BRITISH STANDARD

BS EN 1398:2009

Dock levellers — Safety requirements

ICS 53.080

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 1398:2009. It supersedes BS EN 1398:1998 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee MHE/12, Lifting platforms.

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

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Foreword

This document (EN 1398:2009) 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of an identical text or by endorsement, at the latest by September 2009, and conflicting national standards shall be withdrawn at the latest by September 2009.

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This document supersedes EN 1398:1997.

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 EC Directive(s).

For relationship with EC Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document.

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Introduction

This European Standard is a type C-standard as defined 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. In addition, machinery shall comply as appropriate with EN ISO 12100 for hazards which are not covered by this European Standard.

Where 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 design, construction, installation, maintenance and testing of dock levellers and for safety components on dock levellers.

With the exception of:

a) dock levellers for marine and aircraft applications;

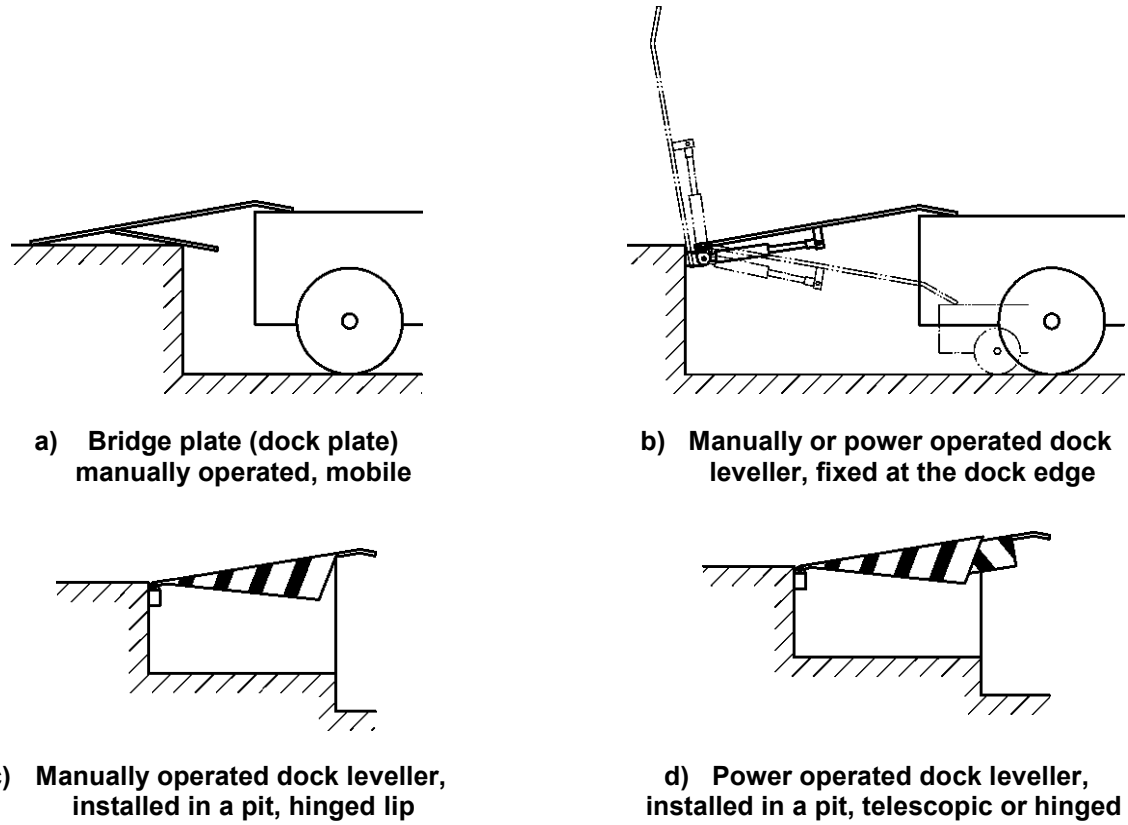
b) lifting tables;

c) vehicle mounted tail lifts.

NOTE 1 Requirements for lifting tables are laid down in EN 1570.

NOTE 2 Requirements for vehicle mounted tail lifts are laid down in EN 1756-1.

1.2 This European Standard is applicable to dock levellers which are used by persons and/or manual or power driven transport equipment (e. g. forklift trucks) as traffic paths between goods vehicles, both road vehicles and rail wagons, and parts of buildings such as loading docks. This standard does not deal with other bridging devices not shown in Figure 1.



a) Bridge plate (dock plate) manually operated, mobile

b) Manually or power operated dock leveller, fixed at the dock edge

c) Manually operated dock leveller, installed in a pit, hinged lip

d) Power operated dock leveller, installed in a pit, telescopic or hinged lip

Figure 1 — Types of dock levellers

NOTE Only dock levellers fitted with a drive system other than directly applied human effort are machines in the sense of the Machinery Directive.

1.3 This European Standard specifies requirements in order to protect persons and objects against accidents and health problems and damage during use and operation of dock levellers.

Persons to protect are:

a) operators and users;

b) maintaining and inspecting personnel;

c) persons near the dock leveller.

Objects to be protected are:

d) goods on dock levellers;

e) transport equipment on dock levellers.

1.4 The significant hazards of dock levellers are listed in Clause 4. These hazards have been identified by risk assessment according to EN ISO 12100-2 and require actions to avoid the hazard, or to reduce the risk, which are covered in Clause 5.

1.5 The safety requirements are based on the assumption that the dock levellers are regularly maintained by competent persons to the instructions of the manufacturer and that the operating person has been instructed in the use of the dock leveller.

1.6 This European Standard is not applicable to dock levellers which are manufactured before the date of its publication as EN.

1.7 This European Standard deals with all significant hazards, hazardous situations and events relevant to dock Levellers, when they are used as intended and under the conditions foreseen by the manufacturer (see Clause 4).

