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**Rough-terrain trucks — Safety  
requirements and verification —**

**Part 1:  
Variable-reach trucks**

*Chariots tout-terrain — Exigences de sécurité et vérification —*

*Partie 1: Chariots à portée variable*

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ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

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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 10896-1 was prepared by Technical Committee ISO/TC 110, *Industrial trucks, Subcommittee SC 4, Rough-terrain trucks*.

ISO 10896 consists of the following parts, under the general title *Rough-terrain trucks — Safety requirements and verification*:

— *Part 1: Variable-reach trucks*

Slewing trucks, lorry-mounted trucks, freely swinging loads and straight-masted trucks are to form the subjects of future parts 2, 3, 4 and 5.

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## Introduction

Variable-reach trucks are known by a variety of terms, including “telehandlers” and “multi-purpose handlers”.

The variable-reach rough-terrain trucks covered by this part of ISO 10896 are designed to transport loads to and place them on elevated work areas and can be driven on unimproved or disturbed terrain.

They can also be equipped with a variety of attachments (e.g. fork arms, bale spikes) and interchangeable equipment (e.g. mowers, sweepers).

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# Rough-terrain trucks — Safety requirements and verification —

## Part 1: Variable-reach trucks

### 1 Scope

This part of ISO 10896 specifies general safety requirements for non-slewing, variable-reach rough-terrain trucks (hereafter known as “trucks”), with an articulated or rigid chassis and equipped with a telescopic lifting means (pivoting boom) on which a load-handling device such as a carriage with fork arms is typically fitted. Fork arms and other integrated attachments are considered to be parts of the truck.

Other standards, in addition to the relevant provisions of this part of ISO 10896, can apply to the attachments.

This part of ISO 10896 is not applicable to the following:

- a) industrial variable-reach trucks covered by ISO 3691-2;
- b) machines designed primarily for earth-moving, such as loaders, even if their buckets are replaced by fork arms (see ISO 20474);
- c) trucks designed primarily with variable-length load suspension elements (e.g. chain, ropes) from which the load may swing freely in all directions (mobile cranes)<sup>1)</sup>;
- d) trucks fitted with personnel/work platforms, designed to move persons to elevated working positions<sup>2)</sup>;
- e) trucks designed primarily for container handling

The significant hazards covered by this part of ISO 10896 are listed in Annex A. This part of ISO 10896 does not address hazards that can occur

- during manufacture,
- when handling suspended loads, which may swing freely,
- when using trucks on public roads,
- when operating in potentially explosive atmospheres, or
- with a battery, LPG or hybrid as the primary power source.

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

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

ISO 3449, *Earth-moving machinery — Falling-object protective structures — Laboratory tests and performance requirements*

1) Additional requirements for trucks intended for freely swinging load applications, their lifting devices and attachments, and personnel/work platform applications on trucks, are being developed by ISO/TC 110/SC4.

## ISO 10896-1:2012(E)

ISO 3450, *Earth-moving machinery — Wheeled or high-speed rubber-tracked machines — Performance requirements and test procedures for brake systems*

ISO 3457, *Earth-moving machinery — Guards — Definitions and requirements*

ISO 3471:2008, *Earth-moving machinery — Roll-over protective structures — Laboratory tests and performance requirements*

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

ISO 3864-1, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*

ISO 3864-2, *Graphical symbols — Safety colours and safety signs — Part 2: Design principles for product safety labels*

ISO 5053, *Powered industrial trucks — Terminology*

ISO 5353, *Earth-moving machinery, and tractors and machinery for agriculture and forestry - Seat index point*

ISO 6016:2008, *Earth-moving machinery — Methods of measuring the masses of whole machines, their equipment and components*

ISO 6682, *Earth-moving machinery — Zones of comfort and reach for controls*

ISO 6683, *Earth-moving machinery — Seat belts and seat belt anchorages — Performance requirements and tests*

ISO 7000, *Graphical symbols for use on equipment — Registered symbols<sup>2)</sup>*

ISO 7096:2000, *Earth-moving machinery — Laboratory evaluation of operator seat vibration*

ISO 9244, *Earth-moving machinery — Machinery safety labels — General principles*

