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Industrial trucks - Safety requirements and verification - Part 4: Driverless industrial trucks and their systems (ISO 3691-4:2020)

Flurförderzeuge - Sicherheitstechnische Anforderungen und Verifizierung - Teil 4: Fahrerlose Flurförderzeuge und ihre Systeme (ISO 3691-4:2020)

Chariots de manutention - Exigences de sécurité et vérification - Partie 4: Chariots sans conducteur et leurs systèmes (ISO 3691-4:2020)

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European foreword

This document (EN ISO 3691-4:2020) has been prepared by Technical Committee ISO/TC 110 "Industrial trucks" in collaboration with Technical Committee CEN/TC 150 "Industrial Trucks - Safety" the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2020, and conflicting national standards shall be withdrawn at the latest by November 2020.

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**Industrial trucks — Safety
requirements and verification —
Part 4:
Driverless industrial trucks and
their systems**

iTeh STANDARD PREVIEW
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Partie 4: Chariots sans conducteur et leurs systèmes*
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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 of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 110, *Industrial trucks*, Subcommittee SC 2, *Safety of powered industrial trucks*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

A list of all parts in the ISO 3691 series can be found on the ISO website.

ISO 3691-4:2020(E)

Introduction

General

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

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (regulators, accident prevention organizations, market surveillance etc.)

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

- machine users/employers (small, medium and large enterprises);
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e.g. for maintenance (small, medium and large enterprises);
- consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

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.

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 types of trucks and on the other side independent standards to cover the respective specific functions of industrial trucks, e.g. visibility, noise, 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 needs to identify the hazards that apply to their product and carry out a risk assessment. The manufacturer then needs 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 can also arise from foreseeable abnormal situations.

In selecting the most appropriate methods, the manufacturer needs 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 need to draw the user's attention to ways shown by experience in which the machinery ought not to be used.

This document 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. Refer to ISO 12100.

Global relevance

From the very beginning, the task was to revise ISO 3691:1980 to establish international basic standards to align 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 for most of the issues addressed. For several potential problem areas, compromises were needed and will still be needed in the future. Where divergent regional requirements remain, these are addressed by ISO/TS 3691-8.

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Industrial trucks — Safety requirements and verification —

Part 4: Driverless industrial trucks and their systems

1 Scope

This document specifies safety requirements and the means for their verification for driverless industrial trucks (hereafter referred to as trucks) and their systems.

Examples of driverless industrial trucks (trucks of ISO 5053-1) can also be known as: “automated guided vehicle”, “autonomous mobile robot”, “bots”, “automated guided cart”, “tunnel tugger”, “under cart”, etc.

This document also contains requirements for driverless industrial trucks which are provided with:

- automatic modes which either require operators’ action(s) to initiate or enable such automatic operations;
- the capability to transport one or more riders (which are neither considered as drivers nor as operators);
- additional manual modes which allow operators to operate the truck manually; or
- a maintenance mode which allows manual operation of truck functions for maintenance reasons.

It is not applicable to trucks solely guided by mechanical means (rails, guides, etc.) or to remotely controlled trucks, which are not considered to be driverless trucks.

For the purposes of this document, a driverless industrial truck is a powered truck, which is designed to operate automatically. A driverless truck system comprises the control system, which can be part of the truck and/or separate from it, guidance means and power system. Requirements for power sources are not covered in this document.

The condition of the operating zone has a significant effect on the safe operation of the driverless industrial truck. The preparations of the operating zone to eliminate the associated hazards are specified in [Annex A](#).

This document deals with all significant hazards, hazardous situations or hazardous events during all phases of the life of the truck (ISO 12100:2010, 5.4), as listed in [Annex B](#), relevant to the applicable machines when it is used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer.

It does not give requirements for additional hazards that can occur:

- during operation in severe conditions (e.g. extreme climates, freezer applications, strong magnetic fields);
- during operation in nuclear environments;
- from trucks intended to operate in public zones (in particular ISO 13482);
- during operation on a public road;
- during operation in potentially explosive environments;