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

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*

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

EN 60529:1991, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*

EN 60947-4-1, *Low-voltage switchgear and controlgear — Part 4-1: Contactors and motor-starters; Electromechanical contactors and motor-starters (IEC 60947-4-1:2000)*

EN 60947-4-2*, Low-voltage switchgear and controlgear — Part 4-2: Contactors and motor-starters — AC semiconductor motor controllers and starters (IEC 60947-4-2:1999)*

EN ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology (ISO 12100-1:2003)*

EN ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles (ISO 12100-2:2003)*

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

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

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

CENELEC

HD 60364-4-41, *Low-voltage electrical installations — Part 4-41: Protection for safety — Protection against electric shock (IEC 60364-4-41:2005, modified)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100-1:2003 and the following apply.

3.1
dock leveller
static or mobile device to bridge the space between a loading dock or similar loading areas and the loading surface of a vehicle which may be at different levels

NOTE 1 Dock levellers may be built as:

a) manually operated, mobile dock leveller, called bridge plate or dock board, see Figure 1a);

b) power operated dock leveller built into a loading dock or fixed at the edge of a dock, see Figure 1b) and d);

c) manually operated dock leveller built in to a loading dock or fixed to the edge of a dock, see Figure 1b) and c).

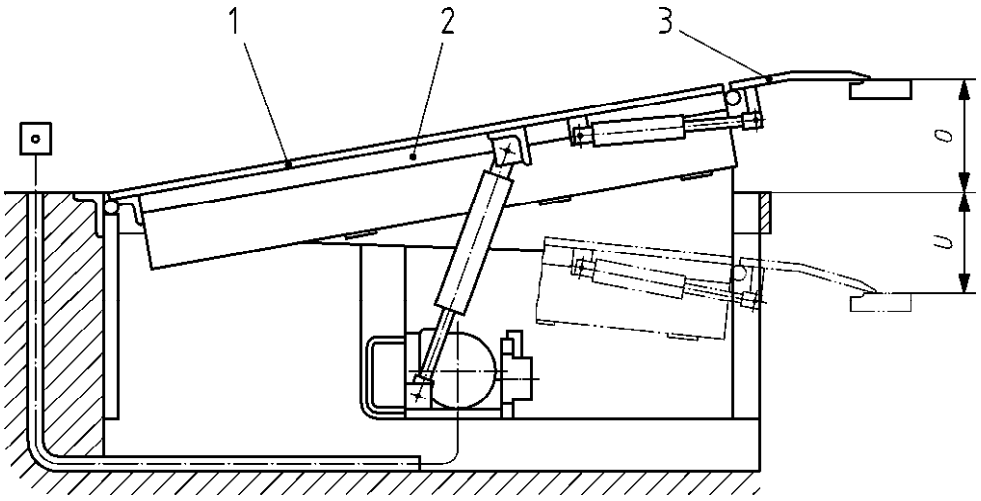
NOTE 2 Dock levellers are provided for loading and unloading operations and are not designed to lift or lower loads.

NOTE 3 The lifting or lowering mechanism is only provided to make alterations in the position of the unloaded dock leveller.

3.2
dock board/bridge plate
dock leveller, consisting of a manually operated plate, suspended or loose

3.3
latched dock leveller
dock leveller which is held in a certain position by a positively engaged locking device

3.4
bridge deck
part of the dock leveller in the form of a plate which is used as traffic path for persons and/or transport equipment, but excluding the lip (see Figure 2)



Key

1 Bridge deck
2 Bearer
3 Hinged lip

Figure 2 — Main parts of a dock leveller

3.5
bearer
supporting part of a dock leveller in the form of a beam, fixed at the under side of the bridge deck (see Figure 2)

3.6
support device
part of a dock leveller, e. g. in the form of a block, bar or bolt which supports the dock leveller in the horizontal stored position

3.7
hinged lip
part of a dock leveller hinged to the bridge deck and resting on the vehicle in the operational position (see Figure 2)

3.8
telescopic lip
part of a dock leveller which can be telescopically extended towards the vehicle and which rests on the vehicle in the operational position

3.9
loading
loading or unloading a vehicle using a dock leveller

3.10
free floating condition
mode in which the dock leveller supported on the vehicle may follow automatically the vertical movements of the vehicle during the loading process

3.11
stored position
position to which the dock leveller is put, or to which it returns, when loading has finished

3.12
automatic return
return cycle of the dock leveller to its stored position with or without operator initiation

3.13
installed
fixed to a dock edge or built in to the loading dock or a similar area

3.14
automatic safety device
device which automatically prevents an uncontrolled and dangerous lowering of the loaded dock leveller

3.15
emergency stop device
manually operated device intended to stop all movements of a dock leveller in the event of danger

3.16
rated load
weight of the greatest moving load (including goods, persons and transport equipment for goods) for which the dock leveller is designed

3.17
competent person
person who, in accordance with his training and experience, has sufficient knowledge in the field of dock levellers and is sufficiently familiar with relevant regulations to be able to assess the safe condition of dock levellers

3.18
operational position
position of the dock leveller in which it is provided for loading and unloading

4 List of significant hazards

The hazards that can influence the safety of persons during operation, maintenance or inspection have been identified by the risk assessment procedure and the corresponding requirements formulated. Table 1 shows the hazards which have been identified and where the corresponding requirements have been formulated in this European Standard.

