



BSI Standards Publication

Industrial trucks – Safety requirements and verification

Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks

National foreword

This British Standard is the UK implementation of EN ISO 3691-1:2015+A1:2020, incorporating corrigendum June 2016. It is identical to ISO 3691-1:2011, incorporating amendment 1:2020 and corrigendum August 2013. It supersedes BS EN ISO 3691-1:2015, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to ISO text carry the number of the ISO amendment. For example, text altered by ISO amendment 1 is indicated by **A1** **A1**.

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 secretary.

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Amendments/corrigenda issued since publication

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31 July 2016	Implementation of CEN corrigendum June 2016: European foreword updated
30 June 2020	Implementation of ISO amendment 1:2020 with CEN endorsement A1:2020

English Version

**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-
1:2011, including Cor 1:2013)**

Chariots de manutention - Exigences de sécurité et
vérification - Partie 1: Chariots de manutention
automoteurs, autres que les chariots sans conducteurs, les
chariots à portée variable et les chariots transporteurs de
charges (ISO 3691-1:2011, y compris Cor 1:2013)

Sicherheit von Flurförderzeugen - Sicherheitsanforderungen
und Verifizierung - Teil 1: Motorkraftbetriebene
Flurförderzeuge mit Ausnahme von fahrerlosen
Flurförderzeugen, Staplern mit veränderlicher Reichweite
und Lastentransportfahrzeugen (ISO 3691-1:2011,
einschließlich Cor 1:2013)

This European Standard was approved by CEN on 1 June 2015.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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European foreword

The text of ISO 3691-1:2011 including Cor 1:2013 has been prepared by Technical Committee ISO/TC 110 “Industrial trucks” of the International Organization for Standardization (ISO) and has been taken over as EN ISO 3691-1:2015 by 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 2016, and conflicting national standards shall be withdrawn at the latest by January 2016.

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

For the purposes of global relevance, the requirements of all clauses referring to ISO/TS 3691-7 have been transferred and published as European Standard EN 16307-1, *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*.

This document supersedes EN ISO 3691-1:2012.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of 2006/42/EC.

For relationship with EU Directive, see informative Annex ZA, which is an integral part of this document.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 3691-1:2011 including Cor 1:2013 has been approved by CEN as EN ISO 3691-1:2015 without any modification.

European foreword to amendment A1

This document (EN ISO 3691-1:2015/A1:2020) 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 Amendment to the European Standard EN ISO 3691-1:2015 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.

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 has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

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

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, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 3691-1:2011/Amd 1:2020 has been approved by CEN as EN ISO 3691-1:2015/A1:2020 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 of 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	Clause(s)/sub-clause(s) of this EN	Remarks/Notes
		<i>To cover all the relevant safety requirements for the products(s) in its scope, this standard (providing global requirements and references to regional requirements for a machine) has to be applied together with one of those standards as specified in the scope (providing European regional requirements for a machine).</i>
1.1.2. Principles of safety integration	4.1.1	
1.1.3. Materials and products	4.1.6, 4.5, 4.6.4	
1.1.4. Lighting	4.10.2	
1.1.5. Design of machinery to facilitate its handling	4.9.8, 4.11.5	
1.1.6. Ergonomics	4.7.1, 4.7.2, 4.7.9, 4.11.1, 6.2.4	
1.1.7. Operating positions	4.5.1, 4.11.1	
1.1.8. Seating		not covered

