
Vozila za talni transport - Varnostne zahteve in preverjanje - 4. del: Vozila brez voznika in njihovi sistemi (ISO/DIS 3691-4:2026)

Industrial trucks - Safety requirements and verification - Part 4: Driverless industrial trucks and their systems (ISO/DIS 3691-4:2026)

Flurförderzeuge - Sicherheitstechnische Anforderungen und Verifizierung - Teil 4: Fahrerlose Flurförderzeuge und ihre Systeme (ISO/DIS 3691-4:2026)

Chariots de manutention - Exigences de sécurité et vérification - Partie 4: Chariots de manutention sans conducteur et leurs systèmes (ISO/DIS 3691-4:2026)

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ICS:

53.060	Industrijski tovarnjaki	Industrial trucks
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DRAFT International Standard

ISO/DIS 3691-4

Industrial trucks — Safety requirements and verification —

Part 4: Driverless industrial trucks and their systems

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

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).

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.

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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 document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative [Annex ZA](#), which is an integral part of this document.

This third edition cancels and replaces the second edition (ISO 3691-4:2023), which has been technically revised.

The main changes are as follows:

- the Scope has been updated to include:
 - a) a list of types of trucks not covered;
 - b) a reference to the operating environment as defined in [Annex A](#);
 - c) a list of significant hazards not covered;
 - d) the exclusion of domestic animals;
- the list of normative references has been updated to include the most recent editions of documents;
- the term entries have been updated and additional term entries, added in [Clause 3](#);
- [4.9](#) integrates changes for detection of persons and safeguarding;
- [5.2](#) has been updated to include new test pieces dependant on Non-contact SPE;

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- [5.3](#) includes additional testing for side detection;
- [Annex A](#) now includes all the specific content required for the commissioning phase of the installation;
- [Annex F](#) has been added for specification of warning and indicator signals;
- [Annex G](#) has been added for cross reference with industrial truck types of ISO 5053-1;
- [Annex H](#) has been added for implementation of muting by a combination of trucks signals;
- [Annex I](#) has been added for determination of alternative performance levels for safety functions;
- [Annex J](#) has been added for demonstration with an alternative method of a PL b for clearance management based on localisation systems.

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.

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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. This document covers driverless industrial trucks and their systems.

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:

- non-contact sensitive protective equipment technology;
- hybrid operated trucks (i.e. manual and automatic operation);
- updates to clearances;
- additional safety functions (e.g. side detection, critical edge detection);
- safeguarding for specific zones.

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 as trucks) and their systems.

NOTE 1 Examples of industrial trucks can be found in ISO 5053-1:2020

For the purpose of this document, driverless industrial trucks are:

- powered mobile machines;
- having at least three wheels;
- operating in an industrial environment;
- designed to carry, tow, push, lift, tier in a rack, or stack a load (load handling);
- controlled by automation, independent of their level of autonomy and;
- which remain stable in the absence of power.

NOTE 2 Level of autonomy is to be understood as type of navigation.

This document is also applicable to trucks which are provided with one or more of the following:

- automatic modes which either require operators' actions to initiate or enable such automatic operations;
- the capability to transport one or more riders (which are not considered as drivers);
- additional modes which allow operators to operate the truck manually;
- maintenance modes which allow manual operation of truck functions for maintenance reasons.

This document is applicable where trucks operate in an area of application where people have specific training, instruction or awareness.

This document is applicable to all significant hazards, hazardous situations or hazardous events during all phases of the lifecycle (ISO 12100:2010, 5.4), as listed in [Annex B](#), relevant to the applicable machines when they are used as intended and under conditions of misuse which are reasonably foreseeable. This document is not applicable to the following:

- solely mechanically guided trucks;
- trucks that are solely remotely controlled by an operator (see ISO/DIS 3691-1:2025).

