BRITISH STANDARD

BS EN 1570:1999
Incorporating Amendment No. 1

Safety requirements for lifting tables

The European Standard EN 1570:1998, with the incorporation of amendment A1:2004, has the status of a British Standard

ICS 53.020.99

BSI British Standards

National foreword

This British Standard is the official English language version of EN 1570:1998, including amendment A1:2004. It supersedes Code of practice for Scissors lifts BS 5323:1980, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee MHE/12, Lifting tables, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

The start and finish of text introduced or altered by amendment is indicated in the text by tags [A1] ⟨A1⟩. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by [A1] ⟨A1⟩.

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

Cross-references

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English version

Safety requirements for lifting tables

(including amendment A1:2004)

Prescriptions de sécurité des tables élévatrices (inclut l'amendment A1:2004)

Sicherheitsanforderungen an Hubtische (enthält Änderung A1:2004)

This European Standard was approved by CEN on 7 May 1998. Amendment A1:2004 was approved by CEN on 7 June 2004.

CEN

European Committee for Standardization
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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 98, Lifting platforms, 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of an identical text or by endorsement, at the latest by November 1998, and conflicting national standards shall be withdrawn at the latest by November 1998.

This European Standard 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 standard.

Normative Annex C and Annex D give test procedures.

Any standards that are published after January 1996 are not referred to in this standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Foreword to amendment A1

This document (EN 1570:1998/A1:2004) has been prepared by Technical Committee CEN/TC 98 Lifting platforms, the secretariat of which is held by DIN.

This Amendment to the European Standard EN 1570:1998 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at latest by February 2005, and conflicting national standards shall be withdrawn at the latest by February 2005.

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

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

Contents

Introduction

This standard is a Type C standard as stated in EN 292.

This standard has been prepared to be a harmonized standard to provide one means of conforming with the Essential Safety Requirements of the Machinery Directive and associated EFTA Regulations.

The extent to which hazards are covered is indicated in the scope of this standard. In addition, lifting tables should comply as appropriate with EN 292 for hazards which are not covered by this standard.

Where, for clarity, an example of a safety measure is given in the text this shall not be considered as the only possible solution. Any other solution leading to the same risk reduction is permissible if an equivalent level of safety is achieved.

While producing this standard it was assumed that 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.

While producing this standard, it was assumed that only trained persons operate the lifting tables and that the working area is adequately lit.

While producing this standard it was assumed that if the positioning of the lifting table creates a danger of falling more than 3,0 m, then the necessary external precautions to reduce this to less than 3,0 m, will be taken by the user.

1 Scope

1.1 [A1] This document specifies the safety requirements for lifting tables for raising and/or lowering goods and/or persons associated with the movement of goods carried by the lifting table (i.e. not for passenger use), for a vertical travel of up to 3,0 m. [A1]

NOTE These lifting tables are intended for the transport of goods and not for the movement of passengers.

1.2 This European Standard deals with all significant hazards pertinent to lifting tables when they are used as intended and under the conditions foreseen by the manufacturer (see Clause **4**). This European Standard specifies the appropriate technical measures to eliminate or reduce 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 document does not apply to the following equipment:

— permanently installed lifting tables, serving specific levels of a building and fitted with a car;

— permanently installed lifting tables, serving specific levels of a building, not fitted with a car but with a vertical travel of more than 2,0 m;

— power operated lifting platforms for persons with impaired mobility;

— lifting tables for airport ground equipment;

— lifting tables for marine use;

— mobile elevating work platforms;

— [A1] vehicle lifts for maintenance; [A1]

— mobile lifting tables used for fire fighting;

— mobile lifting tables used as fork lift trucks, pallet trucks and order pickers;

— mobile lifting tables with a travelling speed of more than 1,6 m/s;

— rail dependent storage and retrieval equipment;

— theatre stage lifts.

1.5 This standard does not consider the power supply to the lifting table by internal combustion engine.

This standard does not establish the additional requirements for:

— 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.

2 Normative references

This European Standard incorporates by dated or undated references, provisions from other publications. These normative references are cited at appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to, or revisions of, any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 292-1, *Safety of machinery — Basic concepts — General principles for design — Part 1: Basic terminology, methodology.*

EN 292-2, *Safety of machinery — Basic concepts — General principles for design — Part 2: Technical principles and specifications.*

EN 294, *Safety of machinery — Safety distances to prevent danger zones being reached by upper limbs.*

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

EN 414, *Safety of machinery — Rules for the drafting and presentation of safety standards.*

EN 418, *Safety of machinery — Emergency stop equipment, functional aspects — Principles for design.*

EN 563, *Safety of machinery — Temperatures of touchable surfaces — Ergonomics data to establish temperature limit values for hot surfaces*

EN 811, *Safety of machinery — Safety distances to prevent danger zones being reached by the lower limbs.*

EN 954-1, *Safety of machinery* — Safety related parts of control systems — Part 1: General principles for design.

EN 982, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics.*

EN 983, *Safety of machinery — Safety requirements for fluid power systems and their components — Pneumatics.*

[A1] EN 1050, *Safety of machinery — Principle for risk assessment.* [A1]

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

EN 1760-1, *Safety of machinery — Pressure sensitive devices — Part 1: General principles for the design and testing of pressure sensitive mats and pressure sensitive floors.*

[A1] *Text deleted* [A1]

EN 60204-1:1992, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements* (IEC 204-1:1992).

EN 60529, *Degrees of protection provided by enclosures* (*IP Code*) (IEC 529:1989).

ISO 606, *Short-pitch transmission precision roller chains and chain wheels.*

ISO 2408, *Steel wire ropes for general purposes — Characteristics.*

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.*

3 Definitions

For the purposes of this standard the following definitions apply:

3.1
lifting table
load lifting device with a load supporting platform guided throughout its travel (e.g. guided by its own mechanism.)

3.2
fixed lifting table
a lifting table where the place of installation is not intended to be changed

3.3
moveable lifting table
a lifting table installed so that the place of installation may be readily changed

3.4
mobile lifting table
a load lifting device which is mobile by one or more integrated devices (e.g. wheels, air cushions etc.)

3.5
guided mobile lifting table
a lifting table which runs on wheels on a pre-set route, (e.g. on rails, in tracks etc.)

3.6
self-propelled lifting table
a 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 where movement takes place that is not initiated by the normal manual controls (e.g. self levelling etc.)

3.8
load platform
the part of the lifting table designed to accommodate the working load and/or persons. Fork arms are considered as a load platform for goods only

3.9
vertical travel
the vertical distance between the highest and the lowest working position for which the lifting table is designed

3.10
nominal load
the load that the manufacturer has guaranteed that the machine will lift when used in accordance with the instruction handbook

3.11
guard
part of machine specifically used to provide protection by means of a physical barrier

3.12
[A1⟩ safe by position
condition when a table or part of table is sufficiently shielded from access to avoid any hazard to persons or goods ⟨A1]

3.13
emergency stop control
that component of the emergency stop equipment which generates the emergency stop signal when the associated manual control (actuator) is operated.

