INTERNATIONAL STANDARD

ISO 3691-5

Second edition
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Industrial trucks — Safety requirements and verification —

Part 5: Pedestrian-propelled trucks

Chariots de manutention — Exigences de sécurité et vérification —

Partie 5: Chariots à conducteur à propulsion manuelle

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: http://www.iso.org/iso/home/standards_development/resources-for-technical-work/foreword.htm

The committee responsible for this document is ISO/TC 110, *Industrial trucks*, Subcommittee SC 2, *Safety of industrial trucks*.

This second edition cancels and replaces the first edition (ISO 3691-5:2009), of which it constitutes a minor revision.

ISO 3691 consists of the following parts, under the general title *Industrial trucks — Safety requirements and verification*:

— *Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks*

— *Part 2: Self-propelled variable-reach trucks*

— *Part 3: Additional requirements for trucks with elevating operator position and trucks specifically designed to travel with elevated loads*

— *Part 5: Pedestrian-propelled trucks*

— *Part 6: Burden and personnel carriers*

— *Part 7: Regional requirements for countries within the European Community* [Technical Specification]

— *Part 8: Regional requirements for countries outside the European Community* [Technical Specification]

Introduction

This document is a type-C standard as stated in ISO 12100.

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

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

The ISO 3691 series of standards covers safety requirements and their verification for industrial trucks as defined in ISO 5053.

Structure

An important step forward in the work on the ISO 3691 series of standards was the agreement to issue a new structure of International Standards for industrial trucks having on one side basic standards for all kinds of trucks (see Foreword) and on the other side independent standards to cover the respective specific functions of industrial trucks, e.g. visibility, noise, vibration, electrical requirements, etc.

Assessment of hazards

The product needs to be designed in such a way that it is fit for its purpose or function and can be adjusted and maintained without putting persons at risk when used under the conditions foreseen by the manufacturer.

In order to properly design a product and to cover all specific safety requirements, the manufacturer will have to identify the hazards that apply to his product and carry out a risk assessment. The manufacturer will then need to design and construct the product taking this assessment into account.

The aim of this procedure is to eliminate the risk of accidents throughout the foreseeable lifetime of the machinery, including the phases of assembling and dismantling where risks of accidents could also arise from foreseeable abnormal situations.

In selecting the most appropriate methods, the manufacturer will need to apply the following principles, in the order given here:

a) eliminate or reduce risks as far as possible by design (inherently safe machinery design and construction);

b) take the necessary protective measures in relation to risks that cannot be eliminated by design;

c) inform users of any shortcoming of the protective measures adopted;

d) indicate whether any particular training is required;

e) specify any need to provide personal protection equipment;

f) refer to the appropriate user's document for proper operating instructions.

Industrial trucks need to be designed to prevent foreseeable misuse wherever possible, if such would engender risk. In other cases, the manufacturer's instructions will need to draw the user's attention to ways shown by experience in which the machinery ought not to be used.

This part of ISO 3691 does not repeat all the technical rules which are state-of-the-art and which are applicable to the material used to construct the industrial truck. Reference will also need to be made to ISO 12100.

Legislative situation/Vienna Agreement

From the very beginning, the task of the working group was to revise ISO 3691:1980 and establish worldwide basic standards to comply with the major legislative regulations in, for example, the EU, Japan, Australia and North America.

Every effort was made to develop a globally relevant International Standard. That goal was achieved with most of the issues. For several potential problem areas compromises were needed and will be needed in the future. Where divergent regional requirements remain, these are addressed by ISO/TS 3691-7 and ISO/TS 3691-8.

In order to ensure that the revised International Standard will be actively used in the ISO member countries, worldwide, procedures are necessary to replace the existing national standards and technical regulations by the revised International Standard. In the European Community, ISO and the European Committee for Standardization (CEN) agreed on technical co-operation under the Vienna Agreement, with the aim of replacing European Standards (EN) by International Standards. Other countries are asked to make similar agreements to ensure that their national standards and technical regulations are replaced by this International Standard.

Only by these actions will there be the guarantee that products in accordance with International Standards can be shipped worldwide freely without any technical barriers.

Industrial trucks — Safety requirements and verification —

Part 5: Pedestrian-propelled trucks

1 Scope

This part of ISO 3691 gives safety requirements and the means for their verification for the following types of pedestrian-propelled trucks (hereafter referred to as *trucks*), equipped with load-handling devices for normal industrial duties, e.g. fork arms and platforms, or integrated attachments for special applications:

— pedestrian-propelled straddle stackers,

— pallet stackers,

— industrial trucks with capacities not exceeding 1 000 kg with manual or electrical battery-powered lifting,

— low-lift pallet trucks with lift height up to 300 mm and rated capacity up to 2 300 kg,

— scissor-lift pallet trucks with lift heights up to 1 000 mm or rated capacity up to 1 000 kg with manual or electrical battery-powered lifting.

It is applicable to trucks provided with either manual or electrical battery-powered lifting, operating on smooth, level, hard surfaces.

NOTE On-board battery chargers are considered to be part of the truck. Attachments mounted on the load-carrier or on the fork arms which are removable by the user are not considered to be part of the truck.

This part of ISO 3691 deals with significant hazards, hazardous situations and events relevant to the applicable machines when used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see Annex C).

It does not establish the additional requirements for

a) climatic conditions,

b) operation in severe conditions (e.g. extreme environmental conditions such as freezer applications, high temperatures, corrosive environments, strong magnetic fields),

c) electromagnetic compatibility (emission/immunity),

d) handling of loads the nature of which could lead to dangerous situations (e.g. molten metal, acids/alkalis, radiating materials, especially brittle loads),

e) handling suspended loads which may swing freely handling,

f) use on public roads,

g) direct contact with foodstuffs,

h) operation on gradients or on surfaces other than smooth, level, hard surfaces,

i) lifting systems using belts,

j) lifting of persons,

k) trucks with overturning moment greater than 40 000 N·m,

l) scissor-lift trucks whose lifting is powered by external means (electric, pneumatic),

m) roll containers,

n) trucks that are intended to be towed by powered vehicles,

o) trucks designed for special applications (e.g. hospitals, restaurant trolleys),

p) winch-operated trucks,

q) mobile lifting tables.

Hazards relevant to noise, vibration and visibility are not significant and are not dealt with in this part of ISO 3691.

Regional requirements, additional to those given in this part of ISO 3691, are addressed in ISO/TS 3691-7.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2328, *Fork-lift trucks — Hook-on type fork arms and fork arm carriages — Mounting dimensions*

ISO 3287, *Powered industrial trucks — Symbols for operator controls and other displays*

ISO 5053, *Powered industrial trucks — Terminology*

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

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

ISO 15870, *Powered industrial trucks — Safety signs and hazard pictorials — General principles*

ISO 20898, *Industrial trucks — Electrical requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5053 and ISO 12100, and the following apply.

3.1
stacker truck
masted truck without tilt, with load-bearing outriggers, equipped with fork arms, a platform or other load-handling device, designed to be manually pushed, pulled and steered by one pedestrian operator

Note 1 to entry: The load can be raised by either manual means or battery power.

3.1.1
straddle stacker
stacking truck with outriggers, equipped with fork arms that are located between the outriggers

3.1.2
pallet stacker
stacking truck where the fork arms extend over the outriggers

3.2
pallet truck
truck with wheels supporting lifting fork arms for handling pallets, designed to be manually pushed, pulled and steered, on a smooth, level, hard surface by a pedestrian operator using an articulated tiller and designed to raise a load by pumping the tiller to a height sufficient for transporting

3.3
pedestrian-propelled industrial scissor-lift pallet truck
truck without a mast, with three or more wheels and with two fork arms or a platform, with a scissor lifting mechanism, a wheel base that varies with the lift height and lateral stabilizers, operating on a smooth, level, hard surface and designed to be manually pushed, pulled and steered by one pedestrian operator using an articulated tiller

3.4
actual capacity
maximum load in kilograms, established by the manufacturer based on component strength and truck stability, which the truck can carry, lift and stack to a specified height, at a specified load centre distance and reach, if applicable, in normal operation

Note 1 to entry: The actual capacity depends on the configuration of the truck in terms of such variables as the type and lift height of the mast fitted, the actual load centre and any attachments that may be fitted. Additional actual capacity ratings with removable attachments can also be established where permitted by the appropriate stability tests or by calculation using empirical data.

