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**Industrial trucks — Safety  
requirements and verification —**

**Part 6:  
Burden and personnel carriers**

*Chariots de manutention — Exigences de sécurité et vérification —*

*Partie 6: Transporteurs de charges et de personnel*

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Published in Switzerland

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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](http://www.iso.org/directives)

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received. [www.iso.org/patents](http://www.iso.org/patents)

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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](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*.

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This first edition of ISO 3691-6, together with ISO 3691-1, ISO 3691-2, ISO 3691-3, ISO 3691-4, ISO 3691-5, ISO/TS 3691-7 and ISO/TS 3691-8, cancels and replaces ISO 3691:1980, of which it constitutes a technical 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 4: Driverless industrial trucks and their systems*
- *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.

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# Industrial trucks — Safety requirements and verification —

## Part 6: Burden and personnel carriers

### 1 Scope

This part of ISO 3691 gives safety requirements and the means for their verification for self-propelled carriers designed for carrying burdens without lifting, as defined in ISO 5053, and/or personnel carriers, having three or more wheels, a maximum speed not exceeding 56 km/h and a load capacity not exceeding 5 000 kg (hereafter referred to as *carriers* or *trucks*).

This part of ISO 3691 is applicable to trucks equipped with a platform (which can be tilting) for the purpose of carrying materials or with a number of seats for the purpose of transporting passengers.

It is not applicable to

- vehicles intended primarily for earth-moving or over-the-road hauling,
- driverless trucks,
- golf cars,
- tractors with a drawbar pull up to and including 20 000 N equipped with a platform for the purpose of carrying materials.

This part of ISO 3691 deals with all significant hazards, hazardous situations or hazardous events, as listed in [Annex A](#), relevant to the applicable machines when used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer.

It does not establish requirements for hazards that can occur when using trucks on public roads or when operating in potentially explosive atmospheres.

Regional requirements, additional to the requirements given in this part of ISO 3691, are addressed in ISO/TS 3691-7 and ISO/TS 3691-8.

### 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 2867:2011, *Earth moving machinery — Access systems*

ISO 3287:1999, *Powered industrial trucks — Symbols for operator controls and other displays*

ISO 3411:2007, *Earth-moving machinery — Physical dimensions of operators and minimum operator space envelope*

ISO 3795:1989, *Road vehicles, and tractors and machinery for agriculture and forestry — Determination of burning behaviour of interior materials*

ISO 5010:2007, *Earth-moving machinery — Rubber-tyred machines — Steering requirements*

## ISO 3691-6:2013(E)

ISO 5053, *Powered industrial trucks — Terminology*

ISO 6292:2008, *Powered industrial trucks and tractors — Brake performance and component strength*

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

ISO 13564-1:2012, *Powered industrial trucks — Test methods for verification of visibility — Part 1: Sit-on and stand-on operator trucks and variable-reach trucks up to and including 10 t capacity*

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

ISO 15870:2000, *Powered industrial trucks — Safety signs and hazard pictorials — General principles*

ISO 20898:2008, *Industrial trucks — Electrical requirements*

ISO 21281:2005, *Construction and layout of pedals of self-propelled sit-down rider-controlled industrial trucks — Rules for the construction and layout of pedals*

ISO 24135-1:2006, *Industrial trucks — Specifications and test methods for operator restraint systems — Part 1: Lap-type seat belts*

ANSI/ITSDF B56.8:2006, *Safety Standard for Personnel and Burden Carriers*<sup>1)</sup>

### 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 burden [personnel] carrier**  
mobile power-driven machine that is not self-loading, used for transporting material and/or personnel on indoor and outdoor improved surfaces, but not for use on public roads

**3.2 operator**  
designated person, trained and authorized, who is responsible for the movement and operation of the carrier and, depending on the carrier type, can be transported by the carrier, or can be on foot accompanying the truck or can be remote from the truck (remote-controlled by cables, radio, etc.)

**3.3 normal operating position**  
position in which the operator is able to control all functions for driving as defined by the manufacturer

**3.4 load capacity**  
maximum load, including the operator and passengers

**3.5 capacity**  
operator and number of passengers permitted by the manufacturer

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1) American National Standards Institute/Industrial Truck Standards Development Foundation.



## 4 Safety requirements and/or protective measures

### 4.1 General

#### 4.1.1 Overall requirements

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.

#### 4.1.2 Normal climatic conditions

For truck operation, the following climatic conditions apply:

- average ambient temperature for continuous duty: +25 °C
- maximum ambient temperature, short term (up to 1 h): +40 °C
- lowest ambient temperature for trucks intended for use in normal indoor conditions: +5 °C
- lowest ambient temperature for trucks intended for use in normal outdoor conditions: -20 °C
- altitude: up to 2 000 m

#### 4.1.3 Electrical requirements

Electrical systems and equipment shall be in accordance with ISO 20898, except where regional requirements apply. See ISO/TS 3691-7 and ISO/TS 3691-8.

#### 4.1.4 Edges and angles

There shall be no sharp edges or angles posing a hazard in the area of the operator in the normal operating position or in the area of access and egress of operators or passengers and during normal operation and daily checks.

#### 4.1.5 Stored energy components

Components which store energy and would cause a risk during removal or disassembly, e.g. hydraulic accumulator or spring applied brakes, shall be provided with a means of releasing the energy before removal or disassembly.

### 4.2 Starting/moving

#### 4.2.1 Unauthorized starting

Carriers shall be provided with a device (e.g. a key, a code, a magnetic card) that prevents starting without that device.

#### 4.2.2 Unintended movement

##### 4.2.2.1 Parking brake

A parking brake shall be provided complying with [4.3.1](#).

##### 4.2.2.2 Internal combustion engine-powered carriers

Internal combustion engine-powered carriers shall be fitted with a device that prevents the engine being started while the transmission is engaged.