3.14
operator
the person operating the lifting table

3.15
maximum working pressure
the maximum pressure in the hydraulic system under normal working conditions with rated load (normally pre-set by the pressure relief valve)

4 List of hazards

〈A1〉 The list of hazards according to the following table is based on EN 1050.

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.

Hazards are shown as "not applicable" where they are considered not to exist on lifting tables and "not significant" where they are unlikely to cause risk to persons.

Table 1

Hazard reference No	Hazards, hazardous situations and hazardous events	Clause No. in this standard
1	**Mechanical hazards** due to:	
	— Machine parts or work pieces, e.g:	
	a) shape;	**5.2.1**, **5.2.8**
	b) relative location;	**5.2.8**
	c) mass and stability (potential energy of elements which may move under the effect of gravity);	**5.1.1.7**
	d) mass and velocity (kinetic energy of elements in controlled and uncontrolled motion);	**5.1.1.6**
	e) inadequacy of mechanical strength	**5.1**
	— accumulation of energy inside the machinery, e.g;	
	f) elastic elements (springs);	**5.8.10**, **5.9.6**
	g) liquids and gases under pressure;	**5.8**, **5.9**
	h) the effect of vacuum	Not applicable
1.1	Crushing hazard	**5.2.1, 5.2.2, 5.2.3, 5.2.4, 5.2.6**
1.2	Shearing hazard	**5.2.1, 5.2.2, 5.2.3, 5.2.4, 5.2.6**
1.3	Cutting or severing hazard	**5.2.8**
1.4	Entanglement hazard	**5.2.9**
1.5	Drawing-in or trapping hazard	**5.2.10**
1.6	Impact hazard	**5.2.11**
1.7	Stabbing or puncture hazard	Not applicable
1.8	Friction or abrasion hazard	Not significant
1.9	High pressure fluid injection or ejection hazard	**5.8.3**
2	**Electrical hazards** due to:	
2.1	Contact of persons with live parts (direct contact)	**5.10.1**
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	**5.10.1, 5.10.2**
2.3	Approach to live parts under high voltage	**5.10.1, 5.10.2**
2.4	Electrostatic phenomena	Not applicable

〈A1〉

Table 1 (*continued*)

[A1]

Hazard reference No	Hazards, hazardous situations and hazardous events	Clause No. in this standard
2.5	Thermal radiation or other phenomena such as the projection of molten particles and chemical effects from short circuits, overloads, etc.	Not applicable
3	**Thermal hazards**, resulting in;	
3.1	Burns, scalds and other injuries by a possible contact of persons with objects or materials with an extreme high or low temperature, by flames or explosions and also by the radiation of heat sources	**5.2.16**
3.2	Damage to health by hot or cold working environment	Not applicable
4	**Hazards generated by noise**, resulting in;	See Annex B
4.1	Hearing loss (deafness), other physiological disorders (e.g. loss of balance, loss of awareness)	Not applicable
4.2	Interference with speech communication, acoustics signals, etc.	Not applicable
5	**Hazards generated by vibration**	
5.1	Use of hand-held machines resulting in a variety of neurological and vascular disorders	Not applicable
5.2	Whole body vibration, particularly when combined with poor postures	Not applicable
6	**Hazards generated by radiation**	
6.1	Low frequency, radio frequency radiation, micro waves	Not applicable
6.2	Infrared, visible and ultraviolet light	Not applicable
6.3	X and gamma rays	Not applicable
6.4	Alpha, beta rays, electron or ion beams, neutrons	Not applicable
6.5	Lasers	Not applicable
7	**Hazards generated by materials and substances** (and their constituent elements) processed or used by the machinery	**5.8.2, 5.8.3**, **7.2.3**
7.1	Hazards from contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	**5.8.2**, **5.8.3**, **7.2.3**
7.2	Fire or explosion hazard	Not significant
7.3	Biological or microbiological (viral or bacterial) hazards	Not applicable
8	**Hazards generated by neglecting ergonomic principles in machinery design** as, e.g. hazards from:	**5.6.4**, **5.6.11**, **5.8.11**
8.1	Unhealthy postures or excessive effort	**5.6.4**, **5.6.11**, **5.8.11**
8.2	Inadequate consideration of hand-arm or foot-leg anatomy	**5.2.1, 5.2.2**
8.3	Neglected use of personal protection of equipment	Not applicable
8.4	Inadequate local lighting	Introduction
8.5	Mental overload and underload, stress	Not applicable
8.6	Human error, human behaviour	**5.5.2**, **5.5.4**, **5.5.6**, **5.7.7**
8.7	Inadequate design, location or identification of manual controls	**5.5.1**, **5.5.3**, **5.5.4**, **5.5.5**, **5.5.6**, **5.5.7**
8.8	Inadequate design or location of visual display units	Not applicable
9	**Combination of hazards**	Not specifically dealt with
10	**Unexpected start-up, unexpected overrun/overspeed** (or any similar malfunction) from;	
10.1	Failure/disorder of the control system	**5.10.1**
10.2	Restoration of energy supply after an interruption	**5.10.1**
10.3	External influences on electrical equipment	**5.10.1**
10.4	Other external influences (gravity, wind, etc.)	**5.5.3, 5.5.4, 5.5.5**

[A1]

Table 1 (*continued*)