3.5
rated capacity of removable attachments
maximum load in kilograms and load centre distance, where applicable, established by the manufacturer of the attachment, which the attachment is capable of handling in normal operating conditions as specified by the manufacturer

Note 1 to entry: For determination, see Annex B.

3.6
rated capacity
⟨stacker truck⟩ maximum load in kilograms given by the manufacturer, based on component strength and truck stability, that the truck can carry, lift and stack to a standard lift height, at a standard load centre in normal position

Note 1 to entry: Where a truck does not lift to the standard lift height, H, it is given a rated capacity at its maximum lift height. For determination, see Annex B.

Note 2 to entry: The rated capacity is used to compare the capacity of different manufacturers' trucks and to provide the break points used in technical standards and statistics. It gives the load that the truck type is capable of transporting or lifting under the above conditions. The safe operating limits for the truck are defined by its actual capacity (see ISO 3691-1).

3.7
normal operating position
position in which the operator shall be able to control all functions for load handling as defined by the manufacturer

3.8
normal operation
intended use for which the truck is designed, according to the manufacturer's specification and defined in the instruction handbook

4 Safety requirements and/or protective measures

4.1 General

Trucks shall comply with the safety requirements and/or protective measures of this clause. In addition, the truck shall be designed according to the principles of ISO 12100 for relevant but not significant hazards which are not dealt with by this document.

4.2 Propelling, steering

4.2.1 Push/pull handles

Push/pull handle(s), either vertical or horizontal, and/or a tiller shall be provided to allow the operator to push, pull and steer the truck and, where applicable, lift the load. The force shall be measured and be within the limits defined in Annex A.

4.2.2 Tiller

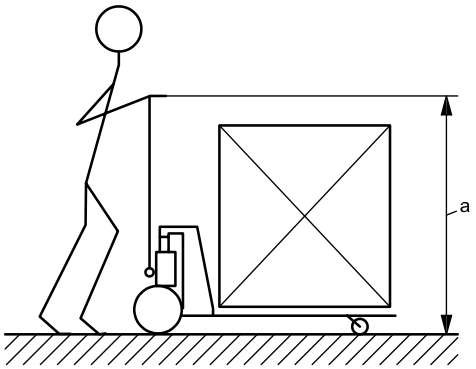
The tiller shall be provided with a handle of the closed loop type or otherwise designed to ensure lateral protection of the operator's hands.

The hand grips shall be of a cross-section enclosed within the space between two concentric circles of 25 mm inside diameter and 35 mm outside diameter and provide a minimum span of 120 mm for each hand.

The height of the tiller handle (dimension a) shall conform to the dimensions shown in Figures 1 to 7.

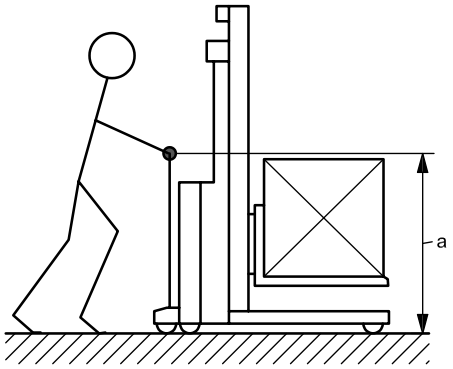
When pulling, the horizontal distance between the end of the tiller and the front of the wheel (dimension b in Figures 3, 5, and 7) shall be more than 500 mm, the handle axis being positioned within 700 mm to 1 000 mm height.

The tiller shall automatically return to the upper rest position when released.



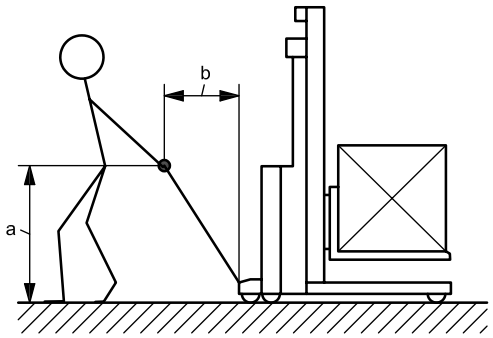
a 1 100 mm to 1 300 mm.

Figure 1 — Height of tiller handle



a 1 100 mm to 1 300 mm.

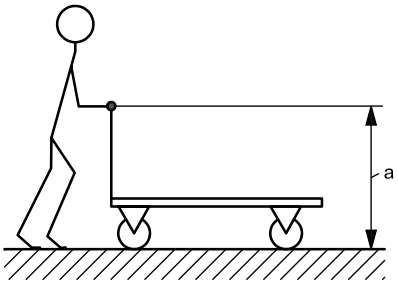
Figure 2 — Tiller (pushing)



a 700 mm to 1 000 mm.

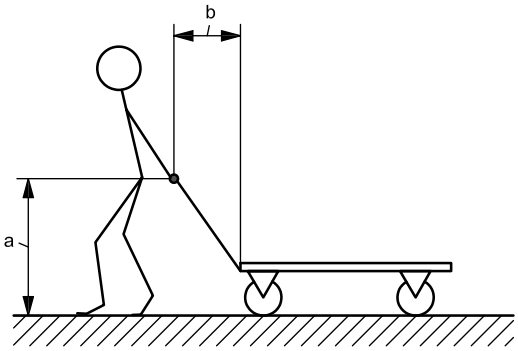
b 500 mm minimum.

Figure 3 — Tiller (pulling)



a 1 100 mm to 1 300 mm.

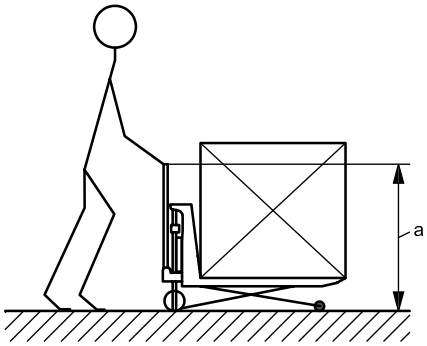
Figure 4 — Tiller (pushing)



a 700 mm to 1 000 mm.

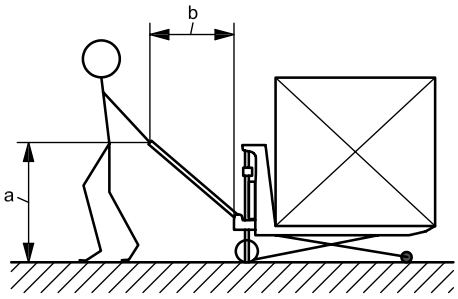
b 500 mm minimum.

Figure 5 — Tiller (pulling)



a 1 100 mm to 1 300 mm.

Figure 6 — Height of tiller handle



a 700 mm to 1 000 mm.

b 500 mm minimum.

Figure 7 — Position of tiller when pulling

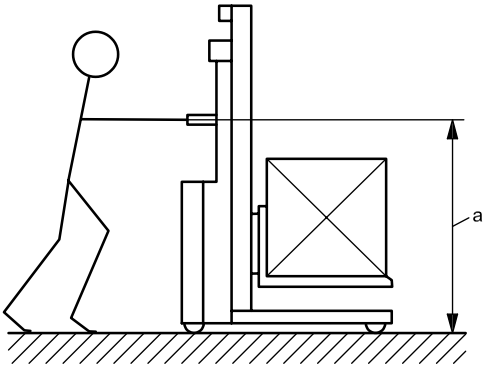
4.2.3 Push/pull bars

The height from the ground to the centre of push/pull bar shall be 1 100 mm to 1 300 mm, see Figures 8 to 11.

Vertical bars shall have a vertical length of at least 300 mm, see Figure 9.