ISO 9533, *Earth-moving machinery — Machine-mounted audible travel alarms and forward horns — Test methods and performance criteria*

ISO 10263-3, *Earth-moving machinery — Operator enclosure environment — Part 3: Pressurization test method*

ISO 10570, *Earth-moving machinery — Articulated frame lock — Performance requirements*

ISO 11112:1995, *Earth-moving machinery — Operator's seat — Dimensions and requirements*. Amended by ISO 11112:1995/Amd 1:2001

ISO 12508, *Earth-moving machinery — Operator station and maintenance areas — Bluntness of edges*

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

ISO 13732-1, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces*

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

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

ISO 15817, *Earth-moving machinery — Safety requirements for remote operator control*

ISO 16528-1:2007, *Boilers and pressure vessels — Part 1: Performance requirements*

ISO 16528-2, *Boilers and pressure vessels — Part 2: Procedures for fulfilling the requirements of ISO 16528-1*

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2) The database on Graphical Symbols for Use on Equipment contains the complete set of graphical symbols included in IEC 60417 and ISO 7000: <http://www.graphical-symbols.info/>



ISO 21507, *Earth-moving machinery — Performance requirements for non-metallic fuel tanks*

ISO 22915-10, *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 22915-14, *Industrial trucks — Verification of stability — Part 14: Rough-terrain variable-reach trucks*

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

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5053 and the following apply.

#### 3.1

##### **rough-terrain truck**

truck designed for operation on unimproved natural terrain as well as the disturbed terrain of work sites

#### 3.2

##### **compact truck**

truck having a maximum height in normal travel mode of 2 150 mm, a maximum operating mass according to ISO 6016 of 6 000 kg, and/or a maximum width in normal travel mode of 1 850 mm

#### 3.3

##### **rated capacity**

$Q_1$

<truck> maximum load permitted by the manufacturer at the standard load centre distance that the truck is capable of lifting and transporting on *fork arms* (3.13) in normal conditions with the boom fully retracted

SEE: Figure 1.

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#### 3.4

##### **rated capacity**

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

Note to entry The rated capacity of the attachment can be associated with the load centre distance. See Table 1.

#### 3.5

##### **actual capacity**

maximum load at a specified load centre distance, established by the manufacturer based on component strength and truck stability, that the truck can carry, lift and stack to a specified lift height and *reach* (3.6), in normal operation

SEE: Figure 1.

Note 1 to entry The actual capacity depends on the configuration of the truck in respect of variables including lift height, the reach of the boom, the actual load centre, load-handling devices and stabilizing devices.

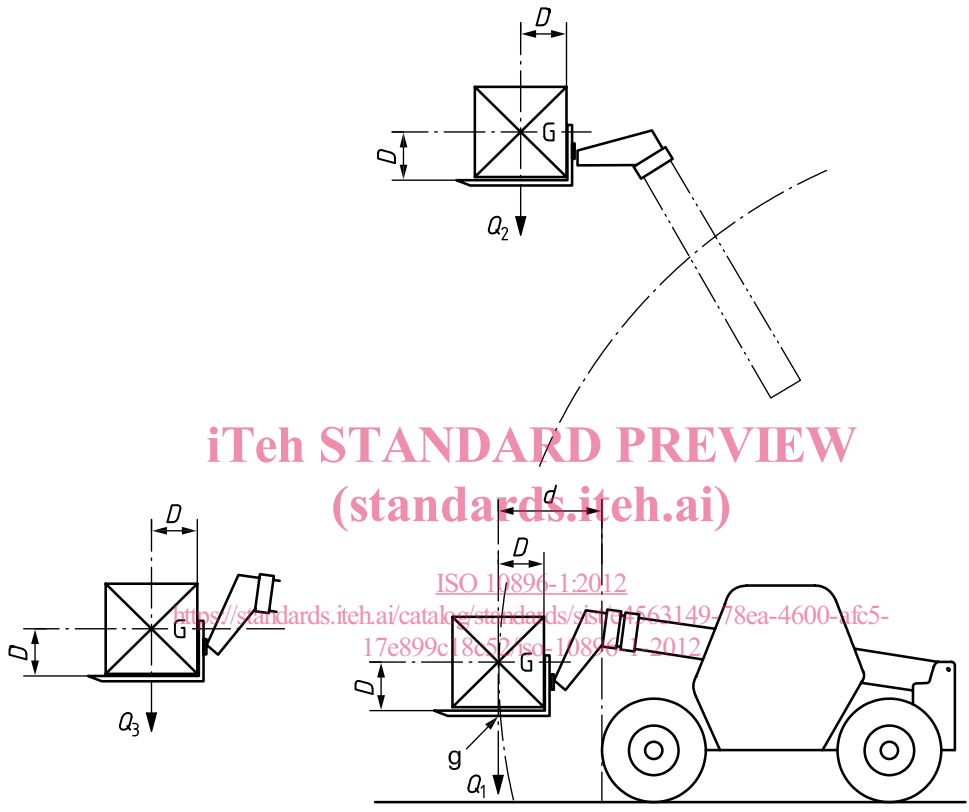
Note 2 to entry It defines the load-handling ability of the particular truck as equipped. Additional actual capacity with removable attachments, where permitted, may also be established by the appropriate stability test or by calculation verified by empirical data.