Hazard reference No	Hazards, hazardous situations and hazardous events	Clause No. in this standard
10.5	Errors in the software	Not dealt with
10.6	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities, see 8.6)	**5.5.3, 5.5.4, 5.5.5, 5.5.6**
11	**Impossibility of stopping the machine in the best possible conditions**	**5.5.7**
12	**Variations in the rotational speed of tools**	Not applicable
13	**Failure of the power supply**	**5.10.1**
14	**Failure of the control circuit**	**5.10.1**
15	**Errors of fitting**	**7.3**
16	**Break up during operation**	**5.1.1**, **5.7.5**, **5.8.7**, **5.9.7**, **7.1**, **7.2**
17	**Falling or ejected objects or fluids**	**5.8.1, 5.8.2, 5.8.3, 5.8.4**, **5.9.1**, **5.9.2**, **5.9.3**, **5.9.4**, **5.2.13, 5.2.14**, **7.1**
18	**Loss of stability/overturning of machinery**	**5.1.2**
19	**Slip, trip, and fall persons (related to machinery)**	**5.2.13**, **5.2.14**, **5.4.1**, **5.2.17**
	Additional Hazards, hazardous situations and hazardous events due to mobility	
20	**Relating to the travelling function**	
20.1	Movement when starting the engine	**5.6.3**
20.2	Movement without a driver at the driving position	**5.6.2**
20.3	Movement without all parts in safe position	**5.2.19**, **5.3.2**
20.4	Excessive speed of pedestrian controlled machinery	**5.3.2**
20.5	Excessive oscillations when moving	**5.3.3**
20.6	Insufficient ability of machinery to be slowed down, stopped and immobilised	**5.6.2**, **5.6.5**, **5.6.8**
21	**Linked to the work position** (including driving station) on the machine	
21.1	Fall of persons during access to (or at/from) the work position	Not dealt with
21.2	Exhaust gases/lack of oxygen at the work position	Not dealt with
21.3	Fire (flammability of the cab, lack of extinguishing means)	Not dealt with
21.4	Mechanical hazards at the work position:	
	i) Contact with the wheels;	**5.6.5**
	j) Rollover;	**5.1.2.1**
	k) Fall of objects, penetration by objects;	**5.2.13, 5.2.14**
	l) Break-up of parts rotating at high speed;	Not dealt with
	m) Contact of persons with machine parts or tools (pedestrian controlled machines).	**5.2.11**
21.5	Insufficient visibility from the work positions	**5.5.1**
21.6	Inadequate lighting	Introduction
21.7	Inadequate seating	Not applicable
21.8	Noise at work position	Annex B Not Dealt with
21.9	Vibration at the work position	Not applicable
21.10	Insufficient means for evacuation/emergency exit	Not applicable
22	**Due to control system**	
22.1	Inadequate location of manual controls	**5.5.1**

Table 1 (*continued*)

[A1]

Hazard reference No	Hazards, hazardous situations and hazardous events	Clause No. in this standard
22.2	Inadequate design of manual controls and their mode of operation	**5.5.3, 5.5.4, 5.5.5, 5.6.2**
23	**From handling the machine (lack of stability)**	**7.1**
24	**Due to the power source and to the transmission of power**	
24.1	Hazards from the engine and the batteries	Not applicable
24.2	Hazards from transmission of power between machines	Not applicable
24.3	Hazards from coupling and towing	**5.6.7**
25	**From/to third persons**	
25.1	Unauthorised start-up/use	**5.5.3**
25.2	Drift of a part away from its stopping position	**5.5.2**, **5.6.1, 5.6.2, 5.6.3**
25.3	Lack or inadequacy of visual or acoustic warning means	**5.2.11**
26	**Insufficient instructions for the driver/operator**	**7.1**, **Introduction**
	Additional hazards, hazardous situations and hazardous events due to lifting	
27	**Mechanical hazards and hazardous events**	
27.1	from load falls, collisions, machine tipping caused by:	
27.1.1	lack of stability	**5.1.2.1**
27.1.2	uncontrolled loading – overloading – overturning – moments exceeded	Annex A, **5.1.2.1, 5.1.2.2** , **5.8.4**, **5.9.4**, **5.7.11, 5.7.12**, **6.9**, **6.12**
27.1.3	uncontrolled amplitude of movements	**5.5.2**
27.1.4	unexpected/unintended movement of loads	**5.4.3**
27.1.5	inadequate holding devices/accessories	**5.8.9**, **5.9.8**, **7.1**
27.1.6	collision of more than one machine	Not dealt with
27.2	from access of persons to load support	**6.10**, **6.11**
27.3	from derailment	**5.6.8**
27.4	from in sufficient mechanical strength of parts	**5.1**, **8.1.5**
27.5	from inadequate design of pulleys, drums	**5.7.1, 5.7.2, 5.7.3**
27.6	from inadequate selection of chains, ropes, lifting and accessories and their inadequate integration into the machine	**5.7.4**
27.7	from lowering of the load under the control of friction brake	**5.7.15**
27.8	from abnormal conditions of assembly/testing/use/maintenance	**7.1**, **8.1.7.1**
27.9	from the effect of load on persons (impact by loading or counterweight)	**5.2.14**, **7.1**
28	**Electrical hazards**	
28.1	from lightning	Not applicable
29	**Hazards generated by neglecting ergonomic principles**	
29.1	insufficient visibility from the driving position	**5.2.15**, **5.5.1**
	Additional Hazards, hazardous situations and hazardous events due to underground work	
30	**Mechanical hazards and hazardous events due to:**	
30.1	lack of stability of powered roof supports	Not applicable
30.2	failing accelerator or brake control of machinery running on rails	Not applicable
30.3	failing or lack of deadman's control of machinery running on rails	Not applicable
31	**Restricted movement of persons**	Not applicable
32	**Fire and explosion**	Not applicable
33	**Emission of dust, gases etc.**	Not applicable

[A1]

Table 1 (*continued*)

[A1]

Hazard reference No	Hazards, hazardous situations and hazardous events	Clause No. in this standard
Additional hazards, hazardous situations and hazardous events due to the lifting or moving of persons		
34	**Mechanical hazards and hazardous events due to:**	
34.1	inadequate mechanical strength – inadequate working coefficients	**5.1**
34.2	failing of loading control	**5.1.2**
34.3	failing of controls in person carrier (function, priority)	**5.5.2**
34.4	overspeed of person carrier	**5.3**, **5.7.5**, **5.8.7**, **5.9.7**
35	**Falling of person from person carrier**	**5.2.12, 5.2.13, 5.2.14**
36	**Falling or overturning of person carrier**	**5.1.2**
37	**Human error, human behaviour**	**6**

[A1]

5 Safety requirements

5.1 Calculations

5.1.1 *Stress*

5.1.1.1 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.

5.1.1.2 The stresses in any part of the lifting table, using the permissible stress method, under normal working conditions, shall not exceed the following:

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

b) 0,50 times the ultimate tensile stress of the material used.

5.1.1.3 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.

5.1.1.4 The minimum dynamic forces to be used for the calculations of **5.1.1.3** shall result from:

a) the total vertical load (this includes the rated load and the selfweight of the moving parts of the structure) increased by 40 % and;

b) 10 % of the rated load taken as acting horizontally at platform level, in the direction causing the maximum stress in the part being considered.

If side barriers prevent movement of the load in a particular direction this direction need not be considered.

5.1.1.5 If persons 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 person, spaced apart at 0,5 m centre to centre and placed in the most unfavourable position on the platform for stress calculations.

5.1.1.6 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.

5.1.1.7 Every lifting table shall also be designed to at least:

1) in one case lift half the rated load distributed over half the length of the platform;

2) and in another case lift one third of the rated load distributed over half the width of the platform.

In neither case shall hazardous tilting or deflection take place when used as intended by the manufacturer.

5.1.2 ***Stability***

5.1.2.1 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 worst overturning moments. 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 persons.