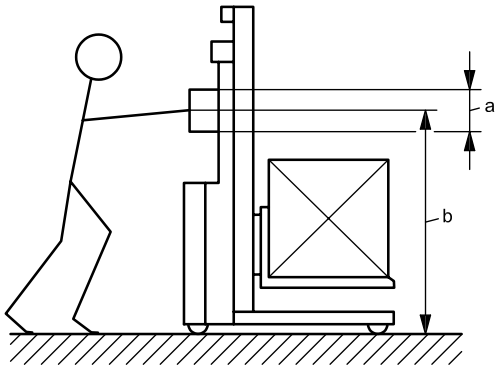
A minimum distance of 50 mm shall be provided between the lateral outside of the push/pull bars and the lateral plan view of the truck.

The hand grips shall be of a cross-section that is enclosed within the space between two concentric circles of 25 mm inside diameter and 35 mm outside diameter.



a 1 100 mm to 1 300 mm.

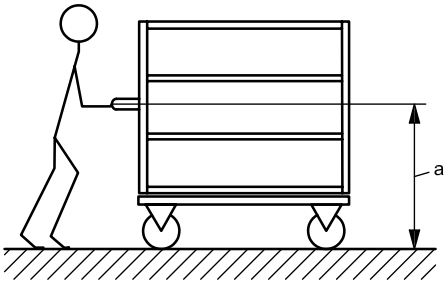
Figure 8 — Horizontal push/pull handle



a 300 mm minimum.

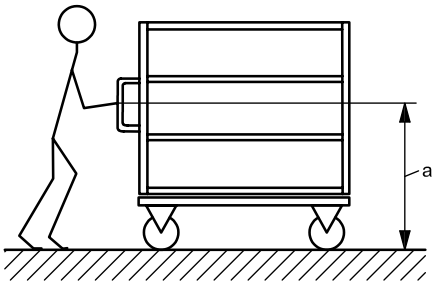
b 1 100 mm to 1 300 mm.

Figure 9 — Vertical push/pull handle



a 1 100 mm to 1 300 mm.

Figure 10 — Horizontal push/pull handle



a 1 100 mm to 1 300 mm.

Figure 11 — Vertical push/pull handle

4.3 Load-handling controls

4.3.1 General

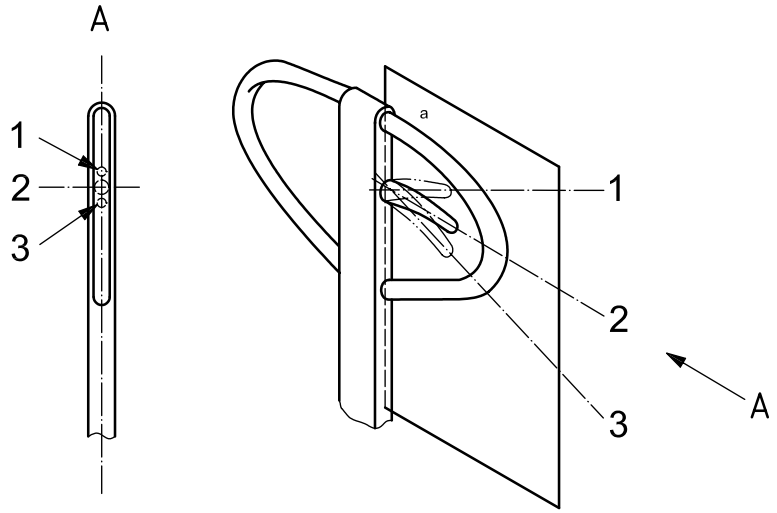
Lift and lower controls may be located on the tiller, when fitted, or may be by a separate device. Controls shall be designed to minimize the risk of unintended operation and shall return to neutral and stop movement when released.

4.3.2 Control with a device located on the tiller

If the lift and lower controls are on the tiller, they shall be located in such a way that the operator is able to activate the controls without releasing hold of the hand grip. The lift and neutral controls shall be maintained in the selected position. The lower control, when released, shall return to the neutral position and lowering movement of the forks or platform shall stop.

The actuating force on selection devices shall not exceed 150 N.

Where the movements of selection devices for lifting and lowering are located in a plane parallel to the tiller plane, the lift control shall be selected by pushing the selection devices towards the tiller articulation point, and the lower control by pulling the selection device in the opposite direction. See Figure 12.



Key

1 lower
2 neutral
3 raise
[a] Tiller plane.

Figure 12 — Example of selection control lever in plane of tiller

4.3.3 Control with a device not located on the tiller

Lifting can be performed by a separate device, e.g. a hand pump lever, foot-operated lever or rotating handle.

Lowering can be by a separate device, e.g. hand-operated lever, foot-operated lever or screw type valve, all of which return to neutral or closed position and stop movement when released.

4.4 Lifting systems

4.4.1 Chain system

The truck or mast manufacturer shall have on record a certificate on chains from the chain manufacturer, showing the breaking load of chains.

When the lifting mechanism includes a chain or chains, the truck manufacturer shall only use leaf or roller chains. The chain(s) shall provide a minimum safety factor, $K_1 \geqslant 5$, when the maximum capacity load is in the transporting position, assuming no friction in the mast structure. K_1 is given by Formula (1):

$$K_1 = (L_c \times n)/(R + w) \quad (1)$$

where

K_1 is the safety factor of the chain;

L_c is the minimum breaking load for a new chain;

n is the number of chains;

R is the maximum load capacity of the truck;

w is the dead weight of lifting mechanism supported by the chains.

Pulley diameters shall be in accordance with the chain manufacturer's instructions.

4.4.2 Wire rope system

The truck manufacturer shall select wire ropes that will provide a minimum safety factor of $K_2 = 6$ when the rated capacity is in the transporting position, assuming no friction in the mast structure. K_2 is given by Formula (2):

$$K_2 = (L_r \times n)/(R + w) \quad (2)$$

where

K_2 is the safety factor of the rope;

L_r is the minimum breaking load for new wire rope;

n is the number of wire ropes;

R is the maximum rated capacity of the truck;

w is the dead weight of lifting mechanism.

The diameter of wire rope guide pulleys, measured from the bottom of the groove, shall be at least 22 × the diameter of the wire rope.

Splicing of wire ropes, except at the terminal ends, is not allowed.

Where more than one wire rope is used, means shall be provided to limit uneven loading in the wire ropes, e.g. by adjustment.

4.4.3 Hydraulic system

4.4.3.1 Limitation of stroke

On stacker trucks, the lift assembly shall be fitted with a positive means of preventing over-travelling. In addition, positive means (e.g. mechanical stops) shall be provided to prevent the fork carrier and moving elements of the mast structure from unintentionally disengaging from the upper end of the mast.

On pallet and scissor-lift trucks, means shall be provided to limit the stroke of the lifting ram at stroke end.

4.4.3.2 Load supporting

The descent of a load equal to the rated capacity caused by an internal leakage in the hydraulic system shall not exceed 25 mm during the first 10 min, under intended operation and with hydraulic fluid at the ambient temperature.

4.4.3.3 Pressure relief valves

Except for manually operated lifting trucks, all powered hydraulic systems shall include a device that prevents the pressure in the system from exceeding a preset level, which shall be less than 115 % of the maximum working pressure under the intended operation. The device shall be so designed that it cannot work loose by itself and that a tool or key is required to alter the pressure setting. Manually operated lifting trucks shall be designed in such a way that can be equipped with a pressure-limiting device.

4.4.3.4 Hydraulic circuit

All hoses, pipes and connections subject to internal pressure shall be capable of withstanding, without bursting or permanent deformation, a pressure equal to at least three times the operating pressure of the respective hydraulic circuit.

On trucks with powered lifting, the hydraulic system shall include a means for appropriate filtering (e.g. a filter or collecting magnet).

4.4.3.5 Lowering speed limitation

On stacker trucks, a device shall be incorporated in the lift circuit, which in the event of a failure of the hydraulic circuit — excluding the hydraulic lift cylinder(s) — shall restrict the rate of descent of the lifting mechanism with its rated load to 0,6 m/s maximum. The device shall be fitted directly at the lifting cylinder(s).

On pallet and scissor-lift trucks, the lowering device shall be designed to allow the operator to control the lowering speed, or the lowering speed shall automatically be limited to 0,2 m/s.

4.4.3.6 Failure of energy supply of hydraulic circuit

In the case of a fault or interruption of the supply of energy, the design of the hydraulic system shall be such that it does not allow any uncontrolled motion of equipment or attachment. Unintentional descent of the lifting system shall be avoided.

