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## Industrial trucks — Safety requirements and verification —

### Part 2: Self-propelled variable-reach trucks

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

*Partie 2: Chariots automoteurs à portée variable*

ICS 53.060

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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 3691-2 was prepared by Technical Committee ISO/TC 110, *Industrial trucks*, Subcommittee SC 2.

This edition cancels and replaces the second edition (ISO 3691:1980), which has been technically revised.

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 and variable reach trucks, and burden carriers*
- *Part 2: Self propelled industrial 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*

## Introduction

### 0.1 General

This International Standard covers safety requirements and verification of industrial trucks as defined in Standard ISO 5053 - Terminology.

For the purpose of this Standard, industrial trucks are wheeled self propelled or manually driven vehicles, except those running on rails. They are either operator controlled or driverless and are designed to carry, tow, push, lift, stack or tier in racks.

### 0.2 Structure

An important step forward within the work for this standard 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.

### 0.3 Assessment of hazards

The product should 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 it is used under conditions foreseen by the manufacturer.

In order to properly design a product and to cover all specific safety requirements, the manufacturer should identify the hazards that apply to his product and should carry out a risk assessment. He then should design and construct it taking account of this assessment.

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 should apply the following principles in the order given:

- Eliminate or reduce risks as far as possible by design (inherently safe machinery design and construction);
- take the necessary protection measures in relation to risks that can not be eliminated by design;
- inform users of the residual risks due to any shortcoming of the protection measures adopted;
- indicate whether any particular training is required;
- specify any need to provide personal protection equipment and;
- refer to the appropriate users document for proper operating instructions.

The machinery should be designed to prevent abnormal use, wherever possible, if such would engender risk. In other cases the instructions should draw the user's attention to ways – which experience has shown might occur – in which the machinery should not be used.

A list of significant hazards is given in clause 4 of each part of the standard. The list provides guidance on appropriate measures to protect against the risks involved.

This International Standard 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 should be made to ISO 12100-2.

#### **0.4 Legislative situation/Vienna Agreement**

From the very beginning, the task of the working group was to revise the standard and to establish world wide basic standards to comply with the major legislative regulations in the world, e.g. EU, USA and Japan.

For several potential problem areas compromises were needed and will be needed in the future.

In order to ensure that the revised ISO Standard is actively used in the ISO countries world wide, procedures are necessary to replace the existing national standards and technical regulations by the revised ISO Standard. In the European Community ISO and the European Committee for Standardization (CEN) agreed on technical co-operation between ISO and CEN (Vienna Agreement) with the aim to replace the European Standards (EN) by the later worldwide ISO standards by using the parallel voting procedure automatically. Other countries are asked to issue similar agreements to ensure that their national standards and technical regulations are replaced by this ISO Standard.

Only by these actions there will be the guarantee that products in accordance with the ISO standards could be shipped world wide freely without any technical barriers.

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# Industrial trucks — Safety requirements and verification —

## Part 2: Self-propelled variable-reach trucks

### 1 Scope

1.1 This part of 3691 specifies the safety requirements for self-propelled seated rider operated variable reach trucks as defined in 3.1 equipped with load handling devices for normal industrial duties, e.g. fork arms or platforms, or attachments for specified applications mounted directly on non-slewing lifting means or an auxiliary mast fixed at the end of the lifting means.

Fork arms, load platforms and integrated attachments are considered to be parts of the industrial truck.

NOTE Trucks can be equipped with stabilizers, axle locking or lateral levelling devices.

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.

For attachments the appropriate clauses of this standard are applicable.

1.2 This part of 3691 does not apply to:

- Rough terrain variable reach trucks [ISO/DIS 3691-2](https://standards.iteh.ai/catalog/standards/sist/ab34d192-d31a-422e-b908-af61bc7e6d11/iso-dis-3691-2)
- Machines designed primarily for earth moving, such as loaders and dozers, even though their buckets and blades are replaced with forks.
- Machines with variable length load suspension elements (chain, ropes, etc.) from which the load may swing freely in all directions

This part of ISO 3691 does not cover those requirements to reduce hazards which may occur:

- a) during construction;
- b) when handling suspended loads which may swing freely;
- c) when using trucks on public roads;
- d) when operating in potentially explosive atmospheres;
- e) from noise, vibration, electromagnetic compatibility and visibility.