Table 1 — Significant hazards and safety requirements

	Significant hazards	Safety requirements; Relevant clauses in this standard
1.1	Crushing hazard	5.2.9, 5.2.10, 5.4.2.1, 5.4.2.2, 5.4.2.4, 5.4.2.5, 5.4.2.7, 5.4.2.8
1.2	Shearing hazard	5.2.9, 5.2.10, 5.4.2.1, 5.4.2.2, 5.4.2.4, 5.4.2.5, 5.4.2.7, 5.4.2.8
1.6	Impact hazard	5.2.11
1.9	High pressure fluid ejection hazard	5.4.4.1, 5.4.4.2, 5.4.4.3, 5.4.4.4, 5.4.4.5
2.1	Contact of persons with live part (direct contact)	5.4.2.6, 5.4.3
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	5.4.3, 5.4.2.6
4	Hazards generated by noise	5.2.6
8	**Hazards generated by neglecting ergonomic principles in machine design**	
8.1	Unhealthy postures or excessive effort	5.3.3, 5.3.4
8.2	Inadequate consideration of hand-arm or foot-leg anatomy	5.3.3, 5.3.4
8.5	Mental overload and underload, stress	not applicable
8.6	Human error, human behaviour	5.4.2.5, 7.4.2
8.7	Inadequate design, location or identification of manual controls	5.4.2.2, 5.4.2.3, 5.4.2.5
8.8	Inadequate design or location of visual display units	5.4.2.5
10	**Unexpected start-up**	
10.1	Failure, malfunction of control system	5.4.2.5, 5.4.2.7, 7.3.2
10.2	Restoration of energy supply after an interruption	5.4.2.9, 7.3.2
10.4	Other external influence gravity, wind etc.	5.1.2.2, 5.2.5
11	Impossible to stop the machine in the best position	5.2.2, 5.4.1
14	Failure of the power supply	5.4.2.7, 5.4.2.8, 5.4.2.9
18	Loss of stability	5.1
19	Slip, trip and fall hazard	5.2.2, 5.2.3, 5.2.4, 5.2.5, 5.2.6, 5.2.7, 5.2.8, 5.2.11, 5.3.2, 5.4.1

5 Safety requirements and/or protective measures

5.1 Calculations and dimensions

5.1.1 General

Dock levellers shall be designed to withstand all loads and forces under all operating and static conditions according to the scope.

Dock levellers have an adequate strength if when the loads and forces given in 5.1.2 are used in the calculation methods given in 5.1.3 the necessary design criteria/safety factors of 5.1.5 are achieved.

5.1.2 Structural design

5.1.2.1 General

Dock levellers wider than 1,25 m shall, in principle, be designed to withstand the passage of forklift and similar industrial trucks. At widths up to 1,25 m, such dock levellers may be designed to withstand loads resulting from pedestrian traffic and pedestrian operated industrial trucks only.

5.1.2.2 Loads and forces

5.1.2.2.1 General

When calculating dock levellers all relevant loads and forces subdivided into primary and supplementary loads and forces shall be taken into account.

Primary loads and forces are as follows:

a) dead loads;

b) rated load plus dynamic effects.

Supplementary loads and forces are considered to be:

c) wind forces;

d) braking and starting loads;

e) inertia forces;

f) impact loads.

Applicable forces and loads at different load combinations are shown in Table 2.

Table 2 — Applicable factors and loads at different load combinations

Applicable factors and loads at different load combinations	Primary loads		Safety against yield stress (factor for combined loads) *	Safety against yield stress (factor for not combined loads) *	Supplementary loads			
	Dead loads (factor)	Rated load (dynamic factor)			Inertia forces, factor	Out of service wind load (kN/m2)	Impact loads (at 1 m)	Braking and starting loads (factor) **
Clause	5.1.2.2.2	5.1.2.2.3	5.1.5.2	5.1.5.2	5.1.2.2.6	5.1.2.2.4	5.1.2.2.7	5.1.2.2.5
Normal operation, leveller in use, or not in use	1	1,4	1,33	1,5	–	–	–	0,3
Cross traffic operation, leveller in stored position	1	1,4	1,33	1,5	–	–	–	0,3
Leveller in stored position, no rated load, wind load can occur	1	–	1,33	1,5	–	1	1	0
Exceptional situation, emergency stop	**1**	**1**	**1**	**1**	**1,4**	–	–	0

* Safety factor against the yield stress is 1,33 when primary and supplementary loads are combined, or 1,5 when not combined loads

** Braking and starting loads are acting in traffic direction

5.1.2.2.2 Dead loads

The masses of all permanently fixed and movable components shall be taken as dead loads.

5.1.2.2.3 Rated load including dynamic effects

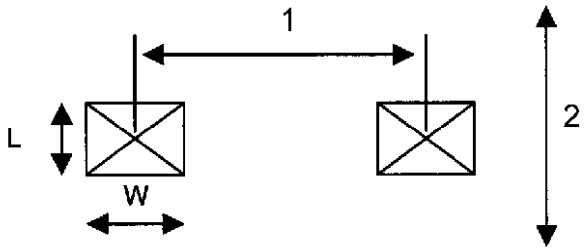
In addition to the rated load dynamic effects shall be considered.

The dynamic effects of the rated load due to its movement shall be calculated by multiplying the rated load by the dynamic factor $\Phi = 1,4$. This load shall, depending on the width b of the deck structure, generally be expressed in terms of:

a) point load for $b \leq 1,25$ m;

b) axle load on one axle for $b > 1,25$ m.

Point loads shall be taken as acting over a square contact area. Axle loads shall be taken acting over two rectangular contact areas at 1 m lateral distance. These areas shall only apply if the actual conditions do not call for more severe loading. The size of the footprint [mm^2] is derived from the wheel load [N] divided by 2 [N/mm^2]. The ratio of the rectangular print is $W:L$ = 3:2. The position of the contact areas is shown in Figure 3.



Key

1	Centre to centre	*L*	Length of the contact area
2	Direction of the traffic	*W*	Width of the contact area

Figure 3 — Position of contact areas

5.1.2.2.4 Wind forces

Dock levellers exposed to the environment shall be designed to withstand a wind pressure of $w = 1,0$ kN/m^2 in both directions, directly on to the front of the deck and also directly on to the back of the deck. This is particularly valid for dock levellers which are stowed in the vertical position when not in use.

5.1.2.2.5 Braking and starting loads

The braking and starting loads for transport equipment operations shall be deemed to be effective at the level of the bridge deck. They shall be calculated at 30 % of the rated load.

5.1.2.2.6 Inertia forces

The effects of inertia shall be taken into account for shock-inducing speed changes of movable components, in particular when a dock leveller travels at operational speed to the final end position in either direction or when the automatic safety device (see 5.4.1) is operated.

5.1.2.2.7 Impact loads

For vertically stowed and latched dock levellers, a directly applied horizontal load of 1 kN/m of width evenly distributed on a line shall be deemed to be effective at a location 1 m above the top of the hinge line of the dock leveller and at right angles to the bridge deck. For dock levellers shorter than 1 m this horizontal load shall be applied to the top edge of the raised dock leveller. Vehicle impact loads need not be considered.