For this calculation the rated load shall be evenly distributed over an area of half the length times half the width of the platform, in the worst overturning position.

The "tilting edge" is to be decided by the manufacturer.

5.1.2.2 Where persons 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 persons 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.

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

5.1.2.4 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.

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

5.2 Safeguarding

5.2.1 Generally crushing and shearing shall be avoided by the following minimum gaps between moving parts and between moving and fixed parts:

— 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 As an alternative to these minimum gaps other safety measures shall be taken to avoid the operator or any other persons being endangered, e.g:

— screen;
— barriers;
— deflectors;
— non-mechanically actuated trip device complying with prEN 50100;
— mechanically actuated trip device complying with category 1 of EN 954-1;
— multiple controls requiring simultaneous operation.

Some of these examples will not be sufficient by themselves in particular cases.

5.2.3 ⟨A1⟩ In scissor type lifts the minimum safety gaps between the scissor legs and the outer scissor leg and the base frame shall be as shown in Figure 1. ⟨A1⟩

5.2.4 When lowering a minimum of free space for the feet shall be provided in accordance with Figure 2 to prevent crushing and shearing of feet.

5.2.5 Where the machine is totally enclosed by the manufacturer with an imperforate rigid guard or is "safe by position" the minimum gaps given in **5.2.1** are not necessary. If the machine is only partly enclosed by an imperforate rigid guard, then these gaps or an acceptable alternative (in accordance with **5.2.2**), shall be provided in the parts of the machine not enclosed.

If a perforate rigid guard is used then this shall comply with the requirements of standards EN 294 and EN 811.

5.2.6 If a mechanically actuated trip device is fitted to the outer edges of the platform then it is necessary to maintain only the minimum gaps for fingers inside the area safeguarded by the device.

The outer surface of the device shall be not more than 8 mm from the outer edge of the platform as shown in Figure 3.

5.2.7 Safety devices shall operate so that the moving part causing the hazard comes to a stop before injury is caused. They shall not create another hazard.

Where a mechanically actuated trip device (e.g. hanging or pivoted trip bar) is fitted to the underside of the platform, the trip device when actuated shall stop all movement 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.

It shall always be possible to raise the platform in order to clear the obstruction.

5.2.8 All moving parts and parts which pass each other or fixed structures, and which persons may contact, shall have no sharp edges, no sharp angles and no rough surfaces.

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

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

5.2.11 A1 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. A1

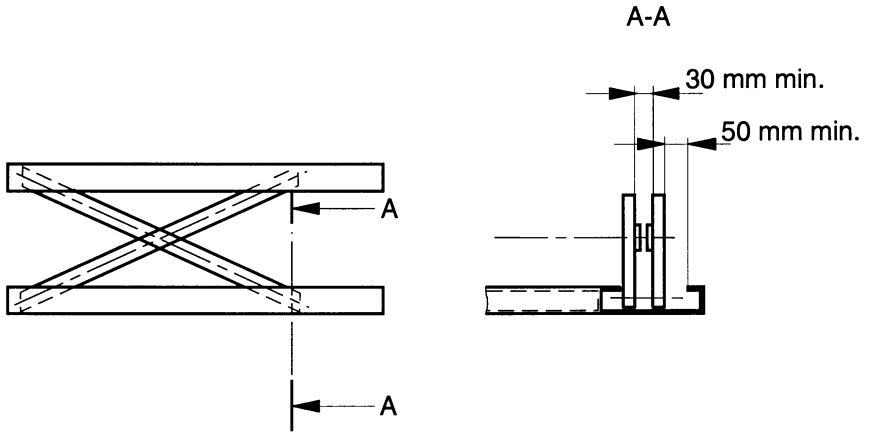


Figure 1 — Gaps between lifting table arms and base

Dimensions in millimetres

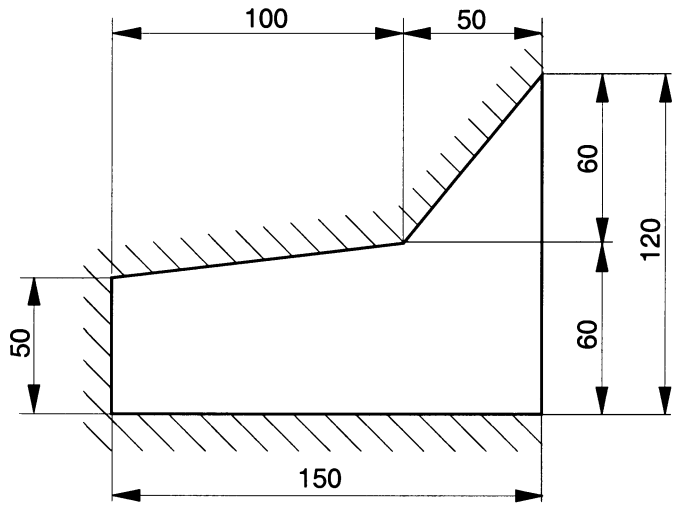


Figure 2 — Minimum foot clearances when lowering

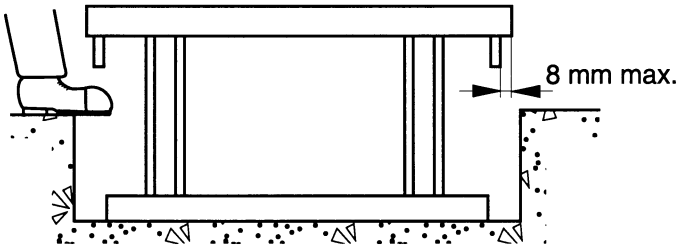


Figure 3 — Arrangement of mechanically actuated trip device

5.2.12 Lifting tables which have a fixed control point on the platform, shall have at least one standing place with an area of 0,5 m by 0,6 m, with a secure handhold for the operator. If outward opening gates are fitted they shall be automatically interlocked (e.g. electrically, pneumatically) with the control system of the vertical travel of the platform (interlocks shall be in accordance with EN 1088).

5.2.13 All lifting tables that have a vertical travel of more than 2,0 m shall be fitted with means to prevent persons or goods falling from the platform.

5.2.14 For persons these means shall, as a minimum, consist of guard-rails at least 1,1 m high, toeguards at 0,15 m high and intermediate guard-rails not further than 0,5 m from either the guard-rail or toeguards.

If gates or opening parts of the barrier are fitted, they shall be interlocked with the control system so that the platform can be moved only when the barrier is closed. Furthermore outward opening parts shall be interlocked in such a way that these parts can only be opened when the platform is in a clearly defined access position.

Goods shall be prevented from falling from the platform as described in the Instructions for Use (see **7.1**).