### 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 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 2328:1993, *Fork-lift trucks -- Hook-on type fork arms and fork arm carriages -- Mounting dimensions*

ISO 2330:2002, *Fork lift trucks — Fork arms — Technical characteristics and testing*

ISO 2867:1994, *Earth-moving machinery — Safety requirements — Access systems*

ISO 3287:1999, *Powered industrial trucks — Symbols for operator controls and other displays*

ISO 3411:1995, *Earth-moving machinery — Human physical dimensions of operators and minimum operator space envelope*

ISO 3691-1.2:2006, *Industrial trucks - Safety requirements and verification — Part 1: Self-propelled trucks, other than driverless trucks, variable reach trucks, and burden carrier trucks*

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

ISO 5053:1995, *Powered industrial trucks — Terminology*

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

ISO 6292:1996, *Powered industrial trucks and tractors — Brake performance and component strength*

ISO 9533:1989, *Earth-moving machinery — Machine mounted forward and reverse audible warning alarm — Sound test method*

ISO 5010: 1992, *Earth moving machinery — Rubber tyred machines — Steering requirements*

ISO 10658:1996, *Industrial trucks operating in special conditions of stacking with the load laterally displaced by powered devices — Additional stability tests*

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

ISO 13562-1:2000, *Industrial variable reach trucks — Part 1: Stability tests*

ISO 13562-2:2001, *Industrial variable reach trucks — Part 2: Additional stability tests for trucks handling freight containers of 6 m length and above*

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

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

ISO 20898, *Industrial trucks – Electrical requirements*

ISO 24135, *Industrial trucks – Operator restraint systems – Specifications and test methods for lap-type seat belts*

### **3 Terms and definitions**

For the purposes of this standard, the terms and definitions of the main truck components given in ISO 5053 together with the following apply.



**3.1****self-propelled seated rider operated variable reach trucks**

self-propelled seated rider operated variable reach trucks (hereinafter referred to as “trucks”) are counterbalanced lift trucks with one or more articulated arms, telescopic or not, non-slewing, as defined in ISO 5053, clause 4.13.2.2 used for stacking loads.

**3.2****actual capacity of truck**

load in kg (depending on lift height and/or forward reach, attachment and load centre distance) specified by the manufacturer, taking into account the stability test results and as indicated by the load chart

**3.3****actual capacity at maximum lift height with forks**

maximum load “Q2” in kg, specified by the manufacturer, that the truck is capable of lifting to its maximum height in normal operating conditions.

NOTE It is equal to the maximum load “Q2” with centre of gravity “G” (see Figure A.1), carried on the fork arms at the standard load centre “D” as specified in A.1 and with the boom adjusted to its maximum height

**3.4****actual capacity at maximum lift height with spreader**

maximum load “Q2” in kg, specified by the manufacturer, that the truck is capable of lifting to its maximum height in normal operating conditions.

NOTE It is equal to the maximum load “Q2” with centre of gravity “G” (see Figure A.2), carried using a spreader at the standard load centre distance as specified in A.2 and with the boom adjusted to its maximum height

**3.5****actual capacity at maximum forward reach with forks**

maximum load “Q3” in kg, specified by the manufacturer that the truck is capable of lifting to its maximum forward reach in normal operating conditions.

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NOTE It is equal to the maximum load “Q3” with centre of gravity “G” (see Figure A.1), carried on the fork arms at the standard load centre “D” as specified in A.1 and with the boom adjusted to its maximum forward reach

**3.6****actual capacity at maximum forward reach with spreader**

maximum load “Q3” in kg, specified by the manufacturer that the truck is capable of lifting to its maximum forward reach in normal operating conditions.

