BS EN ISO 3691-4:2023

BSI Standards Publication

Industrial trucks — Safety requirements and verification

Part 4: Driverless industrial trucks and their systems

bsi.

National foreword

This British Standard is the UK implementation of EN ISO 3691-4:2023. It is identical to ISO 3691-4:2023. It supersedes BS EN ISO 3691-4:2020, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee MHE/7, Industrial trucks.

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

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UK Government is responsible for legislation. For information on legislation and policies relating to that legislation, consult the relevant pages of www.gov.uk.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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Chariots de manutention - Exigences de sécurité et vérification - Partie 4: Chariots sans conducteur et leurs systèmes (ISO 3691-4:2023)

Flurförderzeuge - Sicherheitstechnische Anforderungen und Verifizierung - Teil 4: Fahrerlose Flurförderzeuge und ihre Systeme (ISO 3691-4:2023)

This European Standard was approved by CEN on 5 May 2023.

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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN ISO 3691-4:2023) 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of an identical text or by endorsement, at the latest by January 2024, and conflicting national standards shall be withdrawn at the latest by January 2024.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 3691-4:2020.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s) / Regulation(s).

For the relationship with EU Directive(s) / Regulation(s), see informative Annex ZA, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users’ national standards body/national committee. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Endorsement notice

The text of ISO 3691-4:2023 has been approved by CEN as EN ISO 3691-4:2023 without any modification.

Annex ZA
(informative)

Relationship between this European Standard and the essential requirements of Directive 2006/42/EC aimed to be covered

This European Standard has been prepared under a Commission's standardization request "M/396 Mandate to CEN and CENELEC for Standardisation in the field of machinery" to provide one voluntary means of conforming to essential requirements of Directive 2006/42/EC of the European Parliament and the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast).

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Annex I of Directive 2006/42/EC

The relevant Essential Requirements of Directive 2006/42/EC (MD)	Clause(s)/ subclause(s) of this EN	Remarks/ Notes
1.1.2 (a). Principles of safety integration	4,5,6	
1.1.2 (c). Principles of safety integration	4,5,6	
1.1.2 (d). Principles of safety integration	4,5,6	
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The relevant Essential Requirements of Directive 2006/42/EC (MD)	Clause(s)/ subclause(s) of this EN	Remarks/ Notes
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The relevant Essential Requirements of Directive 2006/42/EC (MD)	Clause(s)/ subclause(s) of this EN	Remarks/ Notes
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The relevant Essential Requirements of Directive 2006/42/EC (MD)	Clause(s)/ subclause(s) of this EN	Remarks/ Notes
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WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

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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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 150, *Industrial Trucks - Safety,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 3691-4:2020), which has been technically revised.

The main changes are as follows:

— the Scope has been updated to include a list of significant hazards not covered;

— the list of normative references has been updated to include the most recent editions of documents;

— the term entries "active detection field" and "operational stop" have been added to Clause 3;

— Clause 4, Clause 5, Clause 6, Annex A, Annex B and Annex C have been updated, with new requirements added in subclauses 4.1.16 to 4.1.27;

— the verification of the safety requirements lists in Annex E have been reworded.

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

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.

Introduction

This document is a type-C standard as stated in ISO 12100:2010.

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 type-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.

This document takes into consideration the current state of the art and especially:

— virtual bumper technology;

— hybrid (i.e. manual and automatic) mode trucks;

— performance level versus category;

— further specified clearances;

— guarding for specific zones.

INTERNATIONAL STANDARD ISO 3691-4:2023(E)

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 as defined in ISO 5053-1:2020) include: “automated guided vehicle”, “autonomous mobile robot”, “bots”, “automated guided cart”, “tunnel tugger”, “under cart”, etc.

This document is also applicable to 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.

This document 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 is applicable to 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.

In particular, this document does not apply to significant hazards related to:

— noise;

— vibrations;

— ionising and non-ionising radiation;

— laser radiation;

— sales literature (commercial documents);

— declaration of vibrations transmitted by mobile machinery.

It does not apply to 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 (see in particular ISO 13482:2014);

— during operation on a public road;

— during operation in potentially explosive environments;

— during operation in military applications;

— during operation with specific hygienic requirements;

— during operation in ionizing radiation environments;

— during the transportation of (a) person(s) other than (the) intended rider(s);

— when handling loads the nature of which can lead to dangerous situations (e.g. molten metals, acids/bases, radiating materials);

— for rider positions with elevation function higher than 1 200 mm from the floor/ground to the platform floor.

This document does not contain safety requirements for trailer(s) being towed behind a truck.

This document does not contain safety requirements for elevated operator trucks.

This document does not apply to trucks manufactured before the date of its publication.

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

ISO 3691-1:2011 ISO 3691-1:2011/Amd 1:2020, *Industrial trucks — Safety requirements and verification — Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks*

ISO 3691-2:2023, *Industrial trucks — Safety requirements and verification — Part 2: Self-propelled variable-reach trucks*

ISO 3691-6:2021, *Industrial trucks — Safety requirements and verification — Part 6: Burden and personnel carriers*

ISO 4413:2010, *Hydraulic fluid power — General rules and safety requirements for systems and their components*

ISO 4414:2010, *Pneumatic fluid power — General rules and safety requirements for systems and their components*

ISO 5053-1:2020, *Industrial trucks — Vocabulary — Part 1: Types of industrial trucks*