4.4.4 Fork arms and platforms — Stacker trucks only

Disengagement of the fork arms from the fork carrier shall only be possible with intentional manual action.

4.4.5 Fork carriers — Stacker trucks only

4.4.5.1 Disengagement of the fork

Fork carriers shall comply with ISO 2328.

4.4.5.2 Fork arm removal slot

Fork carriers shall comply with ISO 2328.

4.4.5.3 Unintentional lateral displacement of fork arms

Fork carriers shall comply with ISO 2328.

4.4.6 Load-handling attachments — Stacker trucks only

4.4.6.1 Disengagement of the attachments

Disengagement of the attachments (clamps, tilted fork carrier, fork extensions, etc.) shall only be possible with intentional manual action.

Movements of the attachment and its parts shall be mechanically limited at the extreme positions.

4.4.6.2 Clamping devices

Clamping devices shall be so designed that the clamping pressure is automatically sustained for at least 10 min by means of non-return valves or any other effective system when the truck's control mechanisms are in the neutral position, or in the event of a malfunction in the power system of the attachment used for support of the load. Instructions in the event of a malfunction shall be given in accordance with 6.2.3 n).

4.4.6.3 Separate attachment hydraulic system

If an attachment has its own separate hydraulic system, this shall comply with the provisions of 4.4.3.4.

4.4.6.4 Attachment hydraulic system connected to truck hydraulic system

If an attachment has a hydraulic system that is connected to the truck hydraulic system, then the two systems shall be compatible and the combined system shall comply with the provisions of 4.4.3.4.

4.5 Parking brake

Stacker and platform trucks shall be provided with a parking brake that should be sufficient to hold the truck laden to its rated capacity on a gradient of 5 % with a hard, smooth surface.

Pallet and scissor-lift trucks shall be designed in such a way that they can be equipped with a parking brake.

4.6 Stability

In order to minimize the hazards of longitudinal and lateral tip-over during intended operation, the trucks shall comply with the requirements for the respective tests defined, for example, in ISO 22915-16 without permanent deformation.

4.7 Lateral stabilizers

Scissor lifts shall be equipped with stabilizers that shall be automatically applied at between 350 mm and 450 mm lift height. They shall be able to maintain the truck at a standstill on level ground.

If manoeuvring with an applied stabilizer is required, a device (e.g. roller) shall be provided with the stabilizer.

4.8 Protection against crushing, shearing and entanglement points

Parts that move relative to one another and are within reach of the operator in the normal operating position shall be adequately guarded. If residual hazards exist, these shall be identified in accordance with 6.2.3. The following minimum distances in accordance with ISO 13857, shall apply:

— places where the operator's fingers can be trapped: 25 mm;

— places where the operator's hands or feet can be trapped: 50 mm;

— places where the operator's arms or legs can be trapped: 100 mm.

If hazards still exist, they shall be identified on the truck in accordance with 6.3.3.4.

Protection against crushing, shearing and entanglement is subject to regional requirements, additional to the requirements of this part of ISO 3691. See ISO/TS 3691-7.

4.9 Edges and angles

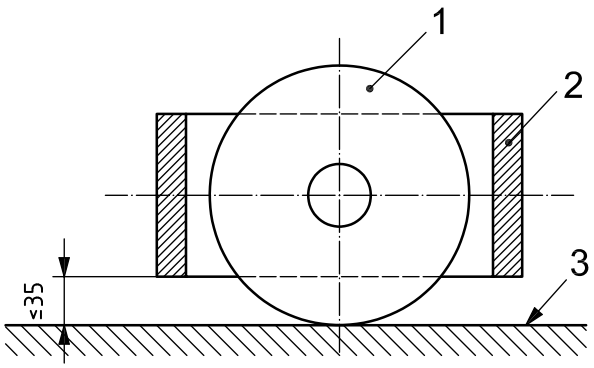
External parts of the truck which may impact parts of the body shall be free of sharp edges and angles that pose a hazard to the operator in the normal operating position.

4.10 Protective devices

4.10.1 Wheel guards

Stacker and platform trucks fitted with push-pull handles and with wheels or castors that extend beyond the confines of the truck chassis shall be provided with guards as illustrated in Figure 13 to protect the operator's feet when in the normal operating position (see Figures 1 to 11). Figure 13 shows a typical wheel guard.

Dimensions in millimetres



Key

1 wheel
2 deflector
3 ground (floor)

Figure 13 — Example of wheel guard

4.10.2 Glass guards or screens

If glass is used for guards or screens, it shall be toughened or laminated safety glass.

4.10.3 Stacker truck load backrest extension

Stacker trucks with a lift height of 1 800 mm and higher shall be designed so that they can be equipped with a load backrest extension. For information for use, see 6.2.2 e) and 6.2.3 b).

4.10.4 Pallet handling

Pallet truck fork arms shall be designed and manufactured to facilitate easy pallet entry and exit (use of rollers, skids, etc.).

4.11 Additional requirements for trucks with battery-powered lifting

4.11.1 Lifting

Controls shall be chosen, designed and positioned so that

— unintended activation is avoided,

— they are clearly identified,

— the movement of the control to activate the function corresponds to the intended effect,

— they return to neutral when released.

The lifting/lowering shall be stopped when releasing the control and shall hold the load in position.

4.11.2 Electrical systems and equipment

All electrical systems and equipment shall comply with ISO 20898, except where regional requirements apply. See ISO/TS 3691-7.

Batteries shall be firmly attached in a ventilated space. Batteries and/or battery locations shall be so designed and built, or covered, to minimize any hazard to the operator caused by battery acid or acid vapours.

Live parts (not connected to the frame) and/or connectors shall be covered with insulating material. It shall be possible to disconnect batteries easily, e.g. by quick coupling or using an accessible isolator switch.

4.12 Lifting points

Lifting points shall be provided if required.

5 Verification of safety requirements and/or protective measures

5.1 General

The manufacturer shall have verification that the requirements of this part of ISO 3691 have been incorporated into the design and manufacture of the truck. Either one or a combination of the following shall achieve this:

— design, e.g. verification of drawings and documents or calculation;

— measurements, e.g. tests of travelling and lowering speed or lift and tilt leakage;

— visual examination, e.g. no permanent deformation after tests, verification of the marking of the truck;

— further tests.

5.2 Functional verification

Functional verification shall be carried out on the truck to verify that it is able to perform the tasks for which it was designed. The truck shall be inspected to make sure that the travelling, braking, steering, load-handling controls and combined functions, if any, are appropriately identified and operate correctly. The correct operation of any warning devices, safety devices and lighting shall also be checked.

5.3 Design verification (type test)

For design verification, see test forces in Annex A.

6 Information for use

6.1 General

All identified hazards shall be addressed in the instruction handbook.

There is no need for the workshop and parts handbooks intended for use by specialized personnel employed by the manufacturer or his authorized representative to be supplied with each truck, and these can be printed in the language of the country where the truck is to be used, as required by national law. In other cases, the instructions shall be in a language agreed between the truck supplier and purchaser.

6.2 Instruction handbooks

6.2.1 General

Each truck and removable attachment shall be supplied to the user with an instruction handbook covering operating and regular servicing, printed in the language of the country where the truck is to be used, where this is required by national law. See also ISO 12100:2010, 6.4.5.

The instruction handbook(s) shall include, if applicable, at least the information listed in 6.2.2 to 6.2.6.

Instruction handbooks are subject to regional requirements, additional to the requirements of this part of ISO 3691. See ISO/TS 3691-7.

6.2.2 Concerning the truck/attachment

a) name and address of the manufacturer or, where applicable, of the authorized representative;

b) designation of type, e.g. stacker truck, pallet truck;

c) description of the truck;

d) attachments that are supplied with the truck and their assembly precautions;

e) details of use of the removable load backrest extension;

f) details for the installation of a fire extinguisher, if required by the application of the truck;

g) description of the safety devices and warning labels.

