load control device for all positions is not available.

The instructions for use delivered with each lifting table include information on the rated load and the method of loading and securing this load.

Since many lifting tables are series production models, the final use of which is not known by the manufacturer, the "information for use" contains requirements concerning the residual risk of overloading.

Table A.1 — Analysis of possible overload situations of lifting tables and the effect of a load control device

A1

	Situation of lifting table				
	Stationary down	Lifting from down	Stationary up at fixed landing ^a	Lowering from upper fixed landing	Lowering from raised position (other than landing)
Consequences of overload	Possible platform damage	Structural damage	Structural damage	Structural damage	Structural damage
Effect of load control device	No effect	Prevents overload	Warning to operator	Warns operator and prevents movement	No effect
Clause in this standard	No device possible	5.8.4.1	5.8.4.2	5.8.4.2	No device possible

^a The overload device for lifting tables which are mechanically locked when at a raised landing can sense any overload only when the platform is not supported by the locking device.

A1

Annex B (normative)

Noise

Generally noise is not considered to be a significant hazard for this type of machinery.

Therefore, there is no special test method for noise in this standard.

This does not absolve manufacturers of machines with a noise emission exceeding the criteria of the Machinery Directive of the responsibility to provide information about the noise emission in the information for use of the machine.

Any lifting table that produces a noise emission value of more than 70 dB(A) measured at 1,0 m from the major noise source shall have this measured value specified in the manual.

The uncertainty of measurement shall be mentioned and the operating conditions of the machine while under measurement and the measuring method shall be described.

If this value does not exceed 70 dB(A) this fact should be stated in the manual (see 7.4.2.14).

Annex C (normative)

Test procedures

C.1 Practical testing procedure

- a) Check the correct function of the controls.
- b) Check that the emergency stop and other safety devices (if fitted) are correctly functioning.
- c) Operate the unloaded lift table through one complete cycle.
- d) Place the rated load distributed as specified by the manufacturer, on the lifting platform and operate the lifting table through one complete cycle (where applicable record the maximum operating pressure). When the lifting table is not designed for a specific loading, requirements of 5.1.2.7 shall be verified.
- e) Record the time taken to raise the platform through its full travel while carrying the rated load, and the time taken to lower the platform through its full travel also while carrying the rated load.
- f) Leave the platform, still carrying the rated load, fully raised for 10 min. Measure and record the vertical creep of the platform in this time. This creep shall not exceed 5 mm.
- g) Engage the maintenance blocking device under the platform carrying the rated load and check that it supports the rated load.
- h) Increase the rated load by a dynamic test coefficient of 1,1 and operate through 1 complete cycle.
- i) Set and test the load limiting device to lift not more than 110 % of the rated load and lock the device against unauthorized adjustment.
- j) Raise the platform to the position of maximum stress on the structure and further increase the rated load to produce the static test coefficient of 1,25.

If various parts of the structure or load-bearing members reach maximum stress at different heights this test shall be repeated at each of these heights.

This test is a static test only and it is not necessary to move the platform under this overload.

- k) After removing all loads visually check (by normal vision) all parts of the lifting table for any deformation or damage.
- l) Check satisfactory operation of braking or holding devices according to the design, where fitted (5.6.2).
- m) Check all ancillary equipment for satisfactory operation, including interlocks where fitted.
- n) Show that overturning conditions are satisfied in accordance with 5.1.3.1 and 5.1.3.4 for mobile lifting tables.

Annex D **(informative)**

Controls

D.1 General

In Figures D.1 to D.8 the following nomenclature applies:

- 1) down;
- 2) up.

This annex shows some examples whereby the requirements of 5.5.3, 5.5.4 and 5.5.5 can be fulfilled.

D.2 Requirements according to 5.5.3

- a) a safety switch with a key that can only be taken out after the lifting table has stopped; or
- b) a push-button that locks automatically and can only be released with a security key; or
- c) an interlockable main switch in accordance with 5.3.2, letter a, b or c of EN 60204-1:2006.