5.2.15 In the case of operator-carrying lifting tables where controls are mounted on the platform, safety precautions shall be taken to protect persons in the hazard area under the platform, e.g. pressure mats (complying with EN 1760-1) or the fitting of mechanically actuated trip devices together with warning notices (see **5.2.18**).

5.2.16 If any parts of the driving system (e.g. hydraulic tanks, motors etc.) are designed to operate at a temperature of above 55 °C, these parts shall be protected or positioned to avoid contact of persons.

5.2.17 A manually operated blocking device shall be fitted to all lifting tables to allow maintenance 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 from a safe position.

This requirement does not apply to lifting tables which are designed to enable all maintenance work to be carried out when the platform is fully lowered on to mechanical depth stops.

5.2.18 Lifting tables which operate in areas to which the public (especially small children) could reasonably be foreseen to have access, shall be enclosed by a rigid guard to prevent the hazard due to the descending platform. Alternatively, a semi-rigid guard (e.g. mesh or material) can be fitted in conjunction with a mechanically actuated trip device.

5.2.19 All lifting tables with power operated lifting and lowering movements and fitted with retractable outriggers, shall have the raising/lowering system interlocked with the correct setting of the outriggers.

5.2.20 Devices shall be fitted to all lifting tables to stop the descent of the platform if the descent speed of the platform exceeds the maximum design speed. The platform shall be stopped before the descent speed exceeds 0,25 m/s.

This does not apply to structural failure.

If pipe rupture valves are used to stop the platform on multi-cylinder driven machines, it shall be impossible for any hydraulic cylinder to be overloaded by more than 100 %.

5.3 Speeds

5.3.1 The lifting and lowering speeds of the platform shall not exceed 0,15 m/s, except where the platform is automatically programme controlled and “safe by position”.

5.3.2 The horizontal travelling speed of pedestrian controlled lifting tables, without remote control, shall not exceed 1,1 m/s, when travelling with the platform fully lowered.

The horizontal travelling speed of pedestrian controlled lifting tables with remote control, shall not exceed 1,6 m/s, when travelling with the platform fully lowered, but shall also be capable of having their speed reduced to 1,1 m/s, by the operator.

The horizontal travelling speed of “ride-on” self-propelled lifting tables shall not exceed 1,6 m/s, when travelling with the platform fully lowered.

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

5.4 Platform

5.4.1 Platforms which are entered by persons shall be fitted with an anti-slip surface (e.g. Durbar plate, grit surface, anti-slip mats).

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

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

5.4.4 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.

5.4.5 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 control 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 (see **5.2.15**).

If the operator's position is not determined by the manufacturer, see Clause **7**.

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

NOTE 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 All controls shall be of the hold-to-run type. This does not apply to automatically controlled movements of the lifting table.

5.5.3 A device shall be fitted to all power operated lifting tables to prevent unauthorized use (see Annex E).

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 E).

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

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

5.5.6 [A1] Where alternative controls are fitted at two different positions they shall be wired so that only one set can be in use at any one time, excluding the emergency stop.

Where one set of alternative controls are mounted on the platform, operation of the platform controls shall always have priority, when operated, over the remotely sited controls, excluding the emergency stop. [A1]

5.5.7 For power-operated lifting tables, emergency stop controls in accordance with EN 418, category O, shall be provided at each control position. If there is only a control position on the platform, there must 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 Clause **7**.

5.5.8 Where the platform is capable of tilting more than 5 degrees from the horizontal, the operator position shall not be on the platform.

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).

5.6.2 Self-propelled mobile lifting tables shall have fitted an automatic brake for the horizontal 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 source.

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

This brake shall also act as the parking brake on these machines.

Alternatively the braking effect can be supplied by a hydrostatic driving system if this gives an equivalent effect. In this case a separate parking brake shall be fitted.

5.6.3 On self-propelled mobile lifting tables, switching on or starting the motor shall not produce any unintentional 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 Figure 4, where:

— [A1] 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. [A1]

5.6.6 Where wheels cannot safely be arranged in accordance with **5.6.5**, a wheel guard (deflector) as shown in Figure 5, 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 towbar is supplied as part of a mobile lifting table it shall not be possible for the tow-bar to become unintentionally detached. If the towbar, 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**.

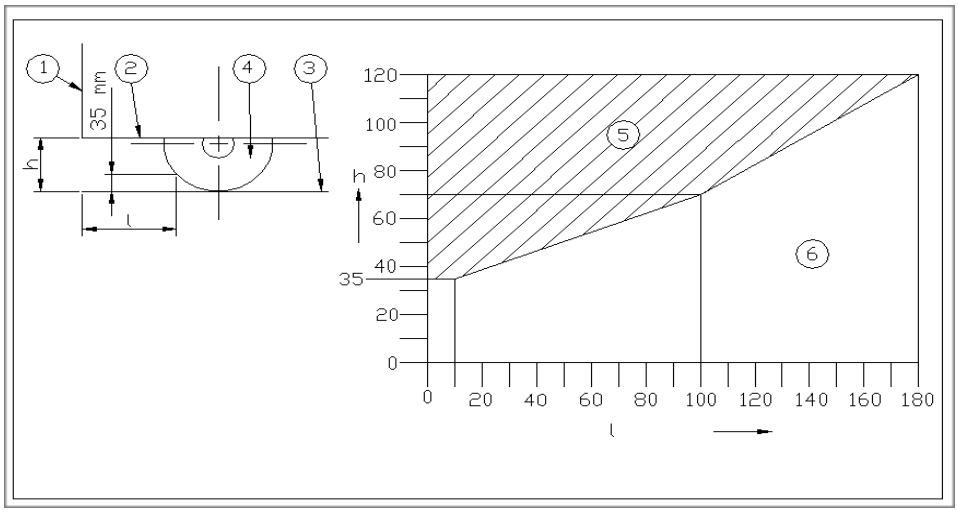
This final switch is not required if other equally effective means of avoiding structural overloading when the end points are reached are provided.

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 normal use the wheels shall be prevented from leaving the rails or tracks.

5.6.11 The manual force needed from one person to move a mobile lifting table without load, shall not exceed 300 N to start the movement and 200 N to sustain the movement. (See Annex F for force measurement methods).

A1



Key

1 Frame edge
2 Frame of truck
3 Ground (floor)
4 Wheel
5 Frame
6 Free space for test

h = Height of frame above ground
l = Minimum distance of free space for feet

Figure 4 — Free space for feet

A1

5.7 Mechanical driving system

5.7.1 Steel wire ropes which are used as load supporting devices shall consist of at least 114 wires. The tensile strength of the ropes shall be between 1 570 N/mm^2 and 1 960 N/mm^2.

