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

Part 3:

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

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Chariots de manutention — Exigences de sécurité et vérification —

*Partie 3: Exigences complémentaires pour chariots avec poste de
conduite élevable et pour chariots spécialement conçus pour une
conduite avec des charges en élévation*

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ISO 3691-3:2016

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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 (see 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 (see 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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html

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

This first edition of ISO 3691-3, together with ISO 3691-1, ISO 3691-2, ISO 3691-4, ISO 3691-5, ISO 3691-6, 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 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]*

The following parts are under preparation:

- *Part 4: Driverless industrial trucks and their systems*

Introduction

General

This part of ISO 3691 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 part of ISO 3691.

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 covers safety requirements and their verification for industrial trucks as defined in ISO 5053-1.

Structure

An important step forward in the work on the ISO 3691 series 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 3:

Additional requirements for trucks with elevating operator position and trucks specifically designed to travel with elevated loads

1 Scope

This part of ISO 3691 gives safety requirements and the means for their verification, additional to those of ISO 3691-1, for industrial trucks with a vertical, non-tilting mast:

- a) those trucks having an elevating operator position, and order-picking trucks, as defined in ISO 5053-1, where the elevating operator position and the load-handling device lifts to a height of more than 1 200 mm above ground level;
- b) lateral- and front-stacking trucks, as defined in ISO 5053-1, designed to travel with a load-handling device elevated more than 1 200 mm above ground level, with the load-handling device elevated, lowered or laterally displaced (laden or unladen) while the truck is travelling.

These trucks are designed to travel indoors on a smooth, level surface (e.g. concrete) and can be guided, unguided, or both, when in use; they are not intended to tow or push.

This part of ISO 3691 is not applicable to stacker trucks which handle two loads, one on the forks and the other on the support arms, this type of truck being covered by ISO 3691-1.

It is not applicable to trucks with an elevating operator position up to and including 1 200 mm, or to trucks specifically designed to travel with an elevated load having a fork height up to and including 1 200 mm above ground level.

It is not applicable to low-level order pickers with elevating operator's position up to and including 1 200 mm lift height which can be equipped with an additional load lifting device having a maximum lift height of 1 800 mm from ground level.

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 are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 2860, *Earth-moving machinery — Minimum access dimensions*

ISO 3691-3:2016(E)

ISO 3691-1:2011, *Industrial trucks — Safety requirements and verification — Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks*

ISO 5053-1:2015, *Industrial trucks — Terminology and classification — Part 1: Types of industrial trucks*

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 22915-21, *Industrial trucks — Verification of stability — Part 21: Order-picking trucks with operator position elevating above 1 200 mm*

ISO 22915-22, *Industrial trucks — Verification of stability — Part 22: Lateral- and front-stacking trucks with and without elevating operator position*

ISO 24134, *Industrial trucks — Additional requirements for automated functions on trucks*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5053-1:2015, ISO 12100:2010, ISO 3691-1:2011, and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 operating with elevated load

elevation or lowering of a load with the load handling device while the truck is travelling

3.2 elevating operator position

operator's platform which can be elevated more than 1 200 mm from the ground to the floor of the platform measured with the truck unladen

3.3 aisle

operating area of the truck between the racks or load faces

3.4 load-handling device

means that supports the load

EXAMPLE Forks, platform, and attachment.

3.5 auxiliary lift

lift mechanism additional to the main lifting device

3.6 guidance system

system which guides the truck on a predetermined path not directly controlled by the operator

3.7 supplementary platform

load-carrying platform accessible from the operator's platform, designed for mounting on the elevating device of an order-picking truck

Note 1 to entry: This platform may be removable.

3.8**personal fall prevention system**

system that limits the fall of the operator

3.9**disposable pallet**

pallet intended to be discarded after a single cycle of use

3.10**VNA****very narrow aisle**

traffic path for industrial trucks in storage systems without a safety distance of at least 0,5 m between the outer parts of the truck (including the load) and fixed parts of the environment (e.g. uprights)

4 Safety requirements and/or protective measures**4.1 General**

The truck 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 part of ISO 3691.

4.2 Modes of operation when lateral stacking

While the truck is lifting, lowering, or travelling at more than 2,5 km/h, it shall not be possible for any part of the lateral reach mechanism to intrude into the racking space. When this lateral reach mechanism is extended, extending or retracting, travelling speed shall be restricted to 2,5 km/h or less.

When a truck is designed for lateral and front stacking, it shall have a device which automatically prevents:

- a) travelling at more than 2,5 km/h when the load handling device is in the forward position;
- b) turning of the load-handling device in its forward position with a travelling speed of more than 2,5 km/h.

These requirements do not apply if the load handling device is kept within the truck width (excluding guidance system).