D.3 Requirements according to 5.5.4

This requirement can be fulfilled as follows:

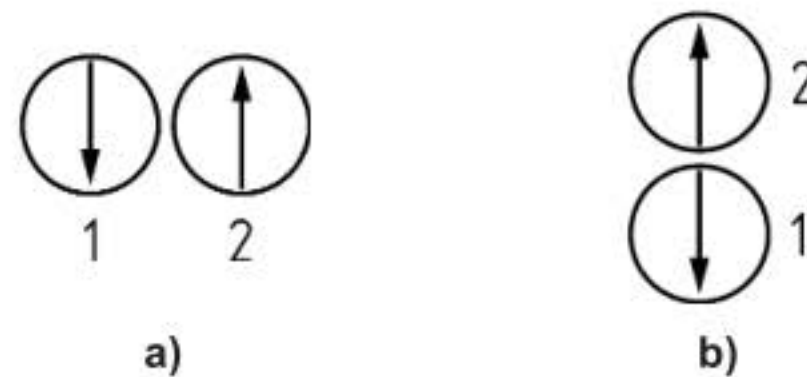
- a) where buttons are used, if the button for the raising movement is positioned above or to the right of the button for the lowering movement (see Figure D.1);
- b) where foot operated buttons are used, if the button for the raising movement is positioned to the right of the button for the lowering movement (see Figure D.2);
- c) where horizontal levers are used:
 - 1) if upward movement of the lever generates the raising movement and the downwards movement of the lever generates the lowering movement (see Figure D.3);
 - 2) if the movement of the lever to the right generates the raising movement and the movement of the lever to the left generates the lowering movement (see Figure D.4).
- d) where vertical levers are used, if the movement of the lever towards the operator generates the raising movement and the movement of the lever away from the operator generates the lowering movement (see Figure D.5);
- e) where pedals are used, if the pedal for the raising movement is on the right and the pedal for the lowering movement on the left (see Figure D.6);
- f) where hand wheels are used, if turning the wheel to the right starts the raising movement and turning it to the left starts the lowering movement (see Figure D.7);

- g) all other methods of control shall use the same principles as above.

D.4 Requirements according to 5.5.5

This requirement can be fulfilled as follows:

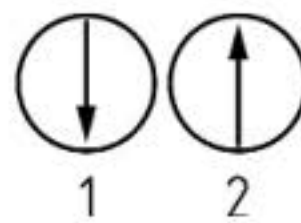
- a) Push-buttons: The button should not be larger than is necessary for it to be operated by one finger of a hand wearing a protective glove. With the exception of the emergency stop control a ring shall surround the button, with minimal clearance, and no part of the button should protrude above the ring.
- b) Foot operated buttons: The space above the button should be completely covered. The distance between the button and the cover shall be approximately 70 mm. A rectangular tubular section approximately 15 mm high should surround the button to protect it from access to the sides (see Figure D.8).
- c) Hand levers: An unlocking action should be necessary before operation.
- d) Hand wheels: Hand wheels should be round, solid and have no burrs or sharp edges.