6.2.3 Operation of the truck

Recommendations on personal protective equipment to be used:

a) intended uses of the truck and attachments;

b) training requirements for the operator;

c) function of operating controls and displays;

d) daily checks before putting the truck into operation;

e) de-energizing of stored energy components;

f) instructions for safe handling by the operator, e.g. when changing attachments or moving fork arms;

g) requirements of the ground/floor where the truck is to be used;

h) instructions for handling loads, warning of the hazards due to the action of wind forces;

i) instructions when operating on a gradient;

j) instructions for towing the truck;

k) instructions for parking the truck;

l) warning of risks during the use of the truck and its attachments including crushing and shearing hazards;

m) climatic conditions in which the truck is designed to operate;

n) information or instructions on action to be taken in the event of malfunctions;

o) the normal operating conditions and conditions defined by the manufacturer, i.e. those for which the truck has been designed and the manner in which the truck will be used;

p) information about lighting of the working area;

q) procedure for movement of inoperative trucks;

r) instructions against operating the truck with guarding removed;

s) lift height for travelling.

6.2.4 Details for trucks with battery-powered lifting systems

a) specification of approved batteries and on-board battery chargers;

b) procedure for safe handling of batteries, including installation, removal and secure mounting on the truck;

c) warning of risks of accumulation of hydrogen under covers;

d) battery charging procedures and instructions.

6.2.5 Service and maintenance of the truck

a) training and qualifications for service and maintenance staff;

b) safe procedure for the identification, detection and correction of faults;

c) instructions for changing tyres or wheels;

d) instructions for verifying that markings, e.g. decals, are in place and legible;

e) instructions for de-energizing stored energy components;

f) access for maintenance while working at height;

g) servicing operations for which no specific skills are required;

h) use of approved spare parts;

i) drawings and diagrams necessary for truck service and maintenance;

j) instructions for disposing of waste material (e.g. oils and battery);

k) type and frequency of inspections and maintenance operations, paying particular attention to the replacement and durability of worn and serviceable parts, emissions, and to the user's logbook (e.g. filter, brakes, chains, hydraulic hoses);

l) instructions about removing and re-attaching guarding.

6.2.6 Transportation, commissioning and storage

a) mass and overall dimensions of the truck and dismantled parts for transport, commissioning and storage;

b) procedures for transporting, including loading and unloading;

c) procedure for truck reassembly and mounting of attachments;

d) functional tests on completion of commissioning;

e) procedure for movement of inoperative trucks;

f) procedure for prolonged shutdown and storage of trucks.

6.2.7 Truck modification

6.2.7.1 Unauthorized truck modification is not permitted. The text of 6.2.7.3 shall be included in the instruction handbook and workshop handbook.

6.2.7.2 Except where provided in 6.2.7.3, no modifications or alterations to a truck covered by this part of ISO 3691, which may effect, for example, capacity, stability or safety requirements of the truck, shall be made without the prior written approval of the original truck manufacturer, his authorized representative, or a successor thereof. This includes changes affecting, for example, braking, steering, visibility and the addition of removable attachments. When the manufacturer or his successor approves a modification or alteration, he shall also make and approve appropriate changes to the capacity plate, decals, tags and operation and maintenance handbooks.

6.2.7.3 Only in the event that the truck manufacturer is no longer in business and there is no successor interested in the business may the user arrange for a modification or alteration to a truck covered by this part of ISO 3691, provided, however, that the user

a) arrange for the modification or alteration to be designed, tested and implemented by engineer(s) expert in industrial trucks and their safety,

b) maintain a permanent record of the design, test(s) and implementation of the modification or alteration,

c) approve and make appropriate changes to the capacity plate(s), decals, tags and instruction handbook,

d) affix a permanent and readily visible label to the truck stating the manner in which the truck has been modified or altered together with the date of the modification or alteration, and the name and address of the organization that accomplished the tasks.

6.3 Marking

6.3.1 Information plates

Information plates are subject to regional requirements, additional to the requirements of this part of ISO 3691. See ISO/TS 3691-7.

6.3.1.1 Trucks

Trucks shall be marked legibly and indelibly (e.g. weather-proof, profiled letters) with the following minimum details:

a) name and address of the manufacturer or, where applicable, of his authorized representative;

b) designation of series or type and compliance with requirements of this part of ISO 3691;

c) serial number and the year of manufacture;

d) non-laden mass of the truck in working order without removable attachments but with fork arms or integrated attachments (for battery-powered trucks, with and without battery); the mass may vary from the figure shown by up to ± 5 %;

e) the rated capacity information, which shall not be in view of the operator in the normal operating position;

f) actual capacity at maximum lift height with load centre distance; where a secondary lift is fitted to a truck, the capacity at maximum lift shall be determined with the secondary mast fully elevated;

g) actual capacities at other lift heights and load centre distances if applicable;

h) actual capacity with each removable attachment fitted at the manufacturer's authorized lift height(s) and load centre(s); the actual capacities shall be easily readable by the operator in the normal operating position;

i) on battery-powered trucks, the authorized maximum and minimum battery mass and the system voltage;

j) if fitted, the nominal power in kilowatts.

6.3.1.2 Removable attachments

Removable attachments shall be marked legibly and indelibly (e.g. weather-proof, profiled letters) with the following minimum details:

a) name and address of the attachment manufacturer or, where applicable, his authorized representative;

b) model or type;

c) serial number and year of manufacture;

d) mass of attachment, which may vary from the figure shown by up to ± 5 % or 200 kg, whichever is the lower;

e) distance of the centre of gravity of the attachment from its mounting face on the truck;

f) rated capacity;

g) in the case of hydraulically or pneumatically operated attachments, the maximum operating pressure recommended by the attachment manufacturer;

h) load centre if applicable;

i) lost load centre;

j) the instruction "The capacity of the truck and attachment combination shall be complied with."

6.3.1.3 Marking of controls

Controls shall be legibly and indelibly marked (e.g. weather-proof, profiled letters) with graphic symbols indicating the function(s) except where obvious, e.g. accelerator pedal. Each symbol shall be affixed to or in close proximity to the control to which it applies. Control symbols shall comply with ISO 3287 where available.

6.3.2 Information plate for trucks operating in special conditions

If a truck is designed to operate in special conditions, the manufacturer shall provide, where appropriate, information in the instruction handbook, and an information plate on the truck identifying the special conditions of use including capacity if different from the actual capacities.

6.3.3 Other information

6.3.3.1 Marking for lifting or slinging of trucks

Locations for slinging and lifting shall be clearly indicated on the truck or be declared in the instruction handbook.

6.3.3.2 Pneumatic tyre inflation pressure

The specified inflation pressures shall be clearly indicated on the truck.

6.3.3.3 Filling points

Filling points and hydraulic fluid shall be clearly indicated on the truck in accordance with ISO 3287.

6.3.3.4 Warning signs

Symbols giving warnings of residual hazards shall be affixed to the truck and attachments on or in close proximity to the hazard concerned. On stored energy devices, a warning label and the method for removing any stored energy shall be affixed to that component and noted in the service handbook. Warnings shall conform to ISO 15870.

6.3.4 Languages

If any of the information in 6.3.1 to 6.3.3 is in words, it shall be written in the language of the country where the truck is to be used, where this is required by the national laws of that country. In other cases the instruction shall be in a language agreed upon between the truck supplier and purchaser.

Annex A
(normative)

Method for measurement of forces, *F*

A.1 Conditions for test

The tests, chosen in accordance with 5.1, shall be carried out with a new truck on a smooth, dry, level, concrete floor in good condition. The tests shall be conducted at an ambient temperature of between 15 °C and 28 °C.

The measuring instrument used shall indicate maximum values with ± 3 % accuracy.

The efforts shall be measured in accordance with the methods described below for all the values of load indicated in Table A.1 which are less than or equal to the rated capacity.

Table A.1 — Maximum design forces

Test load kg	**Propelling**		**Lifting** (manual lifting only)			**Steering** N
	Starting N	Rolling N	Hand-powered except pallet stacker N	Hand-powered pallet stacker N	Foot-powered N	
250	150	75	100	200	300	150
500	200	100	150	200	300	200
750	250	150	200	200	300	250
1 000	300	200	250	200	300	300
1 500[a]	400	300	350	N/A	N/A	300
2 000[a]	500	400	400	N/A	N/A	300
2 300[a]	500	450	400	N/A	N/A	300
1 500 kg, 2 000 kg and 2 300 kg applies only to pallet trucks.						
[a] The values in this table are maximum forces measured under conditions described above.						