NOTE The defined horizontal load has to be considered, to prevent the dock leveller plate from being knocked over by persons or mechanical handling equipment.

5.1.3 Calculation of dock levellers

5.1.3.1 General

Calculations shall be performed in accordance with generally accepted rules.

The source, if generally accessible, shall be stated in case of any unusual formulae or calculation methods. Otherwise formulae shall be developed so that they may easily be verified.

5.1.3.2 Supporting structures, general

Safety in terms of stress shall be proved by calculation for all supporting structures. The principal dimensions, cross sections, materials and fastening means shall be stated. The severest individual primary and supplementary load ratings shall be given respectively for each most unfavourable position.

The hinged or telescopic lips, when not supported on the vehicle, need not be calculated with the rated load for the operation of the automatic safety device or the emergency stop device.

All possible load case combinations shall be taken into account.

Adequate strength shall be proved by calculation for components under compression.

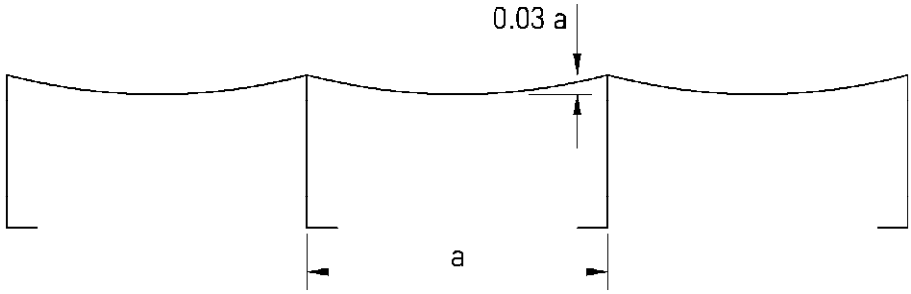
5.1.3.3 Bridge deck

For calculation purposes, only one bearer shall be taken as supporting the point load or the axle load unless lateral distribution of the load is proven.

For the calculation of the deck plate sheets only the rated load without the dynamic factor shall be used.

Where a point load or axle load will be supported by several bearers, such lateral distribution shall be demonstrated for the worst load case (e. g. loading of the end bearer). Non-stiffened sheets shall be calculated according to the plate theory.

The permanent deformation of the sheets shall be max. 3 % of the span *a* (see Figure 4).



Key

a Width of deck plate supporting sections

Figure 4 — Maximum permanent deformation of bridge deck sheets

Distortion of bridge decks occurring under operating conditions, e. g. by a fork lift truck offset to one side shall be considered.

5.1.4 Design Test

As an alternative to calculations, components may be subjected to testing to demonstrate their satisfactory design. The rated load multiplied by the dynamic factor (see 5.1.2.2.3) and the valid safety factor (see 5.1.5.2)

shall be applied to be effective at the most unfavourable position. Components under buckling shall have the safety factor 2,0 applied. There shall be no permanent deformation.

The tests shall be performed and controlled respectively by competent persons or testing organisations.

5.1.5 Design criteria (factors)

5.1.5.1 Stability

The stability of dock levellers when subjected to loads specified in 5.1.2.2 shall be proved by calculation. The effect of the restoring forces shall be 1,5 times the effect of the tipping forces.

5.1.5.2 Safety in terms of stress

General safety in terms of stress of the steel shall be proved by calculation by applying the uniform safety factor S = 1,5 against the yield stress. Other materials shall be dealt with similarly.

In the load cases where primary and supplementary loads are combined, the safety factor S = 1,33 may be used. This load case is given e. g. for forklift trucks, where the rated load on one axle only occurs when the truck is braked.

5.1.5.3 Buckling

Proof of adequate resistance to buckling for components subjected to compression shall be obtained in accordance with valid standards and guidelines.

5.1.5.4 Stresses caused by the operation of the automatic safety device

For this load case the yield stress may be applied (safety factor 1,0) throughout the full cross section as long as there is equilibrium between the internal and external forces.

Proof of resistance to buckling for components subjected to compression may in this case be demonstrated by applying the safety factor S = 1,33.

NOTE In this load case permanent deformation is acceptable, provided failure of the structure does not occur.

5.2 General safety requirements and protective measures

5.2.1 General

Dock levellers shall comply with the safety requirements and/or protective measures of this clause. In addition, dock levellers shall be designed according to the principles of EN ISO 12100 for relevant but not significant hazards, which are not dealt with by this European Standard.

If removable guards are used the fixing system shall remain to the guards or to the dock leveller when the guards are removed.

5.2.2 Gradients

Dock levellers shall be so designed that the maximum gradient of the platform in its highest and lowest operational position does not exceed 12,5 % (approximately 7°).

5.2.3 Anti slip properties (slip resistance)

The areas of dock levellers which are used by persons or transport equipment shall have anti slip properties. The surface should be so designed that fluids can run away.

NOTE 1 Suitable anti slip properties are surfaces with profiles or anti slip treatment. [1)]

5.2.4 Width

5.2.4.1 Standard width

The dock leveller shall be a minimum of 0,70 m wider than the track width of the transport equipment as specified in the manufacturer's instruction, but at least 1,25 m wide.

NOTE 1 This is to make available a minimum safety width on each side of transport equipment.

NOTE 2 The width of a dock leveller should correspond to the width of the loading surface of the loading vehicle.

5.2.4.2 Reduced width

As an exception the minimum width of 1,25 m may be reduced if facilities at the operator's premises make this necessary and the operator takes measures to prevent persons or transport equipment falling. This may be fulfilled if e. g.

a) transport equipment is guided onto the dock leveller and the operating personnel can use an area in the middle of the leveller or

b) dock levellers are used for access to doors in vehicles or buildings which are less than 1,25 m in width and precautions against falling have been taken (e. g. the gap between the dock and vehicle is less than 0,20 m).

5.2.5 Support in the stored position

Dock levellers which are attached to ramp edges and folded upwards in the unused position shall be equipped with automatically operating and positively engaged mechanical devices to prevent them from falling down, e. g. hooks, bolts or bars.