Guided trucks operating in aisles with a non-mechanical guidance system shall comply with the automatic steering requirements of ISO 24134.

4.3 Brakes**4.3.1 Operation without guidance systems**

For operations without guidance systems, the braking performance shall comply with ISO 6292:2008, Table 2 or 3, group C.

Braking when travelling at more than 9 km/h is subject to regional requirements, additional to the requirements of this part of ISO 3691. See ISO/TS 3691-7.

4.3.2 Operation within guided systems

For operation within guided systems, the braking performance shall comply with ISO 6292:2008, Table 2 or 3, group C.

4.4 Additional requirements for trucks with elevating operator position

4.4.1 Travel speed

Travel speed shall be dependent on braking (see [4.4.2](#)) and stability requirements (see [4.6](#)).

4.4.2 Brakes

Automatically acting brakes shall be provided. This (these) brake(s) can be a service as well as a parking brake.

4.4.3 Controls

4.4.3.1 Arrangement

All controls to operate the truck shall be arranged at the elevating operator platform, except the emergency lowering control as specified in [4.4.6](#). It shall not be possible to operate any of the truck functions other than emergency lowering controls unless the operator is at the normal operator position.

4.4.3.2 Fixed section control position

Where two operator positions are embodied, one on the elevating section and one on the fixed section, it shall not be possible to actuate the fixed section controls when the elevating section controls are operable. However, the emergency lowering control requirements specified in [4.4.6](#) are still applicable.

4.4.3.3 Operator protection

Means shall be provided to keep the operator within the confines of the operating position while operating the truck within very narrow aisles, e.g. two hand controls according to ISO 13851, or operator positioning. Any additional person shall be similarly protected.

4.4.3.4 Fitting of more than one operating position

When a truck with an elevating operator position is fitted with more than one operating position, as defined in ISO 3691-1:2011, 4.4.1.2 and/or 4.4.1.3, a lockable switch or other means, e.g. magnetic card, code system, shall be provided to activate the controls for each operating position, protected as specified in [4.4.3.3](#).

4.4.4 Systems for lifting and lowering

4.4.4.1 Mechanical lifting systems

The chains employed in the operator and load elevating system shall comply with the requirements of [4.4.4.4](#) to [4.4.4.6](#).

4.4.4.2 Hydraulic lifting systems

A device shall be provided which prevents descent in the event of a pipe fracturing or a hose bursting. This device shall be either directly attached to or incorporated in the lift cylinder. It shall not be possible to disengage this device unless the rate of descent is limited to not exceed 0,6 m/s.

4.4.4.3 Combined lifting systems

Combined lifting systems shall comply with [4.4.4.2](#) and [4.4.4.4](#) to [4.4.4.6](#).

4.4.4.4 Chains employed in operator elevating systems

4.4.4.4.1 Where chains are used for elevating/lowering the operating position, at least two identical, independently anchored, chains are to be employed.

4.4.4.4.2 Means shall be provided (e.g. adjustment) to equalize the loading of chains used for elevating and lowering the operator position. It shall be possible to inspect the chains over their entire length without dismantling more than covers or guards.

4.4.4.4.3 As a deviation from ISO 3691-1, the safety factor K_1 for chains shall be at least 10.

4.4.4.4.4 The strength of every chain termination shall be at least 80 % of the certified minimum breaking load of the chain required for the maximum actual capacity of the truck.

4.4.4.5 Slack chain detection

Operator elevating mechanisms that use chains shall be fitted with a slack chain detection device. The slack chain detection device when actuated shall automatically stop the downward motion of the elevating mechanism of the operator platform.

4.4.4.6 Disengagement of the operator's platform

Means shall be provided to prevent the operator's platform from being accidentally disengaged from the elevating mechanism over the complete range of its movements (e.g. limitation of stroke or mechanical stop).

4.4.5 Operator position

4.4.5.1 Operator's platform

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Elevated operator's platforms with a lift height of more than 1 200 mm from the ground and fixed operator's stand-on platforms located at heights of more than 1 200 mm shall be equipped with means of fall protection on all sides (e.g. bars or guard rails).

The upper surface of the means shall be at a height between 900 mm and 1 100 mm measured from the upper surface of the means to the floor of the elevated operator position. The means shall be capable of withstanding without permanent deformation a force of 900 N applied in a vertical downwards direction and a force of 900 N applied in a horizontal direction from the inside to the outside, and shall not be capable of being opened outwards.

Where guard rails are fitted, they shall comprise top rails, intermediate rails, and toe boards. The toe board shall have a height of 100 mm and the bottom edge of the toe board shall be at a maximum height of 35 mm above the floor.

See [Figures 1](#) to [4](#) for different types of platforms and examples of guarding.