A.2 Measurement of starting force and rolling force

A.2.1 General

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

The force shall be applied horizontally along the truck's axis on the tiller handle or bar. The tiller shall be maintained in vertical position along the truck's axis (see Figure A.1).

Two tests in both the forward and reverse directions shall be carried out and the average result recorded.

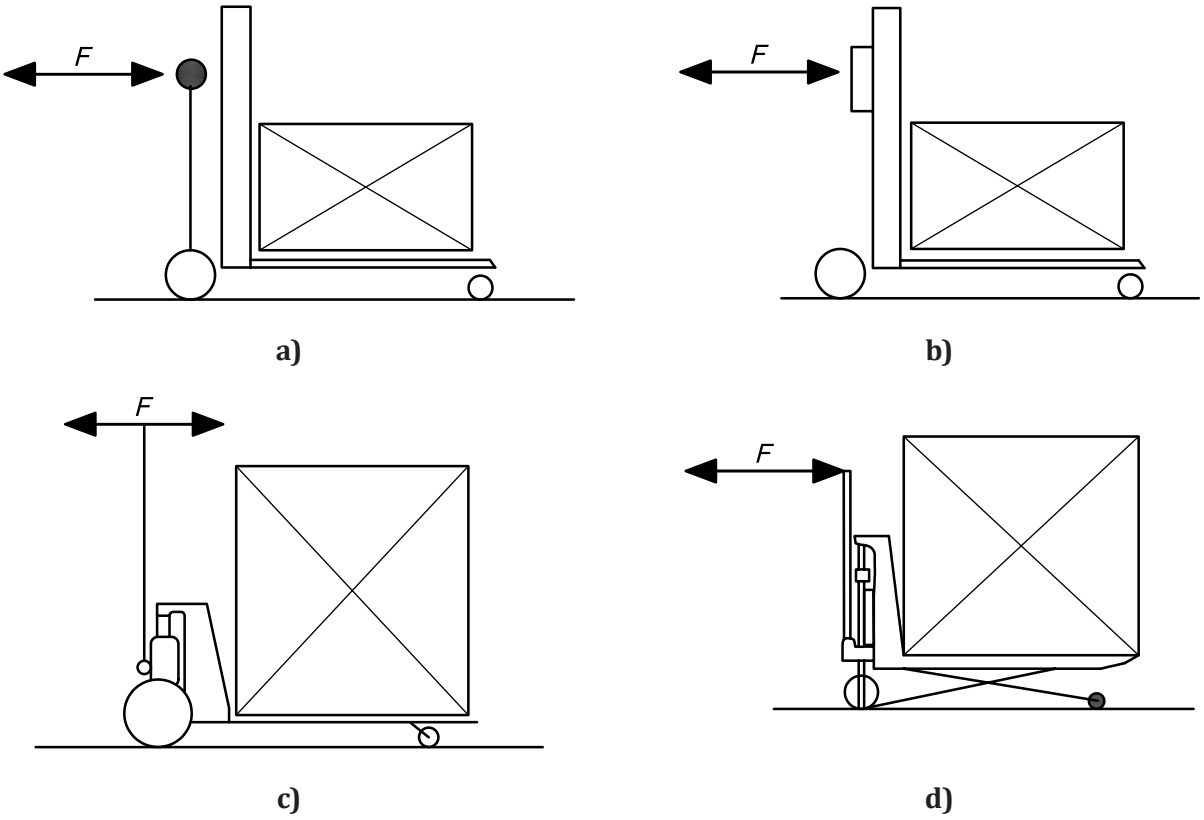


Figure A.1 — Tiller in vertical position

A.2.2 Starting force

The maximum value necessary to start the truck shall be recorded.

A.2.3 Rolling force

The maximum value necessary to maintain the truck at a stabilized speed of 0,5 m/s (±20 %) shall be recorded.

The maximum starting force, $F_{d,max}$, or the maximum rolling force, $F_{r,max}$, is the average of the maximum values recorded in each direction of travel, forward, A_V, and reverse, A_R, during two successive tests.

$$F_{d,max} = \frac{F_{V,max}A_V 1 + F_{V,max}A_V 2 + F_{R,max}A_R 1 + F_{R,max}A_R 2}{4} \quad \text{(A.1)}$$

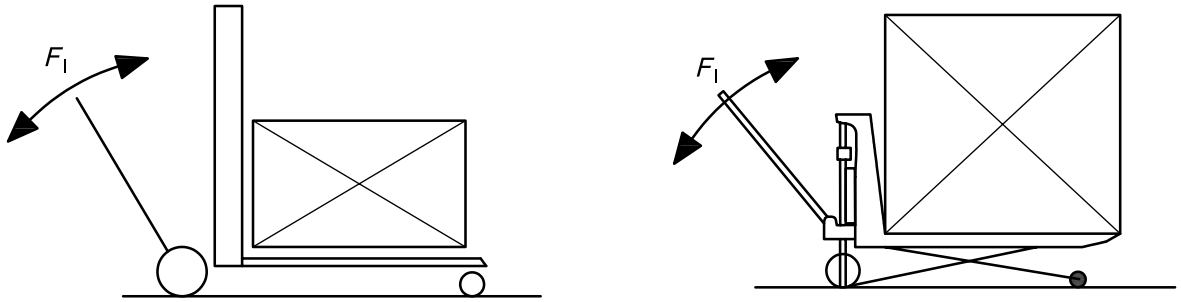
$$F_{r,max} = \frac{F_{V,max}A_V 1 + F_{V,max}A_V 2 + F_{R,max}A_R 1 + F_{R,max}A_R 2}{4} \quad \text{(A.2)}$$

A.3 Measurement of load lifting force

A.3.1 Lifting using a tiller

Engage fork arms into the pallet with its load and lift until they touch the underside of the pallet or, in the case of a platform, put the load on the platform in its lowered position.

Actuate the tiller with full swing as many times as necessary to lift the load to its maximum height (see Figure A.2).



a) **b)**

Figure A.2 — Actuating tiller to lift the load

The maximum force value is measured perpendicularly to the tiller at each pumping cycle.

The maximum lifting force, $F_{l,max}$, is the average of the maximum values measured for each pumping cycle:

$$F_{l,max} = \frac{\sum_1^n F_{l,max\,i}}{n} \quad \text{(A.3)}$$

where

$F_{l,max\,i}$ is the maximum lifting force for cycle i;

n is the number of measurement cycles

A.3.2 Lifting using a hand lever or a pedal

The maximum force value is recorded during a lever or pedal cycle.

The maximum lifting force, $F_{l,max}$, is the average of the maximum values recorded at each lever or pedal cycle during one complete lifting.

A.3.3 Lifting using a rotating handle

The maximum force value is recorded during each turn.

The maximum lifting force, $F_{l,max}$, is the average of the maximum values recorded at each turn during one complete lifting.

A.4 Measurement of the steering force

A.4.1 Steering by means of a tiller

With the truck stationary and lifted up to its travel position, measurement consists of recording the maximum force applied tangentially in the middle of the handle throughout the steering lock in one direction from the tiller's axial position (see Figure A.3).