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

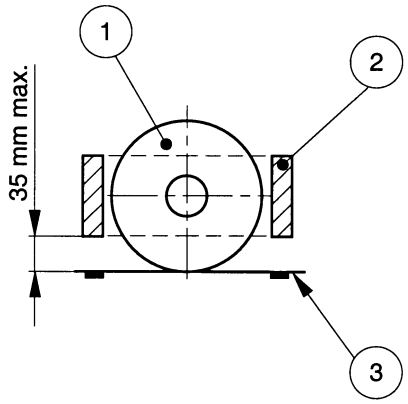
The safety factor, calculated as the total of the minimum guaranteed breaking loads of all the ropes divided by the maximum static supported load, shall not be less than 10 for lifting tables intended to carry persons (including operators and loaders) and not less than 6 for other lifting tables.

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 persons 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.

Dimensions in millimetres



Key
1 Wheel
2 Deflector
3 Ground (floor)

Figure 5 — Foot protection

5.7.2 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 the 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 or other equally effective means).

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.

5.7.3 For pulleys the following requirements shall be fulfilled:

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.

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

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

5.7.4 Chains used as suspension elements 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 10 for lifting tables intended to carry persons (including operators and loaders) and not less than 6 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.

5.7.5 All mechanical driving systems shall be fitted with safety gear to stop the descent of the platform within 100 mm and hold the platform, in the event of a breakage of any part of the lifting mechanism. When actuated the safety gear shall also stop the drive motor and keep it stopped. (See also Clause **7**.)

Final limit switches and wire rope/chain rupture switches shall, if actuated, stop the lifting table and keep it stopped. They shall fulfil the requirements of **5.11.2**.

Final switches shall stop movement before contact with any fixed parts.

5.7.6 A safety device shall be fitted to all lifting tables suspended by ropes and/or chains to detect a slack rope or chain condition and then to stop the drive motor and keep it stopped.

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

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

5.7.9 [A1] The design shear stress of lead-screws and nuts shall be not more than 1/6 of the ultimate tensile stress of the material used. All other parts shall be designed to be not stressed at more than 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. [A1]

NOTE Failure due to buckling should be considered.

Each lead-screw shall have 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.

5.7.10 Each rack and pinion drive shall be equipped with a driving pinion and a safety gear pinion. The design shear stress of racks and pinions shall not be more than 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 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 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.

5.7.11 All lifting tables using a mechanical driving system with ropes or chains for lifting shall be fitted with an overload 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.

5.7.12 All lifting tables using a mechanical driving system with screws or rack and pinions for lifting shall be fitted with an overload 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.

5.7.13 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) [A1⟩ removable winding handles, levers and hand wheels shall be secured against slipping and unintentional removal from the drive shaft, e.g. fitting securing mechanism such as snap-in latches or locking springs. ⟨A1]

d) it shall not be possible for the drive to become disengaged during gearing changes.

5.7.14 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.

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

5.8 Hydraulic system

5.8.1 The hydraulic system shall conform to the requirements of EN 982.

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 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.

5.8.5 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 hydraulic drives shall be equipped with an automatic fail-safe device to limit unintentional lowering of the platform to a maximum of 100 mm and to stop the platform at any height, in case of rupture in the hydraulic supply line. This device shall be designed to carry 150 % of the rated load.

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

5.8.8 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.

5.8.9 Safety devices shall be fitted to prevent descent due to hydraulic leak, where this could produce a hazard for persons, e.g. where the elevated platform forms part of a floor.

5.8.10 In hydraulic systems incorporating hydraulic accumulators, means shall be provided to vent the accumulator liquid pressure automatically or to positively isolate the accumulator when the system is in the unpressurized state.

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. This figure (200 N) may be increased to 300 N for foot pumps. (See Annex F for force measurement methods.)

5.9 Pneumatic system

5.9.1 The pneumatic system shall conform to the requirements of EN 983.

5.9.2 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.

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

5.9.4 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.

5.9.5 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.

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

5.9.7 All pneumatic drives shall be equipped with an automatic fail-safe brake to limit unintentional lowering of the platform to a maximum of 100 mm, and to stop the platform at any height, in case of rupture in the pneumatic supply line. This device shall be designed to carry 150 % of the rated load.

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

5.9.8 Safety devices shall be fitted to prevent descent due to pneumatic leak, where this could produce a hazard for persons, e.g. where the elevated platform forms part of a floor.

5.9.9 Lifting tables which are designed to be used at a temperature below 10 °C shall be designed so that ice formation is prevented, e.g. by the metering of spirits.

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 *Electrical installations and equipment*

Protection against direct contact shall be provided by means of enclosures as detailed in EN 60529.

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) unless the devices are not readily accessible to people.

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 closely as possible to the upper terminal stop.

End of travel limit switches shall be mechanically actuated with positive opening contacts (see EN 60947-5-1) and shall, when operated, cause the lifting table to stop and remain stopped.

6 Marking

6.1 All labels, notices and operating instructions shall be legible and readily understandable (if necessary aided by signs of 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 position and written in the language of the country where the lifting table is to be installed.

6.2 The direction of movement shall be marked with pictograms or other easily recognizable signs on, or alongside, all control buttons, levers and hand wheels.

6.3 If supplied by the manufacturer, the main isolating device shall be marked "main switch" or similarly described in the case of other power supplies e.g. pneumatic.

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

a) rated load and distribution;

b) manufacturer's name and address;

c) type and serial number;

d) I.P. code.

6.5 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 "personnel prohibited" pictogram.

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

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

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

6.9 The rated load of all lifting tables shall be clearly and permanently marked on the working platform of the actual machine.

6.10 Lifting tables which are not designed to carry persons shall be clearly marked with a notice and/or a symbol prohibiting this.

6.11 Lifting tables which are designed to carry persons associated with the movement of goods only, shall clearly exhibit a notice prohibiting carriage of passengers.

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

6.13 [A1] For scissor lift tables a warning notice shall be provided stating "Danger. Do not put hands or feet under the platform", with the appropriate pictogram. [A1]

6.14 Hydraulic fluid power systems with an accumulator shall have a warning label on the accumulator e.g. "caution: depressurize before maintenance".

7 Information for use

7.1 The manufacturer shall supply with each lifting table a set of operating instructions sufficient for safe operation of the lifting table, in a language of the country where the lifting table is to be installed. These 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 e.g., as MEWPs or Lifts and including loading conditions and distribution;

c) commissioning and de-commissioning instructions;

d) operation of the controls and the emergency control, including possible misuses;

e) safety conditions for the opening of the barrier gates where applicable;

f) loading and securing the load, including possible misuses;

g) details of the safety devices;

h) instructions for moving the lifting table, where applicable, including the use of safety shoes etc. when moving manually;

i) procedure in the event of a malfunction;

j) the intended environment of use.

7.1.1 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.

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

7.1.3 In positions where overloading is possible, the user shall supply the necessary warning notices against the residual risk of overloading.

