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ISO/TC 110/SC 2

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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

(Revision of ISO 3691:1980)

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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 3691-4 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 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 shall identify the hazards that apply to his product and shall carry out a risk assessment. The manufacturer 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:

- a) Eliminate or reduce risks as far as possible by design (inherently safe machinery design and construction);
- b) take the necessary protection measures in relation to risks that can not be eliminated by design;
- c) inform users of any shortcoming of the protection measures adopted;
- d) indicate whether any particular training is required and;
- e) specify any need to provide personal protection equipment;
- f) Refer to the appropriate user's document for proper operating instructions

The machinery shall be designed to prevent abnormal use, wherever possible, if such would engender risk. In other cases the instructions shall 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/CD 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, Japan and Australia.

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

In order to ensure that the revised ISO Standard shall be 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 will there 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 4: Driverless industrial trucks and their systems

1 Scope

1.1 This part of ISO 3691 applies to all driverless trucks and their systems except:

- a) trucks solely guided by mechanical means (rails, guides, etc);
- b) trucks operating in areas open to persons unaware of the hazards.

1.2 For the purposes of this part of ISO 3691, a driverless industrial truck is a powered vehicle, including any trailers, designed to travel automatically in which the safety of operation does not depend on an operator. Remote controlled trucks are not considered driverless trucks.

1.3 For the purposes of this part of ISO 3691, a system comprises the control system, which may be part of the truck and/or separate from it, the guidance means and the battery charging system.

1.4 This part of ISO 3691 deals with the technical requirements to minimise the hazards listed in clause 4 which can arise during the commissioning, operation in the area of use for which it was designed and maintenance of trucks in accordance with the specifications given by the manufacturer in the instruction handbook or his authorised representative. In addition, trucks should comply as appropriate with ISO/DIS 12100 for hazards not covered by this standard or the applicable companion standards.

1.5 This part of ISO 3691 covers specific hazards related to the automated functions of trucks and their systems listed in clause 4. This standard must be used in conjunction with the relevant sections of the companion ISO 3691 standards (e.g. ISO 3691-1 for trucks with fork arms, ISO 3691-6 for burden carriers, etc.)

1.6 The provision of a portable control unit does not classify the truck as a pedestrian controlled truck.

1.7 The operating area of trucks can have a significant effect on their safe operation. Annex A establishes requirements for the preparation of the operating area to eliminate the associated hazards. For the person responsible for the integration of the trucks into the workplace, annex A is normative.

1.8 This part of ISO 3691 does not establish requirements for:

- a) operation in severe conditions (e.g. extreme climates, freezer applications, strong magnetic fields);
- b) operation in environments subject to special rules (e.g. potentially explosive atmospheres);
- c) electromagnetic compatibility;
- d) transportation of passengers;
- e) handling of loads the nature of which could lead to dangerous situations (e.g. molten metals, acids/bases, radiating materials);

- f) parts of trucks requiring manual intervention during operation;

2 Normative references

The following referenced documents are indispensable for the application of this document. This part of 3691 incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriated places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this part of 3691 only when incorporated in it by amendment or revision. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/DIS 3691-1:2003, *Industrial trucks — Safety requirements and verification — Part 1: Self propelled industrial trucks other than variable reach trucks, trucks with elevating operator position, trucks specifically designed to travel with elevated load and driverless trucks*

ISO/CD 3691-6:2000, *Industrial trucks — Safety requirements and verification — Part 6: Burden and personnel carriers*

ISO/DIS 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology*

ISO/DIS 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles and specifications*

ISO/DIS 14120:2002, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

ISO 13849-1:1999, *Safety of machinery — Safety related parts of the control systems — Part 1: General principal for the design*

ISO 13850:1996, *Safety of machinery — Emergency stop — Principles for design*

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

ISO 3184:1998, *Reach and straddle fork lift trucks — Stability tests*

ISO 5766:1990, *Pallet stackers and high-lift platform trucks — Stability tests*

ISO 1074:1991, *Counterbalanced fork lift trucks — Stability tests*

ISO 5053:1987, *Powered industrial trucks — Terminology*

ISO 14121 **Add in date (if applicable), and title (in italics)**

ISO/DIS 20898 **Add in date (if applicable), and title (in italics)**

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5053 and ISO 12100-1 apply together with the ones given below and in Annex A:

3.1

driverless truck powered vehicle, including any trailers, designed to travel automatically in which the safety of operation does not depend on an operator.

3.2**load**

item to be handled with mass, dimensions, integrity and positioning in accordance with the manufacturer's specifications

3.3**bumper**

device which generates a signal to stop the truck on physical contact with a person or object

3.4**actuating force of the bumper**

force applied to the bumper when the signal to stop the truck is generated

3.5**control system**

means which controls and manages *the automatic operation of the truck(s) and associated equipment*

3.6**guide path**

intended travel path under automatic control

3.7**load handling**

lifting, lowering, load transfer and load manipulation (e.g. rotation, reach, tilting, clamping and towing)

3.8**automatic mode**

no operator intervention is required for operation

3.9**manual mode**

all operations are under the control of an operator

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3.10**path**

area swept by the truck with its load and its trailer(s) if towed

3.11**competent person**

designated person, suitably trained and qualified by knowledge and practical experience, and in possession of the necessary instructions to enable the assigned task to be carried out

3.12**authorized person**

persons designated by the user to operate or maintain the truck or system

3.13**common zone**

zone not exclusively reserved for automated operation

3.14**hazard zone**

part of a common zone where there is an increased hazard e.g. due to inadequate clearance for personnel or where a load transfer operation takes place