NOTE It is equal to the maximum load “Q3” with centre of gravity “G” (see Figure A.2), carried using a spreader at the standard load centre distance as specified in A.2 and with the boom adjusted to its maximum forward reach

**3.7****actual capacity with stabilisers in use (if equipped)**

maximum load in kg, specified by the manufacturer that the truck is capable of lifting with the stabilisers deployed

**3.8****rated capacity of removable attachments**

maximum load in kg that the attachment is permitted by its manufacturer to handle in normal operation under specified conditions.

NOTE For carriages, this does not include the capacity of the forks

**3.9****axle locking**

mechanism designed to stop oscillation of the rear axle to improve truck stability

**3.10  
stabilizer**

extendable or pivoting mechanical supports used to improve stability of a stationary truck

**3.11  
lateral levelling**

changing the angular relationship between the boom pivot and the ground in order to adjust the boom pivot to horizontal when the truck is standing on a side slope.

NOTE This is to ensure the boom operates in a vertical plane

**3.12  
fork arms**

a device including two or more solid fork arms (hook mounted or shaft mounted) which is fitted on the carriage and usually spread manually

**3.13  
fork arm extensions**

devices fitted over the fork arms to increase their length

**3.14  
boom**

the pivoting support member providing radial and telescoping (if equipped) movement of the load engaging means

**3.15  
spreader**

a device fitted to the boom and designed to connect the lifting points of freight containers, swap bodies and semi-trailers.

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NOTE It may have powered devices to connect the lifting points of the load and an articulated mechanism to facilitate engagement

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intended to carry bulk products such as sand, gravel, coal etc

**3.16  
overhead guard**

a device fitted to the truck for the purpose of protecting the operator against falling objects

**3.17  
load backrest**

that portion of the fork carriage serving to restrain the load when the load is tilted rearward or upward

**3.18  
normal operating position**

a position in which the operator shall be capable of controlling all the operating and load handling functions.

NOTE Other positions may prove necessary if it is not possible to control all the functions of the truck from a single position.

**3.19  
forward travel**

forward direction of travel occurs when the load handling means is leading the travel motion of the truck

**3.20  
front and rear ends of truck**

the front end of a truck is that which leads in the forward direction of travel described in 3.19.

NOTE The rear end of a truck is that which trails

**3.21****quick fastening device**

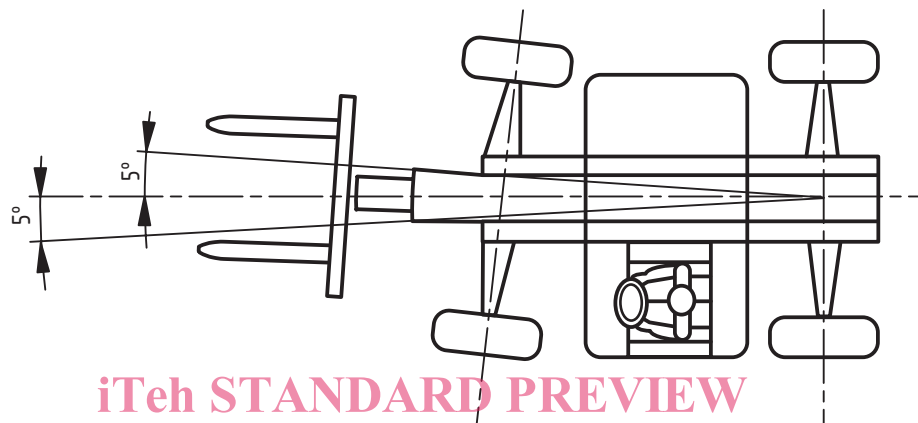
a device fitted at the end of the boom to connect and lock interchangeable attachments without the use of a tool

**3.22****auxiliary mast**

a mast at the end of the boom intended to reach greater lifting heights

**3.23****non-slewing**

having a slewing movement not greater than 5° either side of the longitudinal axis of the truck (see Figure 1)



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**Figure 1 — Slewing movement**

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## 4 List of significant hazards

The following hazards may be applicable and could involve risks to persons if not addressed. The corresponding requirements offer guidance to limit the risk or reduce these hazards. The numbering of the hazards is identical to ISO 14121.