7.1.4 A statement that after the excess speed device (in **5.2.20**) has operated, the reason for the operation shall be investigated before continuing to operate the lifting table.

7.1.5 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.

7.1.6 Where a towbar is needed that is not supplied by the manufacturer the instructions shall state that it shall not be possible for coupling devices between the lifting table and the towing vehicle to become unintentionally detached.

7.1.7 If a turntable is fitted, these instructions shall include the method of operating and of locking this turntable.

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

7.2 The manufacturer shall supply with each lifting table a set of instructions sufficient to inspect, maintain and repair the lifting table including access methods and replacement periods of parts. These shall state that any replacement parts required for the lifting table shall be obtained from the original manufacturer of the lifting table or be of at least equivalent quality and safety.

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

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

7.2.3 The maintenance instructions shall include a warning against the possible leakage of hydraulic fluid and the possible consequences.

7.2.4 When a major repair has been carried out the lifting table shall be re-tested according to Annex C.

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

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

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

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

7.3.4 The installation instruction shall state that where the installation is such that there is a risk of falling a vertical distance of more than 3 m, further precautions may be necessary.

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

7.3.6 These instructions shall state the need to comply with **5.5.7**, the positioning of emergency stop controls.

7.3.7 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 lowering at all times.

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

8 Verification of the safety requirements and/or measures

8.1 General

8.1.1 *Tests*

The tests described in this clause can be used to verify the compliance of lifting tables and their components with this standard.

The checks and tests, to ensure that the lifting table complies with this standard, shall consist of:

a) design check (see **8.1.2**);

b) manufacturing check (see **8.1.3**);

c) visual verification (see **8.1.4**);

d) practical tests (see **8.1.5**);

e) electrical tests (see **8.1.6**);

f) final inspection before despatch (see **8.1.7**).

A type test shall consist of **8.1.2**, **8.1.3**, **8.1.4**, **8.1.5** and **8.1.6**.

An individual machine testing shall consist of **8.1.7**.

[A1] The result of the examinations and tests shall be recorded in a signed report (e.g. as shown in Annex D) and the identity of the person signing the report shall be clearly shown. [A1]

8.1.2 *Design check*

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

a) the drawings give the main dimensions of the lifting table;

b) there is a description of the lifting table with the necessary information about its capabilities;

c) information is given concerning the materials and proprietary components used;

d) diagrams of the hydraulic, pneumatic and electrical circuits are available;

e) instructions covering installation, commissioning, operating, maintenance and dismantling are available.

The documents shall give all the necessary information to enable:

a) the structural calculations to be checked;

b) the stability calculations to be checked.

8.1.3 *Manufacturing check*

The manufacturing check shall verify that:

a) the lifting table has been manufactured in accordance with the checked documents and drawings;

b) test certificates are available for all the wire ropes, chains and hoses;

c) all welding has been carried out according to the drawings and specifications.

8.1.4 *Visual inspection*

It shall be visually checked that:

a) all the markings specified in Clause **6** have been affixed to the lifting table;

b) the lifting table is in accordance with all the documentation provided by the manufacturer.

8.1.5 ***Practical tests***

Practical tests, as detailed in **C.1** for type testing and **C.2** for individual machine final verification, shall be carried out to verify that:

a) the lifting table is stable;

b) the lifting table is structurally sound;

c) all the functions of the lifting table can be safely and correctly carried out.

8.1.6 ***Electrical tests***

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

8.1.7 ***Individual final verification before despatch***

8.1.7.1 Before despatch of each lifting table, a verification shall show that the lifting table satisfies the safety requirements of this standard. Where the lifting table is assembled on site, this verification shall be made at the place of use before the machine is put into service, and a record made of the results (as shown in Annex D).

8.1.7.2 If a type test for the lifting table model has been carried out and the individual lifting table has been produced in accordance with an agreed quality assurance procedure, then it is only necessary to functionally test each individual lifting table with the rated load plus 10 % throughout its full travel.

8.1.7.3 Where the lifting table has not been manufactured using an agreed quality assurance system, the final verification shall consist of tests and verifications in accordance with **8.1.2**, **8.1.3**, **8.1.4**, **8.1.5** and **8.1.6**.

Annex A (informative)
Overloading

The requirements of a load control device for these machines 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.

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

Situation of lifting table	Stationary down	Lifting from down	Stationary up	Lowering from up
possibility of overload	Yes	Yes	Yes	Yes
Consequences of overload	Possible platform damage	Structural damage	Structural damage	Structural damage
Effect of load control device	No effect	Prevents overload	No effect	No effect
Clause in this standard	No device possible	**5.7.11**, **5.7.12**, **5.8.4**, **5.9.4**	No device possible	No device possible

For hydraulic and pneumatic lifting tables pressure relief valves (see **5.8.4** and **5.9.4**) can prevent excessive overload (plus 10 %, plus or minus 5 %) when lifting loads from a "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 of the lifting table is not available.

The instructions for use delivered with each lifting table includes 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.

Annex B (informative)
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 in operation in the manufacturer's works produces a noise emission value of more than 70 dB(a) measured at 1,0 m from the major noise source should have this measured value specified in the manual.

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

The operating conditions of the machine while under test and the test methods used to produce these figures should also be given in the manual.

Annex C (normative)
Test procedures

C.1 Practical tests for type testing procedure

a) Check the correct operation of the controls.

b) Check that the emergency stop and other safety devices (if fitted) are correctly functioning.

c) Operate the unloaded lifting 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).

e) Record the time taken fully raise the platform while carrying the rated load, and the time taken to fully lower the platform 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) Insert maintenance locking device under the platform carrying the rated load and check satisfactory operation.

h) [A1] Increase the rated load by 10 % and operate through the number of cycles necessary to enable the necessary record of the maximum pressure to be made. [A1]

i) Raise the platform to the position of maximum stress on the structure and further increase the rated load to produce a 25 % overload.

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.

For manually operated lifting tables that are not fitted with a load limiting device, a 50 % overload shall be used for this test.

Tests under i) can be omitted if full strain gauge tests are available.

NOTE After removing the 25 % overload, where applicable set the load limiting device to lift not more than 110 % of the rated load and lock the device against unauthorized adjustment.

j) Test the load limiting device.

k) [A1] Reduce and redistribute the load in accordance with **5.1.1.7**. Operate the lifting table through one complete cycle. Check that deflections and tilt are within the manufacturers specification. [A1]

l) After removing all loads visually check (by normal vision) all parts of the lifting table for permanent deformation or damage.

m) Check satisfactory operation of braking or holding devices according to the design, where fitted.

n) Check all ancillary equipment for satisfactory operation, including interlocks where fitted.

o) Show that overturning conditions are satisfied in accordance with **5.1.2.1**.