These devices shall withstand the load resulting of the dead load of the dock leveller in the stored position, of the wind force as given in 5.1.2.2.4 and of the impact load given in 5.1.2.2.7. The device shall be so designed that it cannot be disengaged unintentionally.

Dock levellers which are integrated into traffic areas shall be so designed that they form a level surface in the stored position with their neighbouring surfaces and shall be automatically supported. In the stored position the same loads as in the operation position shall be considered.

5.2.6 Tripping hazards

Dock levellers shall be designed so that they do not cause a tripping hazard in the traffic area for loading.

Dock levellers, supported on the loading surface of a vehicle, shall automatically adjust to height changes (free floating condition) during the loading operation.

Tripping hazards between dock levellers and vehicle loading surfaces which occur if the vehicle loading surface is tilted along its longitudinal axis shall be prevented, for example by means of

a) sufficient torsional flexibility of the dock leveller by itself; dock levellers exceeding 1,75 m in platform length shall have a minimum torsional flexibility of 3 % of the platform width measured at the front edge of the extended lip,

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1) A CEN working group will elaborate an approved test method for slipperiness. The results will be used in a future revision of this European Standard.

or

b) hinged lips which automatically adapt themselves to the lateral angle of the vehicle loading surface.

NOTE Full contact support of dock levellers on vehicle loading surfaces reduces noise generation when using the dock leveller.

5.2.7 Prevention of an unsupported operational position

Manual operated dock levellers which are installed in traffic areas shall be designed so that, when unloaded, they cannot remain in the near horizontal position unless they are supported. A difference in height of max 100 mm to the supported position, measured at the front edge, is permitted.

A near horizontal position is a position with a maximum vertical distance of 50 mm between dock plate and the level of the traffic area, measured at the front edge of the dock leveller.

5.2.8 Prevention of unintentional movement

Dock levellers shall be designed to prevent unintentional movement during the loading operation.

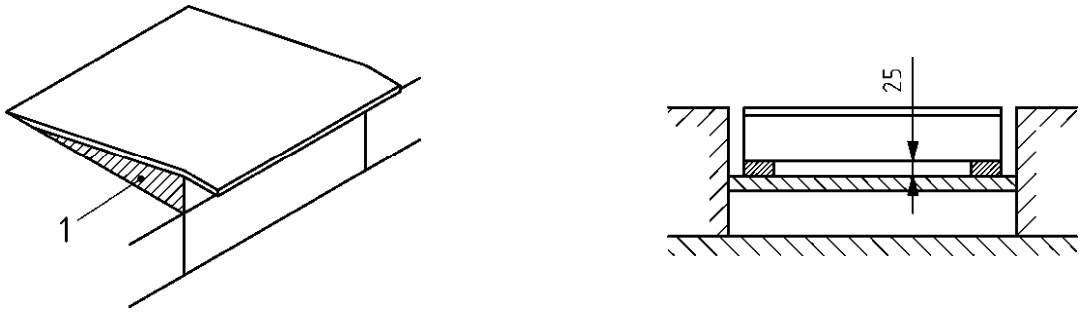
Manually operated dock levellers shall be so designed that they cannot leave their supported position on the vehicle during the loading process.

5.2.9 Crushing and shearing hazards

Crushing and shearing hazards at dock levellers, between dock levellers and neighbouring surfaces and between dock levellers and the vehicle loading surface shall be avoided or, if unavoidable, shall be safeguarded.

Crushing and shearing hazards between the edges of installed dock levellers and the neighbouring traffic areas shall be avoided e.g. by using rigid side panels (see Figure 5 a).

Dimensions in mm



Key
1 Side panel

a) Side panels to avoid crushing/shearing of feet

b) Minimum gaps between lip edge and frame

Figure 5 — Safeguarding of crushing and shearing hazards

Crushing and shearing hazards between the folded lip and the dock leveller frame are to be considered as being safeguarded if a vertical or horizontal minimum gap of at least 25 mm between the lip edge and the frame components is maintained when supported (minimum gaps for fingers according to EN 349). Support blocks of the required static width require no minimum gaps (see Figure 5 b)).

Crushing and shearing hazards between dock levellers and vehicle loading surfaces are to be considered as safeguarded

a) for manually operated dock levellers by the operating person, and

b) for power operated dock levellers by correspondence with the requirements of 5.4.2.2.

5.2.10 Supporting device for maintenance

Installed dock levellers shall be fitted with a mechanical prop/props or device/devices which, when operated, will support the unloaded leveller including its extended hinged lip at its maintenance position and allow maintenance work to be carried out in safety. In this case the hinged lip, however, must remain free to rotate for maintenance purposes. This prop/props or device/devices shall form part of the dock leveller and it shall not be possible for it to be unintentionally disengaged. This device/devices shall be capable of being operated from a safe position.

5.2.11 Visibility of lifted or lowered dock levellers

The visible side components of installed dock levellers, when raised, and the visible side areas of the dock leveller frame when at lowered position as well as the side components of dock levellers resting in a vertical position shall be durably and clearly marked in yellow/black or red/white to indicate danger. In order to highlight tripping risks, the marking shall be on the total length of the dock leveller, minimum 50 mm high, starting immediately under the platform sheet, always on the total length of the dock leveller, minimum 50 mm high, starting immediately under the rim. The lips are excluded from this requirement.

5.3 Additional requirements for manually operated dock levellers

5.3.1 General

Manually operated dock levellers which are moved by directly applied human forces shall fulfil the requirements of 5.3 in addition to 5.2.

5.3.2 Protection against dangerous movements in use

Dock boards shall be designed so that they can be secured and supported so that they will not move in an unsafe manner when used by pedestrians or vehicles.

This may be achieved by bolts, bars or teeth which engage at the dock edge or the frame of the vehicle.

5.3.3 Manual operation

Dock boards to be carried by one man shall not exceed 250 N in weight. If two men are to be used then the weight shall not exceed 500 N.

All dock boards of over 500 N in weight shall be equipped with devices that allow the handling of the dock boards by using forces lower than 250 N, or shall be fitted with means to enable safe movement by mechanical handling equipment.

Devices, e. g. castors, to lighten the movement and operation of dock boards are recommended.