Key

- 1 down
2 up

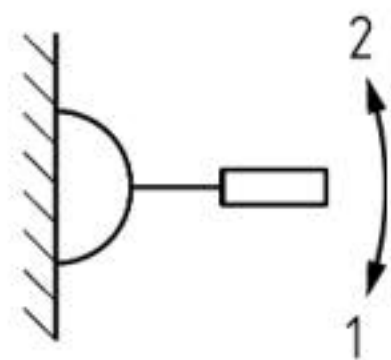
Figure D.1 — Arrangement of buttons



Key

- 1 down
2 up

Figure D.2 — Arrangement of foot operated buttons

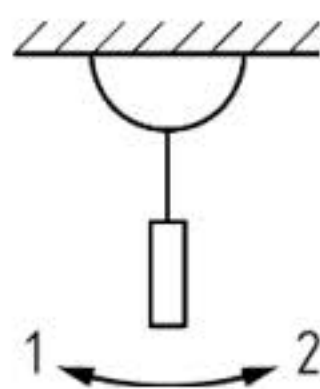


Key

1 down

2 up

Figure D.3 — Up and down movement of horizontal levers

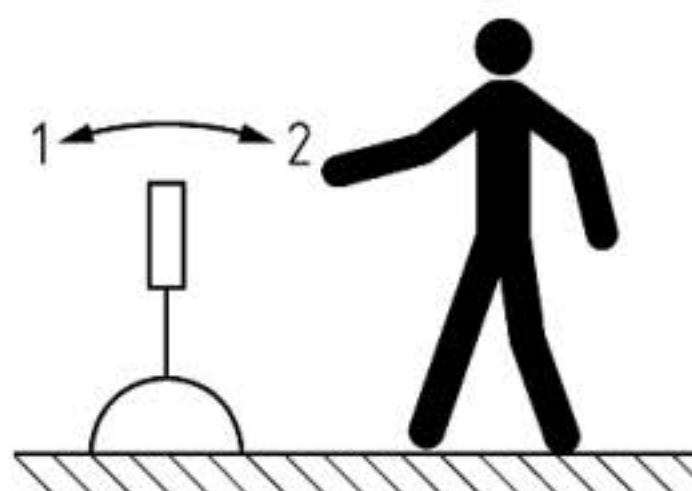


Key

1 down

2 up

Figure D.4 — Left and right movements of horizontal levers

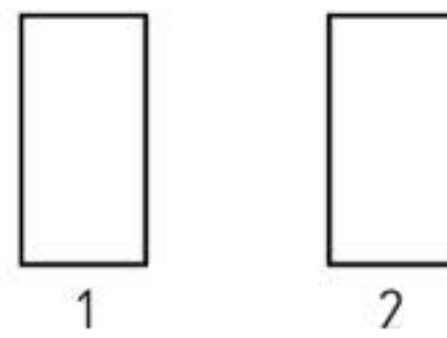


Key

1 down

2 up

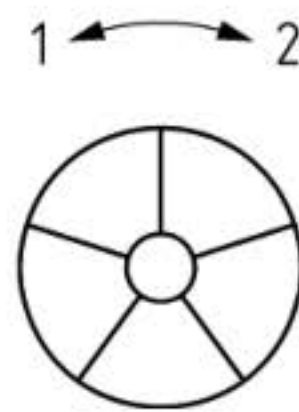
Figure D.5 — Movement of vertical levers



Key

- 1 down
- 2 up

Figure D.6 — Arrangement of pedals



Key

- 1 down
- 2 up

Figure D.7 — Movement of hand wheels

Dimensions in millimetres

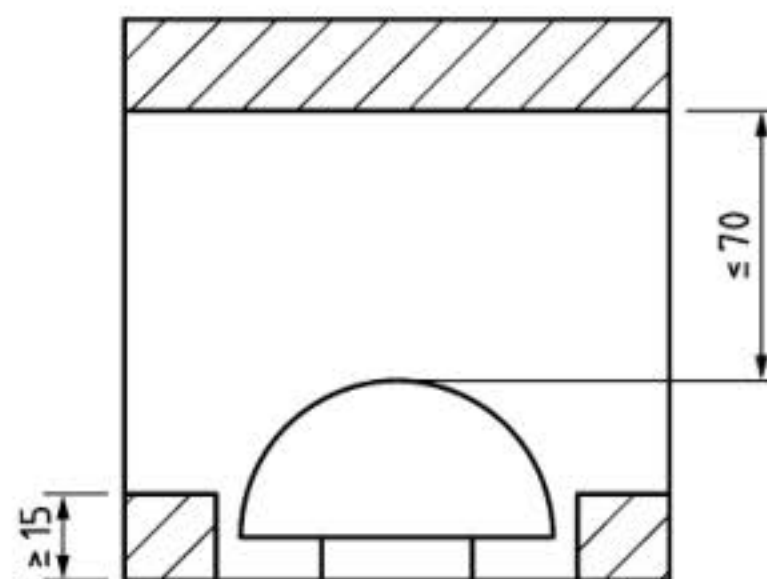
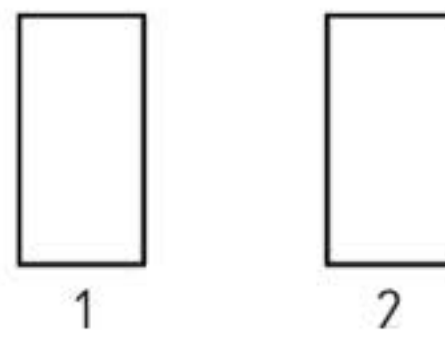