C.2 Practical tests for fitness for purpose test before despatch

a) Check the correct operation of the controls.

b) Check that the emergency stop and other safety devices (if fitted) are correctly functioning.

c) Operate the unloaded lifting table through one complete cycle.

d) Leave the platform, 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.

e) Insert maintenance locking device under the platform carrying the rated load and check satisfactory operation.

f) Increase the rated load by 10 % and operate through one complete cycle (record maximum pressure).

g) Raise the platform to the position of maximum stress on the structure and further increase the rated load to produce a 25 % overload.

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.

For manually operated lifting tables that are not fitted with a load limiting device, a 50 % overload shall be used for this test.

h) Test the load limiting device.

i) Check satisfactory operation of braking devices according to the design, where fitted.

j) Check all ancillary equipment for satisfactory operation, including interlocks where fitted.

C.3 [A1] Practical tests for fitness for purpose test when the lifting table has been manufactured to an approved quality assurance system (e.g. EN ISO 9001 [2000 revision]) [A1]

a) Check the correct operation of the controls.

b) Check that the emergency stop and other safety devices (if fitted) are correctly functioning.

c) Operate the unloaded lifting table through one complete cycle.

d) Load the table with 10 % more than the rated load and operate through one complete cycle.

e) Test the load limiting device.

Annex D [A1] (informative) [A1]
Test certificate for lifting tables

D.1 Description

— Manufacturer's name and address.
— Lifting table type and serial no.
— Electric power supply.
— Weather protection category — inside or outside.
— Rated load and distribution.
— Maximum working pressure.
— Pressure relief valve setting.

D.2 Tests

a) Dynamic (rated load):

load applied;
max. pressure;
raising time;
lowering time.

b) Creep (rated load for 10 min):

load applied;
creep measured.

c) Maintenance support:

satisfactory under full load

d) Dynamic (rated load +10 %):

load applied.

e) Static (rated +25 %):

load applied.

f) Pressure relief valve setting.

g) Unevenly distributed load (see **5.1.1.7**).

[A1] *Text deleted* [A1]

Annex E (informative)
Controls

In diagrams **E.1** to **E.8** the following nomenclature applies:

1) down;

2) up.

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

To **5.5.3**.

This requirement can be fulfilled by:

a) a safety switch with a key that can only be taken out after the lift 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 60204-1:1992.

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 E.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 E.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 E.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 E.4);

d) where vertical levers are used, if the movement of the lever towards the human body generates the raising movement and the movement of the lever away from the human body generates the lowering movement (see Figure E.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 E.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 E.7);

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

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.

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 from the sides (see Figure E.8).

c) Hand levers: an unlocking action should be necessary before operation.

d) Handwheels: handwheels should be round, solid and have no burrs or sharp edges.

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.

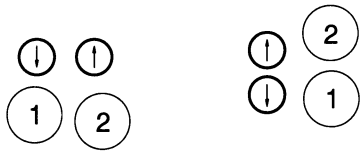


Figure E.1 — Arrangement of buttons

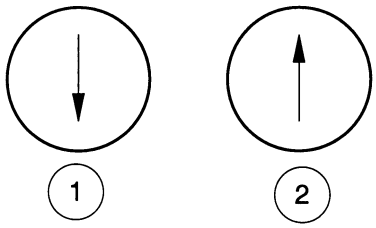


Figure E.2 — [A1] Arrangement of foot operated buttons [A1]

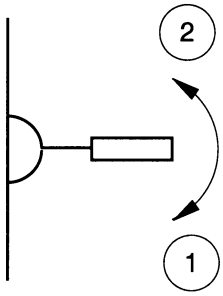


Figure E.3 — Up down and down movement of horizontal levers

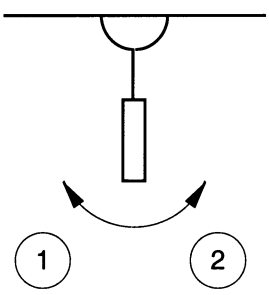


Figure E.4 — Left and right movement of horizontal levers

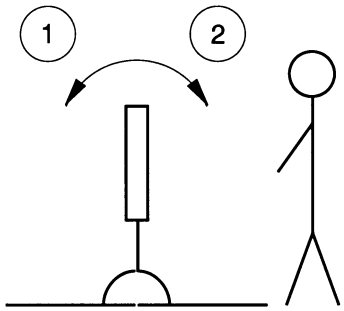


Figure E.5 — Movement of vertical levers

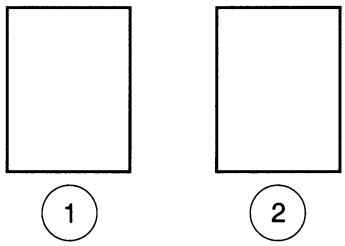


Figure E.6 — Arrangement of pedals

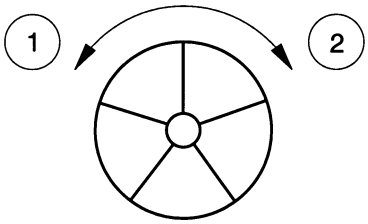


Figure E.7 — Movement of hand wheels

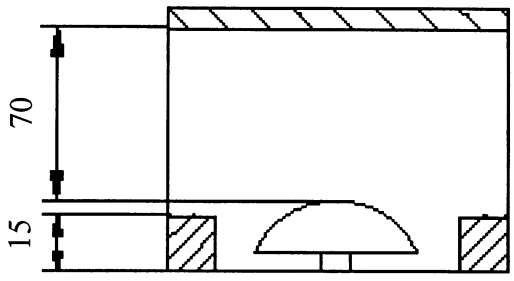


Figure E.8 — Covering of foot operated buttons

Annex F (normative)
Manual force measurement methods

F.1 Maximum allowed forces for mobile lifting tables

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

to start an unloaded lifting table moving from rest: 300 N;

to maintain the movement of the lifting table: 200 N;

to raise the loaded lifting table platform using a hand pump: 200 N;

to raise the loaded lifting table platform using a foot pump: 300 N.

F.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 ±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.

F.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.

F.4 Starting force

The maximum value necessary to start the table moving shall be recorded.

F.5 Rolling force

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

F.6 Average forces

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

F.7 Hand or foot forces

[A1] Actuate the handle or foot pedal as many times as necessary to raise the fully loaded platform to its maximum height. [A1]

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 recorded at each handle or pedal cycle during one complete lifting.

Annex ZA (informative)
[A1] Relationship between this European Standard and the Essential Requirements of EU Directive 98/37/EC amended by 98/79/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 one means of conforming to Essential Requirements of the New Approach Directive 98/37/EC amended by 98/79/EC

Once this standard is cited in the Official Journal of the European Communities 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. [A1]

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