The relevant Essential Requirements of Directive 2006/42/EC	Clause(s)/sub-clause(s) of this EN	Remarks/Notes
1.2.1. Safety and reliability of control systems	4.3.2, 4.3.3, 4.4.2.1, 4.4.2.2, 4.4.2.3, 4.4.2.4, 4.4.2.5, 4.4.2.6, 4.4.3, 4.4.4	
1.2.2. Control devices	4.4.1, 4.4.3, 4.4.4, 6.3.1.4	
1.2.3. Starting	4.2.1, 4.2.2, 4.4.1, 4.4.2.1, 4.4.2.2, 4.4.2.3, 4.4.2.4, 4.4.2.5, 4.4.2.6, 4.4.3, 4.4.4, 4.4.5	
1.2.4.1. Normal stop	4.3.2, 4.3.3, 4.4.2.1, 4.4.2.2, 4.4.2.3, 4.4.2.4	
1.2.4.2. Operational stop		not covered
1.2.5. Selection of control or operating modes	4.4.2.6	
1.2.6. Failure of the power supply	4.3.2, 4.4.3, 4.6.4	
1.3.1. Risk of loss of stability	4.8.2, 4.8.3	
1.3.2. Risk of break-up during operation	4.5, 4.6.2, 4.6.3.3, 4.6.4, 4.6.5, 5.2	
1.3.3. Risks due to falling or ejected objects	4.7.5, 4.9.1, 4.9.2	
1.3.4. Risks due to surfaces, edges or angles	4.1.5	
1.3.5. Risks related to combined machinery	6.3.1.2	
1.3.6. Risks related to variations in operating conditions	4.1.2, 4.1.3,	
1.3.7. Risks related to moving parts	4.5.3.1, 4.7.7.2, 4.7.7.3, 4.7.7.4	
1.3.8.1. Moving transmission parts	4.1.1, 4.7.5.2, 4.7.7.2, 4.7.7.3, 4.7.7.4	
1.3.8.2. Moving parts involved in the process	4.2.1, 4.7.7.2, 4.7.7.3, 4.7.7.4	
1.3.9. Risks of uncontrolled movements	4.2.2, 4.6.3.1, 4.6.3.2, 4.6.3.4	
1.4.1. General requirements		not covered

The relevant Essential Requirements of Directive 2006/42/EC	Clause(s)/sub-clause(s) of this EN	Remarks/Notes
1.4.2.1. Fixed guards		not covered
1.4.2.2. Interlocking movable guards		not covered
1.4.2.3. Adjustable guards restricting access		not covered
1.5.1. Electricity supply	4.9.5	
1.5.2. Static electricity		not covered
1.5.3. Energy supply other than electricity	4.5	
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1.5.7. Explosion	4.5.4, 4.9.5.4	
1.5.8. Noise		not covered
1.5.9. Vibrations		not covered
1.5.10. Radiation		not covered
1.5.11. External radiation		not covered
1.5.12. Laser radiation		not covered
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The relevant Essential Requirements of Directive 2006/42/EC	Clause(s)/sub-clause(s) of this EN	Remarks/Notes
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3.3.5. Control circuit failure	4.4.3.2	

The relevant Essential Requirements of Directive 2006/42/EC	Clause(s)/sub-clause(s) of this EN	Remarks/Notes
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3.5.1. Batteries	4.9.5	
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4.1.2.7. Movements of loads during handling		not covered
4.1.3. Fitness for purpose	5.3	
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The relevant Essential Requirements of Directive 2006/42/EC	Clause(s)/sub-clause(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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 3691-1 was prepared by Technical Committee ISO/TC 110, *Industrial trucks*, Subcommittee SC 2, *Safety of powered industrial trucks*.

This first edition of ISO 3691-1, together with ISO 3691-2, ISO 3691-3, 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. It also incorporates the Amendment ISO 3691:1980/Amd 1:1983.

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

General

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

The machines 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 instructions will need to draw the user's attention to ways shown by experience in which the machinery ought not 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 3691-7:2011 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 will be 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.

Industrial trucks — Safety requirements and verification —

Part 1:

Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks

1 Scope

This part of ISO 3691 gives safety requirements and the means for their verification for the following types of self-propelled industrial trucks (hereafter referred to as *trucks*), as defined in ISO 5053:

- a) industrial counterbalanced trucks;
- b) reach trucks with retractable mast or retractable fork arm carriage;
- c) straddle trucks;
- d) pallet-stacking trucks;
- e) high-lift platform trucks;
- f) trucks with elevating operator position up to 1 200 mm;
- g) side-loading trucks (one side only);
- h) lateral-stacking trucks (both sides), and lateral- and front-stacking trucks;
- i) pallet trucks;
- j) bidirectional and multidirectional trucks;
- k) tractors with a drawbar pull up to and including 20 000 N;
- l) rough-terrain counterbalanced trucks;
- m) industrial trucks powered by battery, diesel, gasoline or LPG (liquefied petroleum gas).

NOTE 1 Trucks powered by CNG (compressed natural gas) are not dealt with. It is intended that CNG and other power sources be addressed in future revisions of this part of ISO 3691.

For trucks with an elevating operator position of more than 1 200 mm and/or trucks designed to travel with an elevated load of more than 1 200 mm, this part of ISO 3691 is intended to be used in conjunction with ISO 3691-3.

NOTE 2 ISO 3691-3 is not applicable to counterbalanced fork lift trucks or trucks intended for container handling.

NOTE 3 Some low-level order pickers with an elevating operator's position up to and including 1 200 mm lift height can be equipped with an additional lifting device to lift the load to a maximum lift height of 1 800 mm.