Lifting handles shall be fitted to all dock boards to be manually moved.

Dock boards which are hinged at dock edges shall not require a manual force of more than 300 N to pivot 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.

Mechanically operated dock levellers installed in docks or in the floor shall 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 dock levellers shall fulfil the ergonomic requirements as stated in ISO 11228-1 and ISO 11228-2.

5.3.4 Adjustments of dock levellers with mechanical drives

All counterbalanced, spring operated and other stored energy operated dock levellers shall be provided with means of adjustment to compensate for wear and frictional changes which could affect the balance and the bias of the platform.

The adjustment device shall ensure that the manual operating force remains below 300 N.

5.4 Additional requirements for power-operated dock levellers

5.4.1 Automatic safety device

Unsupported power operated dock levellers shall be secured automatically against uncontrolled and dangerous lowering when carrying more than 25 % of the rated load, e. g. by a hydraulic valve mounted directly on the lifting cylinder.

In the cases of a dock leveller with a small closed height due to the lack of space on the site, if the lifting cylinder has to be inclined at a steep angle, the value (normally 25 %) may be increased up to 35 %. This value shall be specified by the manufacturer.

If such a lowering starts, e. g. by the loading vehicle driving away before the dock leveller has returned to its stored position, the dock leveller shall either

a) stop within a distance of 6 % of the length of the bridge deck; measured at the front edge of the bridge deck, or

b) reduce the lowering speed to not more than 0,05 m/s.

5.4.2 Requirements for control

5.4.2.1 Control system

The control system shall be designed according to EN ISO 13849-1:2008, performance level “c”.

5.4.2.2 Location of controls

The control panel of power-operated dock levellers shall be located and designed so that operating personnel can easily observe all movements and the operator is clear of all risks from the leveller and the vehicle.

5.4.2.3 Controls

Controls shall be designed so that if they are released

a) the dock leveller will become stationary,

or

b) the dock leveller will lower itself under its own weight at a speed not exceeding 0,20 m/s, measured at the front edge of the dock plate.

5.4.2.4 Control of automatic return

In exception to 5.4.2.3 the return movement of the dock leveller to its stored position may be started automatically or started by the operator. If started automatically the control system shall be designed according to EN ISO 13849-1:2008, performance level “c” and audible and visible warnings shall be initiated.

Automatically started return is only allowed when the dock leveller is unloaded and when the vehicle has left its loading position.

Unintentional movement shall be avoided according to 5.2.8.

5.4.2.5 Design of controls

The controls of power-operated dock levellers shall be arranged and marked so that their functions are easily understandable. They shall also be designed, arranged and safeguarded against unintentional operation, e. g. by flush installation on the control panel.

NOTE The use of symbols or pictograms is recommended.

5.4.2.6 Emergency stop device

Power-driven dock levellers shall be equipped with a clearly marked and easily accessible emergency stop device according to EN ISO 13850 by which all movements of the dock leveller can be stopped in the event of danger. The emergency stop device shall be located on the control panel.

The function of the emergency device and the main switch may be combined in one switching unit which fulfils the following requirements for both:

a) power-switching performance (AC 1);

b) one ON and OFF position only;

c) lockable in the OFF position and

d) easily visible red control component in front of contrasting yellow background.

5.4.2.7 Supply disconnecting device

The supply disconnecting device shall be of type a), b), c) or d) according to 5.3.2 of EN 60204-1:2006. The requirements of 5.3 of EN 60204-1:2006 shall be fulfilled.

5.4.2.8 Stopping of dock levellers

In the event of activation of the emergency switch, main switch, or of a power loss, all movements of power-driven dock levellers shall stop.

5.4.2.9 Prevention of automatic start-up

Power shall be restored after a power loss or the activation of the main switch or emergency stop control – see 5.4.2.8 – by a manually operated control. The control shall ensure that there is no movement uncontrolled by the user of the dock leveller unless this is to enable the dock leveller to return to the stored or operating position at speeds not exceeding 0,2 m/s.

5.4.3 Requirements for electrical equipment

5.4.3.1 General

The electrical installation shall be designed and the electrical equipment shall be selected such that avoidance of hazards due to the electrical energy is ensured.

Electrical installations shall be in compliance with, and designed according to, the relevant standards, e. g. HD 60364-4-41.

The electrical installations shall be capable of withstanding the mechanical, thermic and climatic stresses expected to occur during normal service duties of the dock leveller.

The potential hazards of the electromagnetic characteristics of the installation shall be considered.

The nominal data specified for the electrical equipment by the manufacturer of the dock leveller shall not be exceeded.

5.4.3.2 Protection mode

The minimum mode for the protection of electrical housings from the ingress of water and foreign matter shall be in accordance with IP 54 of EN 60529:1991.

5.4.3.3 Contactors

Contactors shall have a mechanical life compatible with a periodic rating class 0.3 and meet the minimum design requirements to service category AC 3 according to EN 60947-4-1 and EN 60947-4-2.

5.4.3.4 Solenoid valves

Coils of solenoid valves shall be designed for continuous operation.

5.4.4 Requirements for hydraulic and pneumatic equipment

5.4.4.1 General

Hydraulic and pneumatic equipment shall be designed according to EN 982 and EN 983.

Hydraulic and pneumatic cylinders, pipes and their connections which may be subjected to the pressure permitted by the pressure relief valve shall be designed to withstand at least

a) in hydraulic systems two times this pressure and

b) in pneumatic systems three times this pressure

without permanent deformation.

Hoses shall be dimensioned in order to withstand a bursting pressure equal to at least three times the pressure permitted by the pressure relief valve.

Parts which are subject to overload under automatic safety operation shall be designed to withstand this overload pressure.

5.4.4.2 Pressure relief valve

A pressure relief valve shall be fitted in all systems and shall be positioned and set so that it is not possible to operate at a pressure of more than 115 % of the normal working pressure.

This valve shall be secured against unauthorised adjustment.

5.4.4.3 Cylinders

It shall not be possible for the positioning mechanism to lower away from the platform if the platform travel is unintentionally blocked.

It shall not be possible for the supporting medium to drain out of the cylinder if the platform descent is blocked.