This document does not cover significant hazards related to:

- protection against corruption;
- special requirements for guards / adjustable guards restricting access;
- noise;

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- vibrations;
- ionising and non-ionising radiation;
- laser radiation;
- cleaning of internal parts;
- sales literature (commercial documents);
- supervisory function;
- declaration of vibrations transmitted by mobile machinery;
- self-evolving behaviour or logic (e.g. artificial intelligence).

It does not address the hazards that can occur:

- during operation in severe conditions (e.g. extreme climates, freezer applications, strong magnetic fields);
- during operation in nuclear environments;
- 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 an elevation function higher than 1 200 mm from the floor/ground to the platform floor.

This document does not contain safety requirements for trucks intended to operate in public zones or spaces accessible to any persons without specific training, instruction or awareness.

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

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

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

This document does not take into consideration domestic animals as they are not expected to be present in industrial environments.

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/DIS 3691-1:2025, *Industrial trucks — Safety requirements and verification — Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks*

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- 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*
- ISO 7010:2019¹⁾, *Graphical symbols — Safety colours and safety signs — Registered safety signs*
- ISO 7250-1:2017, *Basic human body measurements for technological design — Part 1: Body measurement definitions and landmarks*
- ISO 10896-1:2020, *Rough-terrain trucks — Safety requirements and verification — Part 1: Variable-reach trucks*
- ISO 10896-2:2016, *Rough-terrain trucks — Safety requirements and verification — Part 2: Slewing trucks*
- ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*
- ISO 13849-1:2023, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*
- ISO 13849-2:2012, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation*
- ISO 13850:2015, *Safety of machinery — Emergency stop function — Principles for design*
- ISO 13851:2019, *Safety of machinery — Two-hand control devices — Principles for design and selection*
- ISO 13855:2024, *Safety of machinery — Positioning of safeguards with respect to the approach of the human body*
- ISO 13856-2:2013, *Safety of machinery — Pressure-sensitive protective devices — Part 2: General principles for design and testing of pressure-sensitive edges and pressure-sensitive bars*
- ISO 13856-3:2013, *Safety of machinery — Pressure-sensitive protective devices — Part 3: General principles for design and testing of pressure-sensitive bumpers, plates, wires and similar devices*
- ISO 13857:2019, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*
- ISO 14119:2024, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*
- ISO 14120:2015, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*
- ISO 14122-2:2016, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways*
- ISO 15870:2000, *Powered industrial trucks — Safety signs and hazard pictorials — General principles*
- ISO 22915-2:2018, *Industrial trucks — Verification of stability — Part 2: Counterbalanced trucks with mast*
- ISO 22915-3:2021, *Industrial trucks — Verification of stability — Part 3: Reach and straddle trucks*

1) As impacted by ISO 7010:2019/Amd 1:2020, ISO 7010:2019/Amd 2:2020, ISO 7010:2019/Amd 3:2021, ISO 7010:2019/Amd 4:2021, ISO 7010:2019/Amd 5:2022, ISO 7010:2019/Amd 6:2022, ISO 7010:2019/Amd 7:2023, ISO 7010:2019/Amd 8:2024, ISO 7010:2019/Amd 9:2025 and ISO 7010:2019/Amd 10:2025.

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ISO 22915-4:2018, *Industrial trucks — Verification of stability — Part 4: Pallet stackers, double stackers and order-picking trucks with operator position elevating up to and including 1 200 mm lift height*

ISO 22915-5:2020, *Industrial trucks — Verification of stability — Part 5: Single-side-loading trucks*

ISO 22915-7:2016, *Industrial trucks — Verification of stability — Part 7: Bidirectional and multidirectional trucks*

ISO 22915-8:2026, *Industrial trucks — Verification of stability — Part 8: Additional stability test for trucks operating in the special condition of stacking with mast tilted forward and load elevated*

ISO 22915-9:2014, *Industrial trucks — Verification of stability — Part 9: Counterbalanced trucks with mast handling freight containers of 6 m (20 ft) length and longer*