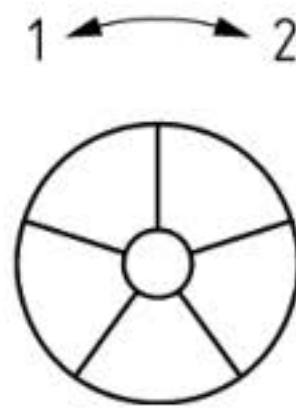
Figure D.8 — Covering of foot operated buttons



Key

- 1 down
- 2 up

Figure D.6 — Arrangement of pedals



Key

- 1 down
- 2 up

Figure D.7 — Movement of hand wheels

Dimensions in millimetres

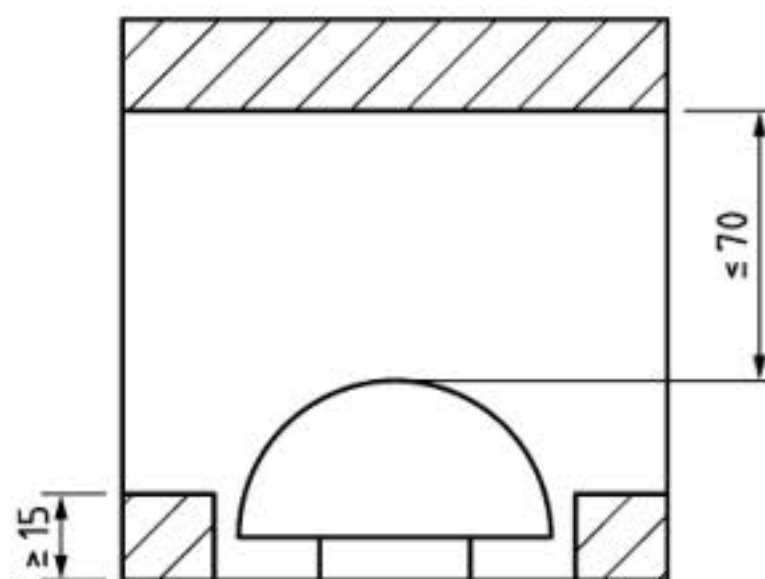


Figure D.8 — Covering of foot operated buttons

Annex E (normative)

Manual force measurement methods

E.1 Driving the lifting table

E.1.1 Maximum allowed forces for mobile lifting tables

The maximum manual forces required for mobile lifting tables operations shall not exceed the figures shown in 5.6.12.

E.1.2 Conditions for test

The tests shall be carried out with a new lifting table on a smooth, dry, level, trowelled finish concrete floor in good condition. The tests shall be carried out in an ambient temperature of between 15 °C and 28 °C. The measuring instrument used shall have a range of error of $\pm 3 \%$.

The forces required are measured in accordance with the methods described below. Two tests in both the forward and reverse directions shall be carried out and the average result recorded.

E.1.3 Measurement of starting force and rolling force

With the unloaded lifting table in starting position and stationary, the wheels are positioned in the direction that they naturally take when moving the table in the test direction.

The force shall be applied horizontally along the table's axis, on the handle or bar in the test direction.

E.1.4 The maximum starting force

The force necessary to start the table rolling shall be measured.

E.1.5 The maximum rolling force

The force necessary to maintain the table at a stabilized speed of 0,5 m/s shall be measured.

E.1.6 Average forces

The starting force or the rolling force is the average of the maximum values measured in each direction of travel, forward and reverse, during two successive tests.