Hazard		Corresponding requirement	
4.1	Mechanical hazards		
4.1.1	Crushing hazard	5.3	Brakes
		5.4	Controls
		5.5.4	Access to engine and other compartments
		5.7	Operator position
		5.7.4	Guards for wheels
		5.7.6	Protection against crushing, shearing and trapping
		5.7.7	Operator restraint
		5.9.1	Overhead guard
		5.9.2	Warning device
		5.10.1	Visibility
		5.11.1	Operator's cab
		5.11.2	Provisions for transportation of the

			truck and removable attachments
		5.12	Systems for towing
		7.2.2	Operation of the truck and/or attachment(s)
		7.3.4.5	Warnings
4.1.2	Shearing hazard	5.3	Brakes
		5.4	Controls
		5.5.4	Access to engine and other compartments
		5.7	Operator position
		5.7.4	Guards for wheels
		5.7.6	Protection against crushing, shearing and trapping
		5.7.7	Operator restraint
		5.9.1	Overhead guard
		5.10.1	Visibility
		7.2.2	Operation of the truck and/or attachment(s)
		7.3.4.5	Warnings
4.1.3	Cutting or severing hazard	5.1.4	Edges or angles
		5.5.4	Access to engine and other compartments
		5.7.6	Protection against crushing, shearing and trapping
		7.2.5	Service and maintenance of truck and/or attachment(s)
4.1.4	Entanglement hazard	5.5.4	Access to engine and other compartments
4.1.5	Drawing-in or trapping hazard	5.5.4	Access to engine and other compartments
		5.7.4	Guards for wheels
		5.7.6	Protection against crushing, shearing and trapping points
4.1.6	Impact hazard	5.11.1	Operator's cab
	- from mechanical failure	5.6.1	Chains
		5.6.2	Hydraulic lifting system
		5.6.4	Fork arms
		6	Verification of requirements and safety requirements
		7.2.2	Operation of the truck and/or attachment(s)
		7.2.5	Service and maintenance of truck and/or attachment(s)
	- from unstable loads	5.6.2	Hydraulic lifting system
		5.6.4	Fork arms
		5.6.6	Fork carriers
		5.6.7	Load handling attachments

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	- from road debris	5.6.8	Load retention device
	- from lifting or transporting a truck	5.9.1	Overhead guard
4.1.7	Stabbing or puncture hazard	5.7.4	Guards for wheels
		5.11.2	Provisions for transport of the truck and removable attachments
4.1.9	High pressure fluid ejection or ejection hazard	5.1.4	Edges or angles
		7.2.5	Service and maintenance of the truck and/or attachment(s)
		5.1.5	Stored energy components
		5.6.3.1	Hydraulic circuit
		5.6.3.2	Pressure control
		7.2.2	Operation of the truck and/or attachment(s)
4.3	Thermal hazards		
4.3.1	Burns, scalds and other injuries by a possible contact of persons with an extreme high or low temperature, by flames or explosions and also by the radiation of heat sources	5.5.1	Exhaust system
		5.7.5	Protection from burning
		5.11.1.2	Fire resistance
4.3.2	Damage to health by hot or cold working environment	5.11.1	Operator's cab
4.4	Hazards generated by noise		
4.4.1	Hearing loss (deafness), other physiological disorders	7.2.1	Concerning the truck/attachment
		7.2.2	Operation of the truck and/or attachment(s)
4.4.2	Interference with speech communication, acoustic signals, etc.	7.2.1	Concerning the truck/attachment
		7.2.2	Operation of the truck and/or attachment(s)
4.7	Hazards generated by materials		
4.7.1	Hazards from contact with or inhalation of harmful fluids, gases mists, fumes, and dusts	5.5.1	Exhaust system
		5.11.1.3	Ventilation
		7.2.4	Details for internal combustion engine powered trucks
4.7.2	Fire or explosion hazard	5.5.3	Fuel tanks
		5.5.5	Additional requirements for internal combustion engine driven trucks using liquefied petroleum gas (LPG)
		5.11.1.2	Fire resistance
		7.2.1	Concerning the truck/attachment
4.8	Hazards generated by neglecting ergonomic principals in machinery design		
4.8.1	Unhealthy postures or excess effort	5.7.1	Dimensions