ISO 22915-10:2023, *Industrial trucks — Verification of stability — Part 10: Additional stability test for trucks operating in the special condition of stacking with load laterally displaced by powered devices*

ISO 22915-11:2011, *Industrial trucks — Verification of stability — Part 11: Industrial variable-reach trucks*

ISO 22915-12:2015, *Industrial trucks — Verification of stability — Part 12: Industrial variable-reach trucks handling freight containers of 6 m (20 ft) length and longer*

ISO 22915-13:2026, *Industrial trucks — Verification of stability — Part 13: Rough-terrain trucks with mast*

ISO 22915-14:2010, *Industrial trucks — Verification of stability — Part 14: Rough-terrain variable-reach trucks*

ISO 22915-15:2020, *Industrial trucks — Verification of stability — Part 15: Counterbalanced trucks with articulated steering*

ISO 22915-17:2020, *Industrial trucks — Verification of stability — Part 17: Towing tractors, burden and personnel carriers*

ISO 22915-20:2023, *Industrial trucks — Verification of stability — Part 20: Additional stability test for trucks operating in the special condition of offset load, offset by utilization*

ISO 22915-22:2014, *Industrial trucks — Verification of stability — Part 22: Lateral- and front-stacking trucks with and without elevating operator position*

IEC 61496-1:2020, *Safety of machinery - Electro-sensitive protective equipment - Part 1: General requirements and tests*

IEC 61496-2:2020, *Safety of Machinery — Electro-sensitive protective equipment — Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs)*

IEC 61496-3:2025, *Safety of machinery — Electro-sensitive protective equipment — Part 3: Particular requirements for Active Opto-electronic Protective Devices responsive to Diffuse Reflection (AOPDDR)*

IEC 60204-1:2016+AMD1:2021, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

IEC 61558-1:2017, *Safety of power transformers, power supply units, reactors and similar — Part 1: General requirements and tests*

IEC FDIS/62046:2026, *Safety of machinery - Application of protective equipment to detect the presence of persons*

EN 619:2022, *Continuous handling equipment and systems - Safety requirements for equipment for mechanical handling of unit loads*

EN 1175:2025, *Safety of industrial trucks — Electrical/electronic requirements*

EN 1570-1:2024, *Safety requirements for lifting tables - Part 1: Lifting tables serving up to two fixed landing*

EN 12895:2015+A1:2019, *Industrial trucks — Electromagnetic compatibility*

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EN 16307-1:2020, *Industrial trucks - Safety requirements and verification - Part 1: Supplementary requirements for self propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5053-1:2020, ISO 5053-2:2019, ISO 5053-3:2024 and ISO 12100:2010 and the following apply.

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

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

**3.1
driverless industrial truck system**
combination of one (or more) driverless industrial trucks and ancillary components to control the operation of the trucks

Note 1 to entry: Ancillary components can be integrated and/or external to the truck

Note 2 to entry: Ancillary components are part of the commissioning, integration and use. Some examples of ancillary components include the following:

- charging stations;
- communication with other machines or equipment (e.g. packaging machines, production lines, conveyors, automatic doors, load handling systems, charging stations, on-line charging systems);
- fire alarm communications;
- traffic control;
- localization systems (e.g. QR code, RFID, reflectors, wireguidance);
- safeguarding (e.g. guards, protective devices);
- signs, warnings, floor markings.

**3.2
automatic mode**
mode of operation where no operator oversight or action is required for the operation

Note 1 to entry: Manual interactions (e.g. picking) can occur between automatic operations

**3.3
automatic mode with a rider**
operating condition where riders are present on the truck during automatic movement

**3.4
manual mode**
mode of operation where the truck is under the control of an operator

**3.5
maintenance mode**
mode of operation which allows operation of truck functions; where it is necessary to override safety functions for maintenance reasons

Note 1 to entry: Safeguards can be disabled in this mode.

**3.6
manual operation**
manual use of a stand-on, sit-on or pedestrian-controlled truck with tiller for productive operation