#### 4.2.2.3 Travel controls

Travel controls on internal combustion engine powered carriers shall be so arranged that on level ground the carrier will not move from rest until the transmission has been engaged.

#### 4.2.2.4 Powered travel movement

Powered travel movement of the carrier with a ride-on operator shall be possible only if the operator is in the normal operating position.

Powered travel shall not occur automatically when the operator returns to the normal operator position(s) without an additional operation, e.g. by requiring resetting the direction control or reactivating speed control, etc.

#### 4.2.2.5 Manual gearbox and manually operated clutch pedal

A carrier with an automotive-type manual gearbox and manually operated clutch pedal satisfies the requirements of [4.2.2.2](#) and [4.2.2.4](#).

#### 4.2.3 Speedometer

A speedometer shall be provided on ride-on carriers that have a maximum travel speed greater than 25 km/h.

### 4.3 Brakes

#### 4.3.1 General

All carriers shall be designed with service and parking brakes complying with ISO 6292. The parking brake shall be equipped with a system preventing unintentional release.

Emergency braking is subject to regional requirements, additional to the requirements of this part of ISO 3691. See ISO/TS 3691-7 and ISO/TS 3691-8.

#### 4.3.2 Stand-on carriers

Stand-on carriers shall be equipped with a brake system that will automatically engage upon release of the brake actuating control by the operator. This system may serve as the service and parking brake.

#### 4.3.3 Failure of the energy supply

Failure of the energy supply for the brake release shall not result in loss of braking for automatically acting brakes. The brake shall be automatically applied in the event of failure of energy supply to this brake system.

### 4.4 Manual control actuators

#### 4.4.1 General

##### 4.4.1.1 Consistency with the carrier motions

Movement of these controls, where practicable, shall be consistent with the carrier motions being operated. They shall be confined within the plan view outline of the carrier or tiller.

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#### 4.4.1.2 Multiple operators

If additional operating positions are fitted, i.e. more than one operator, the operation of these controls shall only be possible from one operating position at a time, excepting the emergency disconnect switch, which shall be operable from all positions.

#### 4.4.1.3 Multiple operating positions

If more than one operating position is fitted for a single operator, the use of the controls of one operating position shall preclude the use of the controls of other operating positions, excepting the emergency disconnect switch, which shall be operable from all positions.

### 4.4.2 Travel and braking controls

#### 4.4.2.1 General

The motion of the speed operating control shall be designed such that an increase in the movement of the control increases the travel speed. When the control is released, it shall return to the neutral position of the control actuator.

#### 4.4.2.2 Sit-on carriers

Pedal operated travel and braking controls shall comply with ISO 21281.

#### 4.4.2.3 Differential locking

For carriers fitted with a pedal-operated differential lock, depression of the pedal shall lock the differential and it shall be unlocked by releasing the pedal. It shall be possible to unlock the differential when the truck is moving.

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#### 4.4.2.4 Hand-operated direction control lever

The movement of a direction control lever shall correspond to the selected direction of travel.

#### 4.4.2.5 Hand-operated accelerator control lever

The control lever shall be a hold-to-run control. It shall return to the neutral position when released. Movement towards the front of the carrier or away from the operator shall increase speed.

#### 4.4.2.6 Additional operation from outside the carrier

##### 4.4.2.6.1 General

If travel control from outside the carrier is provided for the operator, the travel speed shall be limited to 6 km/h. These controls can be attached to the carrier or remote control can be provided. This operating system can be made operable by means of a separate switch or automatically when the operator leaves the normal operating position.

##### 4.4.2.6.2 Security

If the control actuator is released, the drive unit shall switch off automatically and the brake shall be engaged. Simultaneous operation from the operating positions shall be excluded.

#### 4.4.2.6.3 Additional requirements for cable-connected remote control

Length and layout of the cables shall allow the operator to operate from outside of the area of hazard of the truck and have visibility of the path of travel. It shall not be possible for the cable to become entangled with the wheels.

On a portable control panel, the control elements, with the exception of the emergency stop, shall be guarded against unintentional operation.

#### 4.4.2.6.4 Additional requirements for cableless control

The transmission range shall be adequate for the operator to operate from outside the area of hazard of the truck and have visibility in the path of travel.

On the portable control panel, the control elements for movement, with the exception of the emergency stop, shall be guarded against unintentional operation.

The reliability level shall be at least  $10^{-9}$  and the hamming distance shall be 2. The remote control shall meet the requirements of ISO 13849-1, performance level (PL) c.

In case of communication being lost, the brake system shall engage within 0,5 s.

No control interference shall be possible when more than one truck is operating under remote control at the same time.

#### 4.4.2.6.5 Additional requirements for carriers with trailer coupling

The controls (e.g. rear touch device) shall be arranged such that the operator does not have to step between the carrier and the trailer to operate them.

The rear touch device shall be secured against unintentional operation.

When operating the rear touch device, the carrier shall travel at a speed of not more than 2,5 km/h.

### 4.4.3 Steering controls

#### 4.4.3.1 Direction

Clockwise rotation of the steering wheel or any equivalent movement of the steering control shall steer the carrier to the right when driving forward.

For pedestrian-operated carriers fitted with a tiller, when travelling in the forward direction, clockwise movement of the tiller shall steer the carrier to the right.

#### 4.4.3.2 Failure of power supply

In the event of an interruption of the power supplied to the steering system (including a dead motor or engine), it shall be possible to maintain the path being steered until the carrier is brought to a stop.

For carriers with a maximum travel speed above 20 km/h, the steering performance in the case of power supply shall comply with ISO 5010.

#### 4.4.4 Marking

For marking, graphic symbols for controls shall comply with [6.3.2](#).