Cylinders shall be mounted so that they are subjected only to axial loads.

5.4.4.4 Venting

When a hydraulic system is fitted, unless it is designed to be self venting, means shall be provided for venting trapped air which could interfere with the safe operation of the dock leveller.

5.4.4.5 Pipes and hoses

Hydraulic and pneumatic pipes and hoses shall be designed, mounted and (where necessary) protected to preclude damage from rubbing, chafing, bending etc. during normal operation.

5.4.4.6 Air supply

When a pneumatic system is fitted, the air supplied to the dock leveller shall be clean and free from liquids to the manufacturer's specification.

6 Verification of the safety requirements and/or the protective measures

Table 3 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 subclauses in this European Standard.

Table 3 — Means of verification of the safety requirements and measures

Subclause	Safety requirements and measures	Inspection	Function test	Measurement
5.2.2	Gradients			X
5.2.3	Anti slip properties	X		
5.2.4	Width			X
5.2.5	Support in the stored position	X	X	
5.2.6	Tripping hazards	X	X	
5.2.7	Prevention of unsupported positions		X	
5.2.8	Prevention of unintentional movement		X	
5.2.9	Crushing and shearing hazards	X		X
5.2.10	Supporting device for maintenance	X	X	
5.2.11	Visibility of lifted or lowered dock levellers	X		
5.3.2	Protection against dangerous movements in use		X	
5.3.3	Manual operation	X		X
5.3.4	Adjustments of dock levellers with mechanical drive	X		
5.4.1	Automatic safety device		X	
5.4.2.1	Control system		X *)	
5.4.2.2	Location of controls	X		
5.4.2.3	Controls		X	
5.4.2.4	Control of automatic return		X	
5.4.2.5	Design of control instruments	X		
5.4.2.6	Emergency stop device		X	
5.4.2.7	Main switch		X	
5.4.2.8	Stopping of dock levellers		X	
5.4.2.9	Prevention of automatic start-up		X	
5.4.3.1	Requirements for electrical equipment; General	X		
5.4.3.2	Protection mode		X *)	
5.4.3.3	Contactors	X		
5.4.3.4	Solenoid valves	X		
5.4.4.1	Requirements for hydraulic and pneumatic equipment; General		X	
5.4.4.2	Pressure relief valve		X	
5.4.4.3	Cylinders		X	
5.4.4.4	Venting	X		
5.4.4.5	Pipes and hoses	X		
5.4.4.6	Air supply	X		
*) or declaration of the manufacturer				

7 Information for use

7.1 General

Information for use of dock levellers shall be provided in accordance with Clause 6.5 of EN ISO 12100-2:2003 and include specific information as described below.

Manufacturers, importers or suppliers shall supply dock levellers with the essential marking and with written instructions for use including installation, operation, maintenance and inspection in the official language(s) of the country of installation.

7.2 Marking

All dock levellers shall have an easily visible permanently fixed warning notice preferably as a "personnel prohibited" pictogram and/or in letters at least 15 mm high, as follows:

DO NOT ENTER UNDER THIS DOCK LEVELLER UNLESS IT IS MECHANICALLY LOCKED

The following data shall be easily visible and permanently fixed to each dock leveller:

a) the name and full address of the manufacturer and where applicable his authorised representative;

b) designation of the machinery;

c) capacity of the dock leveller;

d) model type;

e) serial or manufacturing number;

f) year of manufacturing, that is the year in which the manufacturing process is complete.

It is prohibited to pre-date or post date the machinery when affixing CE marking;

and additionally for dock levellers with external power supplies:

g) details of supply required (for electrical equipment: voltage, frequency, power).

7.3 Instructions for use

7.3.1 Installation instructions

All details to ensure an easy and safe installation shall be given by manufacturers, importers or suppliers, e.g. power connection, dimensions for the pit, fixing details.

7.3.2 Operating instructions

The instructions shall contain necessary details about safety in use, regarding

a) purpose of the equipment,

b) initial start-up,

c) specifications of spare parts to be used, when these affect the health and safety of operators,

d) use and function during operation and methods to be followed in the event of faults in operation, and

e) essential instructions for safe operation.

The essential instructions for safe operation shall particularly contain, but not be restricted to, the following:

f) dock levellers shall not be operated above their rated loads;

g) dock levellers shall not be operated above their permitted gradients taking into consideration the permitted gradients of the means of transport;

h) dock levellers shall not be operated in combination with vehicle tail lifts unless the tail lift is explicitly designed for that purpose;

i) the vehicle shall be positioned not more than 0,20 m from the loading dock if dock levellers with a reduced width as given in 5.2.4.2 are used;

j) transport equipment with a track width of more than the permitted value shall not be used;

k) when not in use dock levellers shall be immediately returned to their stored position;

l) unless an automatic return system is fitted, care shall be taken to ensure that the vehicle does not depart before the dock leveller is returned to its stored position;

m) dock boards shall be fixed during the operation so that they are secured against unintentional movement;

n) that the lip should be at least 0,10 m engaged on the vehicle bed;

o) information for the user how the lorry driver shall dock in to the right position to a manual or power operated leveller fixed at the dock edge;

p) dock boards shall be safety stored after use.

7.3.3 Brief operating instructions

Dock levellers shall be equipped with brief operating instructions in the language(s) as described in Clause 7 or with illustrations which can be permanently affixed and easily visible near the operator's location. These instructions shall include the rated load.

7.4 Instructions for maintenance and inspection

7.4.1 General

In order to ensure proper and safe maintenance and inspection of the dock leveller and if necessary special devices, the manufacturer shall provide the user with the instructions on maintenance and inspection. Where applicable, this shall include, but not be limited to, the following.

7.4.2 Maintenance

Maintenance work shall be carried out by a competent person at regular intervals in accordance with the manufacturer's documentation. Existing regulations and safety requirements shall be observed.

The drive units of power-operated dock levellers shall be switched off and safeguarded against unintentional and unauthorised operation prior to carrying out service or maintenance. An exception hereto is the function test, where the maintenance person observes the dock leveller carrying out certain functions in order to detect failures.