**3.6 reach**

*d*  
 distance between two vertical parallel planes, one plane being tangent to the front of the outside diameter of the front tyres or tracks, the other plane being tangent to the curve described by the centre of gravity of the load moving from its highest position to its lowest position

SEE: Figure 1.

NOTE In practice, the reach can be measured by referring to a point, *g*, corresponding to the vertical projection of the centre of gravity, *G*, of the load onto the plane of the top surface of the *fork arms* (3.13), as shown in Figure 1.



**Key**

- d* reach
- D* standard load centre distance
- G* centre of gravity of the load
- g* point corresponding to vertical projection of *G*
- Q*<sub>1</sub> rated capacity
- Q*<sub>2</sub> actual capacity at maximum lift height
- Q*<sub>3</sub> actual capacity at maximum reach

**Figure 1 — Parameters for determining actual capacity of a truck with fork arms**

**3.7 lift height**

height from the ground to the upper face of the fork arms or underside of the load, whichever is the lower

### 3.8 standard load centre distance

*D*

distance from the centre of gravity of the load, horizontally rearwards to the front of the fork shanks and vertically downwards to the upper faces of the *fork arms* (3.13)

SEE: Figure 1.

Note to entry Table 1 gives standard load centre distances in relation to their rated capacities.

**Table 1 — Standard load centre distances and rated capacities**

Rated capacity <i>Q</i> <sub>1</sub> kg		Standard load centre distance <i>D</i> mm				
		400	500	600	900	1 200
0	< 1 000	X		X <sup>a</sup>		
≥ 1 000	< 5 000		X <sup>c</sup>	X <sup>b</sup>		
≥ 5 000	< 10 000			X		
≥ 10 000	< 20 000			X	X	X
≥ 20 000	< 25 000				X	X
≥ 25 000						X

NOTE Trucks may be rated for special applications with load centres related to those applications.

<sup>a</sup> 600 mm is used in the USA.  
<sup>b</sup> 600 mm is used in Asia, Australia and the USA.  
<sup>c</sup> 500 mm is typically used in Europe.

### 3.9 lost load centre

**LL**

effective thickness

**ET**

horizontal shift in the standard load centre that may occur when removable attachments are added to a truck

### 3.10 axle oscillation locking-mechanism

mechanism designed to lock oscillation of an axle to improve truck stability

### 3.11 stabilizing devices

extendable and/or pivoting mechanical supports used to improve the stability of a truck when stationary

### 3.12 lateral levelling

change in the lateral inclination angle between the chassis and the ground made to ensure that the boom operates in a vertical plane even when the truck is positioned on a side slope

### 3.13 fork arms

device comprising two or more solid fork arms, each consisting of a shank (vertical portion) and blade, which is hook- or shaft-mounted, fitted on the carriage and usually adjusted manually

### 3.14 boom

pivoting support member that permits horizontal and vertical placement of the load or **attachment** (3.17)

**3.15**  
**crab steering mode**

steering mode where all wheels of the truck steer in the same direction

**3.16**  
**normal operating position**

position specified by the manufacturer in which the operator is able to control the truck operations, including load-handling functions

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

**3.17**  
**attachment**

component or assembly of components which can be mounted on the *attachment bracket* (3.18) for a specific use

**3.18**  
**attachment bracket**

device fitted at the end of the boom to connect and lock interchangeable *attachments* (3.17) without the use of a tool to facilitate quick interchange of attachments

**3.19**  
**non-slewing**

slewing movement not greater than 5° to either side of the longitudinal axis of the truck

SEE: Figure 2.