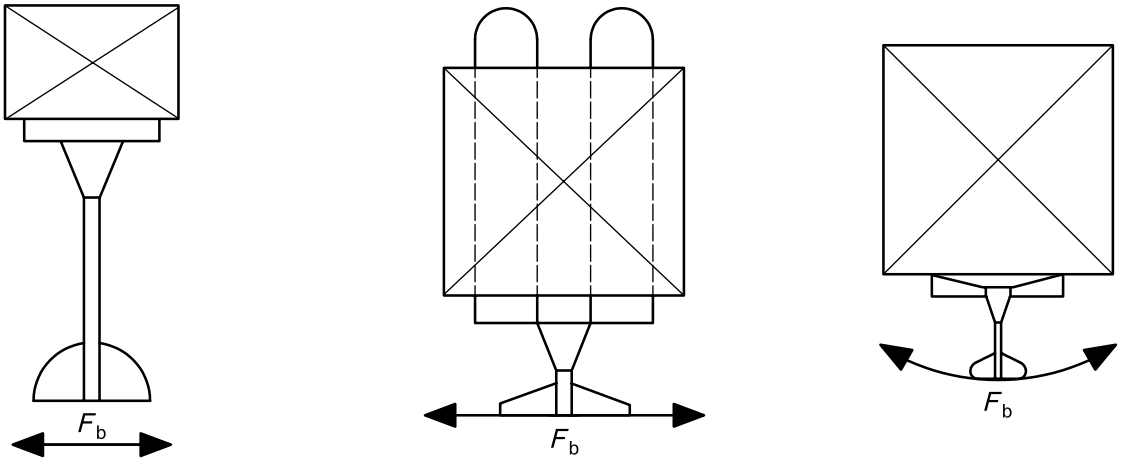


Figure A.3 — Tangentially applied force

During measurement, the lower surface of the tiller handle is maintained at a height of 950 mm above the ground.

Two measurements are recorded in each direction of tiller steering.

The maximum steering force, $F_{b,max}$, is the average of the four recorded measurements on the left hand side, L and on the right hand side, R.

$$F_{b,max} = \frac{F_{b,max}L1 + F_{b,max}L2 + F_{b,max}R1 + F_{b,max}R2}{4} \quad (A.4)$$

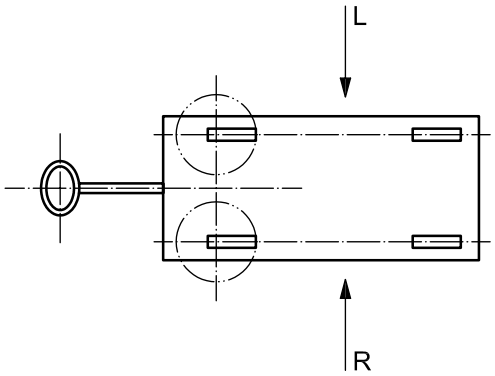
A.4.2 Steering by means of horizontal or vertical bars

With the truck travelling at 1 km/h and lifted up to its travel position, measurement consists of recording the maximum force applied tangentially in the middle of the horizontal bar or between the vertical bars during 90° steering in one direction.

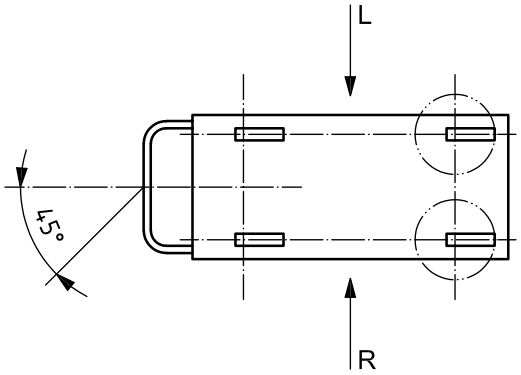
Two measurements are recorded in each direction of bar steering.

The maximum steering force, $F_{b,max}$, is the average of the four recorded measurements on the left hand side, L and on the right hand side, R.

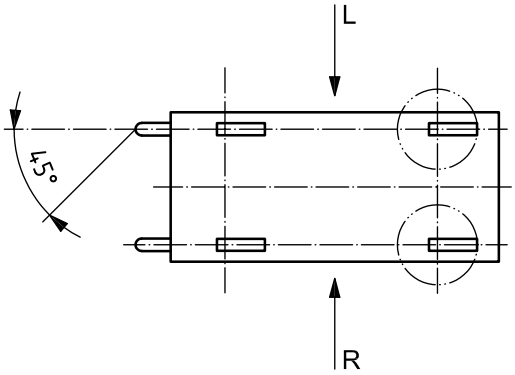
See Figure A.4.



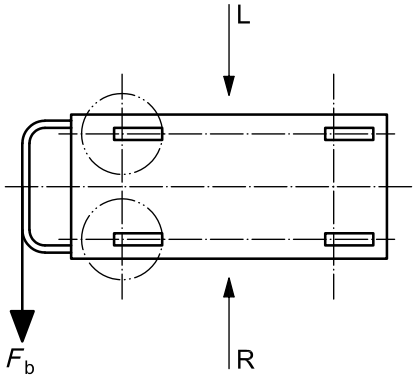
a) Truck with tiller



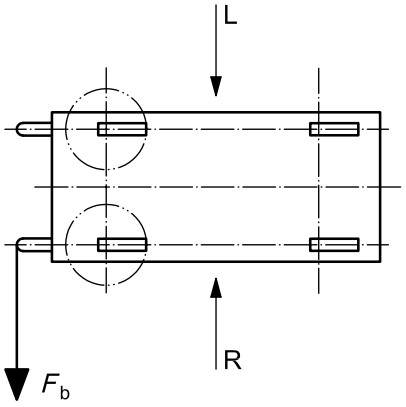
b) Swivelling wheels placed on opposite side of bar or bow



c) Swivelling wheels placed on opposite side of bar or bow



d) Swivelling wheels placed on side of bar or bow



e) Swivelling wheels placed on side of bar or bow

Figure A.4 — Position of the wheels and direction of the force at the beginning of measurement

Annex B
(normative)

Rated capacity

B.1 General

B.1.1 Stacker trucks

The rated capacity is the load in kilograms given by the manufacturer, which the truck type is capable of transporting and/or lifting under the following specific conditions.

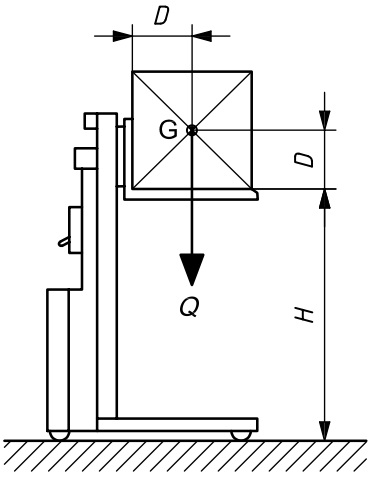
The rated capacity is defined for a load uniformly distributed over the length and width of the fork arms or platform.

It is equal to the load, *Q*, which the truck type is designed to carry and stack on fork arms or on a platform with a vertical mast, the maximum lift height of which is equal to the standard lift height, *H* (see Clause B.2), and with a standard load centre of gravity distance, *D* (see Clause B.3).

The centre of gravity "G" shall be on the centre-line of the truck.

Where a truck does not lift to the standard lift height, *H*, it is given a rated capacity at its maximum lift height.

See Figure B.1.



Key

D standard load centre of gravity distance
G centre of gravity
H standard lift height
Q load

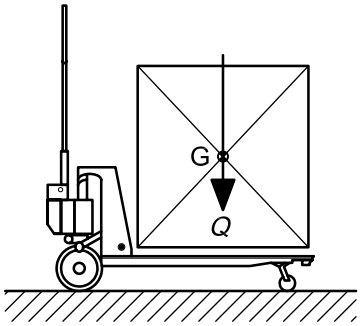
Figure B.1 — Rated capacity of stacker trucks

B.1.2 Pallet trucks

The rated capacity is the load in kilograms given by the manufacturer, which the truck can raise and transport under intended operation.

The rated capacity is defined for a load uniformly distributed over the length (see Figure B.2) and width of the fork arms, without going beyond the length.

The centre of gravity shall be at the longitudinal axis of the truck.



Key

G centre of gravity

Q load

Figure B.2 — Rated capacity of pallet trucks

B.1.3 Scissor-lift pallet truck

The rated capacity is the load in kilograms given by the manufacturer, which the truck can lift and transport under the following intended operation conditions:

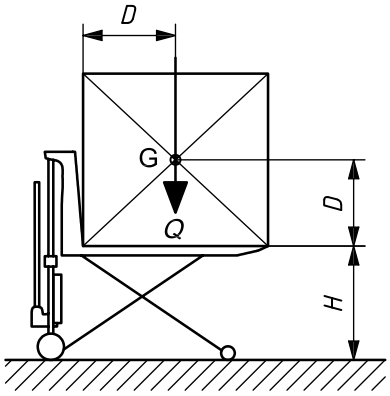
— the rated capacity is defined for a load uniformly distributed over the length and width of the fork arms or platform;

— the centre of gravity is on the longitudinal axis of the truck, located at a distance measured horizontally from the face of the fork arm shank and vertically from the upper face of the fork arms;

— the height, *H*, is the maximum lift height from the ground.