If service or maintenance work is carried out underneath raised dock levellers they are to be secured against descending by use of the maintenance prop or device (see 5.2.10).

7.4.3 Inspection

Dock levellers which are permanently affixed to buildings shall be inspected for safe function by a competent person prior to the initial start-up. Intervals for inspections along with items and areas to be examined shall be given by the manufacturer.

Dock levellers shall be inspected regularly as necessary for safety according to manufacturer's instruction.

The inspection includes in particular:

a) visual inspection regarding outwardly recognisable wear and damages;

b) functional checks;

c) checks of completeness and effectiveness of safety installations.

Dock levellers shall also be inspected after major repairs, e. g. repairs on structural components by welding. The extent of inspection required is determined by the extent of the repair work needed.

Written records of the results of all inspections with the date, name, address and signature of the competent person shall be kept by the user.

Annex A
(informative)

Examples of suitable tests

A.1 General

If a sample of a dock leveller is subject to a type examination, the following points are examined in particular – if relevant:

a) completeness and correctness of documentation;

b) compliance of the test sample with documentation;

c) width and gradient;

d) anti slip characteristics of the traffic areas;

e) effectiveness of the safety devices to prevent unintentional movement;

f) support in stored position;

g) absence of tripping hazards;

h) effectiveness of safety devices to prevent unintentional lowering;

i) effectiveness of safety devices to prevent crushing and shearing hazards;

j) effectiveness of the supporting device;

k) labels and markings;

l) manual operating forces;

m) condition and quality of the hydraulic or pneumatic equipment;

n) compliance of the electrical equipment with the requirements;

o) stability of the dock leveller in accordance with A.2;

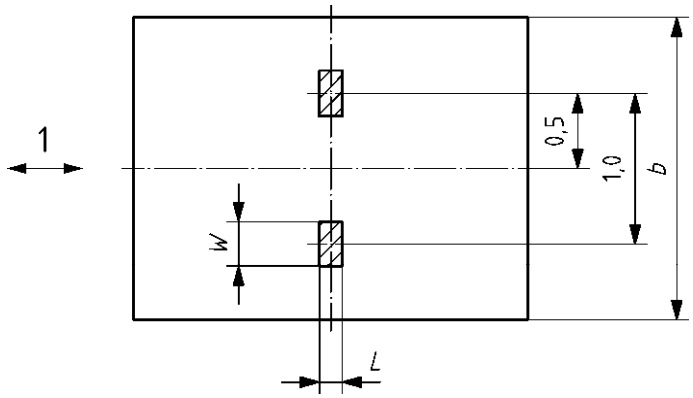
p) function of the automatic safety device in accordance with A.3.

The results of the tests as well as the name and address of the testing persons or institute are recorded in a signed report.

A.2 Stability test

The test load is the rated load multiplied by the safety factor (see 5.1.5.2) and the dynamic factor (see 5.1.2.2.3). The dock leveller is supported in a horizontal position on the completely extended lip. The test load is positioned in the centre and also offset on the dock leveller in accordance with Figure A.1 and Figure A.2.

Dimensions in m



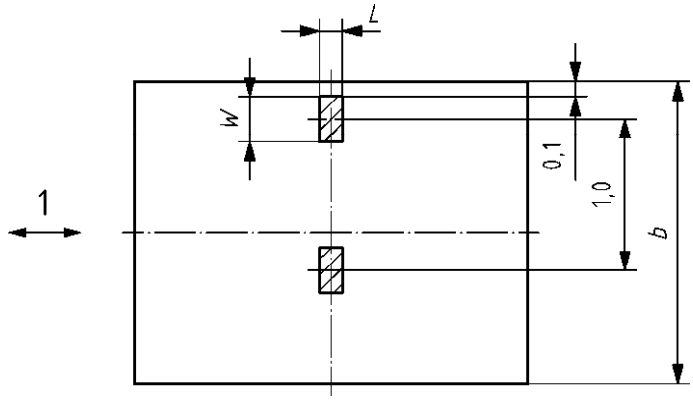
Key

1 Direction of Travel

b Width of the dock leveller

Figure A.1 — Stability test for load case 1

Dimensions in m



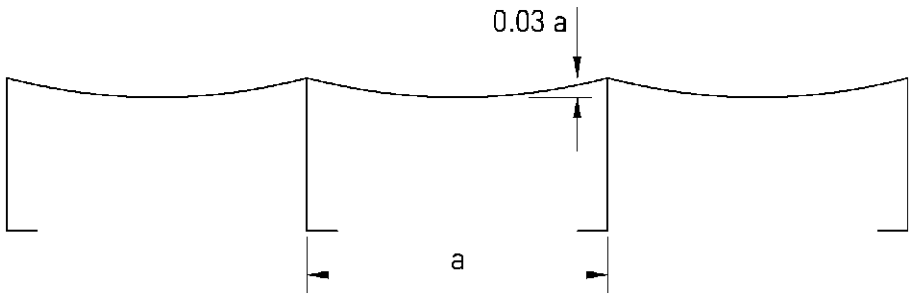
Key

1 Direction of travel

b Width of the dock leveller

Figure A.2 — Stability test for load case 2

After the test, the dock leveller shall not show a visible permanent deformation. The bridge deck is allowed to be deformed within the limits as shown in Figure A.3.



Key

a Width of deck plate supporting sections

Figure A.3 — Maximum deformation of bridge deck sheets

A.3 Function test of the automatic safety device

The test load of 25 % (respectively up to 35 % see 5.4.1) of the rated load is positioned on the dock leveller in the middle of the deck plate. The dock leveller is supported horizontally on the lip which is in the operational position. The temperature of the environment is 20°C ± 10°C.

After removing the supporting device the dock leveller shall be stopped or have its speed reduced by the automatic safety device. The falling distance shall not be greater than 6 % of the length of the bridge deck, measured at the front edge. The reduced speed shall be not more than 0,05 m/s.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 98/37/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 Machinery 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 except Clause 5.3 confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements except ESR 1.7.4. f) 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 ZB
(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 on machinery.

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 except Clause 5.3 confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements except ESR 1.7.4.2 u) 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.

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