E.2 Lifting and lowering

E.2.1 Hand or foot forces

The handle or foot pedal is actuated as many times as necessary to raise the fully loaded platform to its maximum height.

The maximum force value is measured perpendicularly to the handle or pedal during each pumping cycle.

Annex E (normative)

Manual force measurement methods

E.1 Driving the lifting table

E.1.1 Maximum allowed forces for mobile lifting tables

The maximum manual forces required for mobile lifting tables operations shall not exceed the figures shown in 5.6.12.

E.1.2 Conditions for test

The tests shall be carried out with a new lifting table on a smooth, dry, level, trowelled finish concrete floor in good condition. The tests shall be carried out in an ambient temperature of between 15 °C and 28 °C. The measuring instrument used shall have a range of error of $\pm 3 \%$.

The forces required are measured in accordance with the methods described below. Two tests in both the forward and reverse directions shall be carried out and the average result recorded.

E.1.3 Measurement of starting force and rolling force

With the unloaded lifting table in starting position and stationary, the wheels are positioned in the direction that they naturally take when moving the table in the test direction.

The force shall be applied horizontally along the table's axis, on the handle or bar in the test direction.

E.1.4 The maximum starting force

The force necessary to start the table rolling shall be measured.

E.1.5 The maximum rolling force

The force necessary to maintain the table at a stabilized speed of 0,5 m/s shall be measured.

E.1.6 Average forces

The starting force or the rolling force is the average of the maximum values measured in each direction of travel, forward and reverse, during two successive tests.

E.2 Lifting and lowering

E.2.1 Hand or foot forces

The handle or foot pedal is actuated as many times as necessary to raise the fully loaded platform to its maximum height.

The maximum force value is measured perpendicularly to the handle or pedal during each pumping cycle.

The maximum force value is the average of the maximum values measured at each handle or pedal cycle during one complete lifting.

Annex F
(informative)

Signs



Figure F.1 — Hands and feet prohibition notice
(see 7.2.4)



Figure F.2 — Person prohibition sign (see 7.2.1)



Figure F.3 — Persons prohibited from riding on
platform (see 7.2.5)

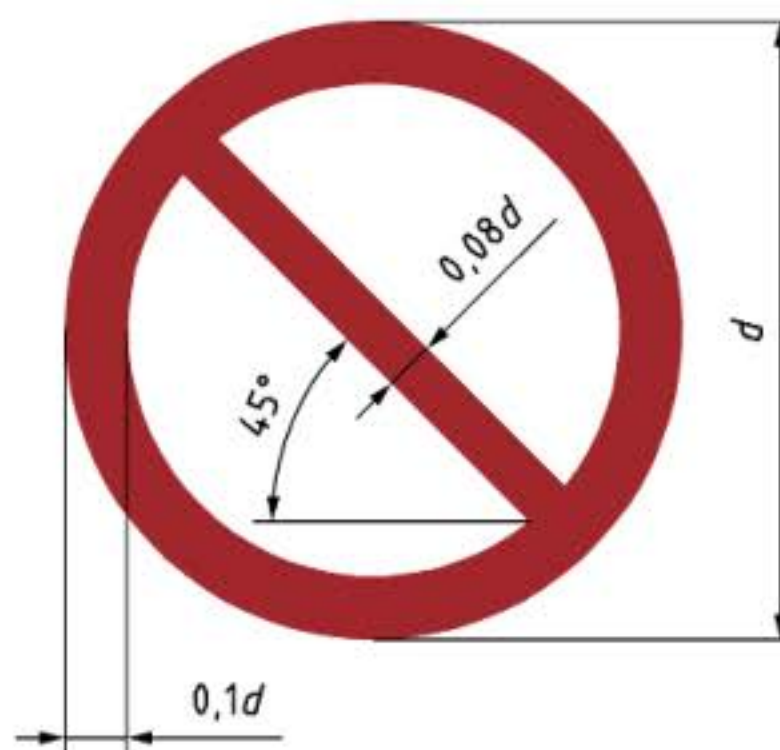


Figure F.4 — Layout for prohibition sign

Annex ZA (informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Annex ZA (informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC

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