B.2 Standard lift height

This is the height, *H*, from the ground to the upper surface of the fork arm blades or load platform, as shown in Figures B.1 and B.3 and Table B.1



Key

D standard load centre of gravity distance
G centre of gravity
H standard lift height
Q load

Figure B.3 — Rated capacity of scissors lift pallet truck

B.3 Standard load centre of gravity distance

This is the distance, *D*, in millimetres from the centre of gravity "G" of the load measured horizontally to the front face of the fork arm shank and vertically to the upper surface of the fork arm blades, as shown in Figure B.3 and Table B.1. See also Figure B.1.

Table B.1 — Load centre of gravity distance and lift height for rated capacity

Rated capacity *Q* kg	**Standard lift height** *H* m	**Standard load centre of gravity distance** *D* mm	
		Straddle stacker	Pallet stacker
$Q \leq 250$	1,5	250	—
$251 \leq Q \leq 500$	1,5	350/500	600
$501 \leq Q \leq 750$	2,0	500	600
$751 \leq Q \leq 1\,000$	2,5	500	600
NOTE This table does not apply to special applications.			

Annex C
(informative)

List of significant hazards

This list contains all the significant hazards, hazardous situations and events, as far as they are dealt with in this part of ISO 3691, identified by risk assessment of pedestrian-propelled trucks and which require action to eliminate or reduce the risk. See Table C.1.

NOTE The structure of the table is based on that of ISO 12100:2010, Table B.1. The order of lines within a group corresponds to the truck functionalities.

Table C.1 — List of significant hazards

No.	Type or group/origin	Potential consequences	Clause/ Subclause	Corresponding requirement
1	**Mechanical hazards**			
	— Acceleration, deceleration (kinetic energy) — Machinery mobility — Moving elements — Rotating elements	— Being run over — Being thrown — Crushing — Drawing-in or trapping — Impact	4.2	Propelling, steering
			4.3.1	Load-handling controls — General
			4.3.2	Control with a device on the tiller
			4.3.3	Control with a device not located on the tiller
			4.4.3.1	Limitation of stroke
			4.4.3.6	Failure of energy supply of hydraulic circuit
			4.4.6.1	Disengagement of the attachment
			4.5	Parking brake
			4.11.2	Electrical systems and equipment
			5	Verification of safety requirements and/ or protective measures
			6	Information for use
	— Angular parts — Approach of a moving element to a fixed part — Cutting parts — Sharp edges	— Crushing — Cutting or severing — Drawing-in or trapping — Entanglement — Shearing — Stabbing or puncture	4.2	Propelling, steering
			4.8	Protection against crushing, shearing and entanglement points
			4.9	Edges and angles
			4.10	Protective devices
			5	Verification of safety requirements and/ or protective measures
			6	Information for use

Table C.1 *(continued)*

No.	Type or group/origin	Potential consequences	Clause/ Subclause	Corresponding requirement
	— Falling objects	— Crushing — Impact	4.4.1	Chain system
			4.4.2	Wire rope system
			4.4.3.1	Limitation of stroke
			4.4.3.2	Load supporting
			4.4.3.4	Hydraulic circuit
			4.4.3.5	Lowering speed limitation
			4.4.4	Fork arms and platforms — Stacker trucks only
			4.4.5	Fork carriers — Stacker trucks only
			4.4.6	Load handling attachments — Stacker trucks only
			4.6	Stability
			4.7	Lateral stabilizers
			4.10.4	Pallet handling
			4.12	Lifting points
			5	Verification of safety requirements and/ or protective measures
			6	Information for use
	— High pressure	— Injection	4.4.3.3	Pressure relief valves
			4.4.3.4	Hydraulic circuit
			5	Verification of safety requirements and/ or protective measures
			6	Information for use
	— Stability	— Being thrown — Crushing — Impact	4.6	Stability
			4.7	Lateral stabilizers
			4.12	Lifting points
			5	Verification of safety requirements and/ or protective measures
			6	Information for use
2	**Electrical hazards**			
	— Arc — Electromagnetic phenomena — Electrostatic phenomena — Live parts — Not enough distance from live parts under high voltage — Overload — Parts which have become live under fault conditions — Short-circuit — Thermal radiation	— Burns — Chemical effects — Electrocution — Falling, being thrown — Fire — Projection of molten particles — Shock	4.11.2	Electrical systems and equipment
			5	Verification of safety requirements and/ or protective measures
			6	Information for use

Table C.1 *(continued)*

No.	Type or group/origin	Potential consequences	Clause/ Subclause	Corresponding requirement
3	**Thermal hazards**			
	— Explosion[a] — Flame — Radiation from heat sources	— Burns — Dehydration — Discomfort — Injuries from heat-source radiation — Scalding	4.11.2	Electrical systems and equipment
			5	Verification of safety requirements and/ or protective measures
			6	Information for use
4	**Noise hazards**			
	No origin of this kind of hazard in industrial trucks covered by these specifications[b]			
5	**Vibration hazards**			
	No origin of this kind of hazard in industrial trucks covered by these specifications			
6	**Radiation hazards**			
	No origin of this kind of hazard in industrial trucks covered by these specifications			
7	**Material/substance hazards**			
	— Combustible — Explosivea — Flammable — Fluid — Fume — Gas	— Breathing difficulties, suffocation — Cancer — Corrosion — Effects on reproductive capability — Explosiona — Fire — Infection — Mutation — Poisoning — Sensitization	4.4.3.4	Hydraulic circuit
			4.10.2	Glass guards or screens
			4.11.2	Electrical systems and equipment
			5	Verification of safety requirements and/ or protective measures
			6	Information for use

[a] Explosive atmospheres are subject to regional requirements, additional to the requirements of this part of ISO 3691. See ISO/TS 3691-7 and ISO/TS 3691-8.

[b] Noise emissions are subject to regional requirements, additional to the requirements of this part of ISO 3691. See ISO/TS 3691-7.

Table C.1 — *(continued)*

No.	Type or group/origin	Potential consequences	Clause/ Subclause	Corresponding requirement
8	**Ergonomic hazards**			
	— Access — Design or location of indicators and visual display units — Design, location or identification of control devices — Effort — Local lighting — Mental overload/underload — Posture — Repetitive activity — Visibility	— Discomfort — Fatigue — Musculo-skeletal disorders — Stress — Any other (e.g. mechanical, electrical) as a consequence of human error	4.2	Propelling, steering
			4.3	Load-handling controls
			4.11.1	Lifting
			4.11.2	Electrical systems and equipment
			5	Verification of safety requirements and/ or protective measures
			6	Information for use
9	**Hazards associated with environment in which machine is used**			
	— Dust and fog — Electromagnetic disturbance — Lightning — Moisture — Temperature — Water — Lack of oxygen	— Burns — Slight disease — Slipping, falling — Suffocation — Any other as a consequence of the effect caused by the sources of the hazards on the machine or parts of the machine	6	Information for use
10	**Combination of hazards**			
	E.g. repetitive activity + effort + high environmental temperature	E.g. dehydration, loss of awareness, heat stroke	6	Information for use

Bibliography

[1] ISO 2330, *Fork-lift trucks — Fork arms — Technical characteristics and testing*

[2] ISO 10658, *Industrial trucks operating in special conditions of stacking with load laterally displaced by powered devices — Additional stability test*[1)]

[3] ISO 22877, *Castors and wheels — Vocabulary, symbols and multilingual terminology*

[4] ISO 22878, *Castors and wheels — Test methods and apparatus*

[5] ISO 22883, *Castors and wheels — Requirements for applications up to 1,1 m/s (4 km/h)*

[6] ISO 22915-16, *Industrial trucks — Verification of stability — Part 16: Pedestrian-propelled trucks*

[7] ISO 14121-1, *Safety of machinery — Risk assessment — Part 1: Principles*[2)]

1) Withdrawn.

2) Replaced by ISO 12100:2010.

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