This part of ISO 3691 is not applicable to self-propelled variable-reach trucks, driverless trucks or burden carriers, which are covered in ISO 3691-2, ISO 3691-4 and ISO 3691-6, respectively.

It is not applicable to industrial trucks operating in severe conditions (e.g. extreme climates, freezer applications, hazardous environments), where special precautions can be necessary.

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.

This part of ISO 3691 deals with all significant hazards, hazardous situations or hazardous events, as listed in Annex B, with the exception of the following, 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

- during construction,
- when handling suspended loads that can swing freely,
- when using trucks on public roads,
- when operating in potentially explosive atmospheres,
- when using trucks in very narrow aisles with clearance of less than 500 mm to the racks,
- arising from a non-ergonomic body attitude when driving sit-on trucks, load trailing,
- during travelling with unladen trucks having a rated capacity of more than 10 000 kg, due to visibility concerns,
- due to overload.

NOTE 4 For the purposes of this part of ISO 3691, fork arms, load platforms and integrated attachments are considered to be parts of the industrial truck. Attachments mounted on the load carrier or on the fork arms which are removable by the user are not considered to be part of the industrial truck. Requirements for attachments are given in the appropriate clauses.

2 Normative references

The following referenced documents are indispensable for the application 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 2328:2007, *Fork-lift trucks — Hook-on type fork arms and fork arm carriages — Mounting dimensions*

ISO 2330, *Fork-lift trucks — Fork arms — Technical characteristics and testing*

ISO 2867:2006, *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 3691-3:—¹⁾, *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*

ISO 3691-5:2009, *Industrial trucks — Safety requirements and verification — Part 5: Pedestrian-propelled trucks*

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

ISO 5053, *Powered industrial trucks — Terminology*

ISO 6055:2004, *Industrial trucks — Overhead guards — Specification and testing*

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 13284:2003, *Fork-lift trucks — Fork-arm extensions and telescopic fork arms — Technical characteristics and strength requirements*

ISO 13564-1:—¹⁾, *Powered industrial trucks — Test methods for verification of visibility — Part 1: Sit-on and stand-on operator 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 13850:2006, *Safety of machinery — Emergency stop — Principles for design*

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

ISO 15871:2000, *Industrial trucks — Specifications for indicator lights for container handling and grapple arm operations*

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 22915-1:2008, *Industrial trucks — Verification of stability — Part 1: General*

ISO 22915-2:2008, *Industrial trucks — Verification of stability — Part 2: Counterbalanced trucks with mast*

ISO 22915-3:2008, *Industrial trucks — Verification of stability — Part 3: Reach and straddle trucks*

ISO 22915-4:2009, *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 22915-7:2009, *Industrial trucks — Verification of stability — Part 7: Bidirectional and multidirectional trucks*

ISO 22915-8:2008, *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 22915-10:2008, *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*

1) To be published.

ISO 22915-11:—²⁾, *Industrial trucks — Verification of stability — Part 11: Industrial variable-reach trucks*

ISO 22915-20:2008, *Industrial trucks — Verification of stability — Part 20: Additional stability test for trucks operating in the special condition of offset load, offset by utilization*

ISO 22915-21:2009, *Industrial trucks — Verification of stability — Part 21: Order-picking trucks with operator position elevating above 1 200 mm*

ISO 24134:2006, *Industrial trucks — Additional requirements for automated functions on trucks*

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

IEC 60695-11-10:2003, *Fire hazard testing — Part 11-10: Test flames — 50 W horizontal and vertical flame test methods*

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

self-propelled industrial truck

wheeled vehicle having at least three wheels with a powered driving mechanism, except for those running on rails, designed either to carry, tow, push, lift, stack or tier in racks any kind of load and controlled by an **operator** (3.7)

NOTE See ISO 5053 for a comprehensive terminology.

3.2

pedestrian-controlled truck

truck designed to be controlled by an **operator** (3.7) walking with the truck by means of, for example, a tiller or remote control

NOTE The truck may be equipped with a stand-on option.

3.3

ride-on truck

truck designed to be controlled by an **operator** (3.7) riding on a seat or a driving platform on the truck

NOTE Stand-on industrial trucks with a seat for the operator are considered as being stand-on trucks.

3.4

low-lift truck

truck having a lift height of 500 mm or less

3.5

bidirectional truck

truck designed to travel in either direction on a line parallel with its longitudinal axis, or perpendicular to this axis

NOTE Adapted from ISO 5053:1987, 3.6.1.2.

2) To be published.