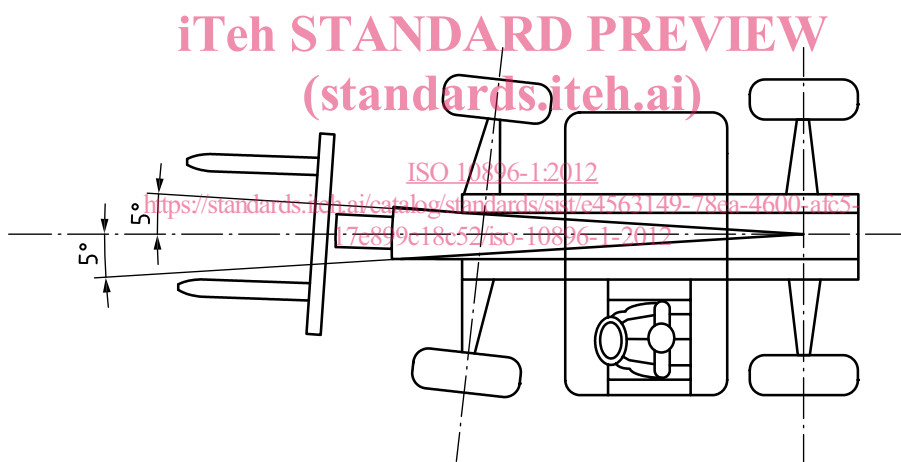


Figure 2 — Non-slewing movement

**3.20**  
**boom float**

control mode that uses gravity to allow an *attachment* (3.17) at the end of the boom to follow a contour (e.g. the ground)

**3.21**  
**maximum working pressure**

highest pressure at which a hydraulic circuit is intended to operate under normal operating conditions

**3.22**  
**articulated truck**

truck in which steering is achieved by displacement of the front and rear frames around a central pivot

**3.23**  
**level ground**

ground with a gradient of  $(0 \pm 2) \%$

**3.24****hybrid**

truck powered using of two or more distinct power sources

**4 Requirements****4.1 General****4.1.1 Sharp edges and acute angles**

Sharp edges and acute angles shall meet the requirements specified in ISO 12508 in areas to which the operator can be exposed during operation, access, egress and daily maintenance.

**4.1.2 Stored energy components**

Components that store energy and can cause a risk of injury during removal or disassembly, e.g. hydraulic accumulators and spring-applied brakes, shall be provided with a means to release the energy before removal or disassembly and shall be clearly marked.

**4.2 Starting/moving****4.2.1 Unauthorized starting**

All trucks shall be provided with a device (e.g. key, key pad, magnetic card) that prevents starting without the use of such device.

**4.2.2 Unintended movement**

Trucks shall be fitted with a device which prevents the engine being started while the drive system is engaged. When the drive system direction control is in neutral, provisions shall be made to locate and maintain it in its neutral position.

**4.2.3 Uncontrolled motion**

The truck shall not move from rest, on level ground, until the drive system has been engaged.

**4.2.4 Powered travel movement**

Means shall be provided to prevent powered travel when the operator is not in the normal operating position. Powered travel shall not occur automatically when the operator returns to the normal operating position without an additional operation, e.g. by reset of the direction control to neutral.

Application of the parking brake shall apply neutral travel control.

**4.2.5 Non-activation of the parking brake**

Means shall be provided to warn the operator, if he/she leaves the operating position when the parking brake is not applied.

**4.2.6 Inching pedal**

If an inching pedal is fitted, it shall be depressed to modulate the transmission and may apply the service brake. It shall be capable of being operated by the operator's left foot. If there is no separate means of applying the service brake, the inching pedal shall be a single pedal capable of being operated equally by either foot.