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Industrial trucks – Verification of stability - Part 2: Counterbalanced trucks with mast

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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](http://www.iso.org/directives)).

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

This second edition cancels and replaces the first edition (ISO 22915-2:2008), of which it constitutes a minor revision. The changes compared to the previous edition are as follows:

- in Clause 2, removed ISO 5053, *Powered industrial — Terminology*;
- in Clause 2, added ISO 5053-1, *Industrial Trucks — Terminology and Classification — Part 1: Types of industrial Trucks*;
- in Clause 3, removed references to ISO 5053;
- in Clause 3, added references to ISO 5053-1.

A list of all parts in the ISO 22915 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](http://www.iso.org/members.html).

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## Industrial trucks – Verification of stability – Part 2: Counterbalanced trucks with mast

### 1 Scope

This document specifies the tests for verifying the stability of counterbalanced trucks with masts, equipped with fork arms or with load handling attachments. It is not applicable to those trucks designed for handling freight containers, dealt with by ISO 22915-9.

### 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 5053-1, *Industrial trucks — Terminology and classification — Part 1: Types of industrial trucks*

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

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5053-1 and ISO 22915-1 apply.

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

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

### 4 Test conditions

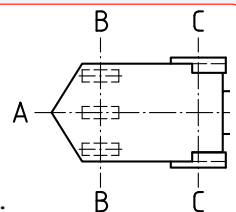
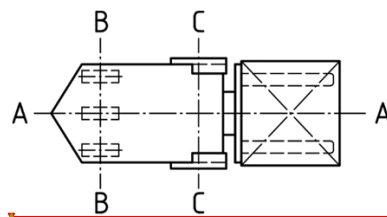
#### 4.1 General

See ISO 22915-1.

#### 4.2 Position of trucks and tilt table

##### 4.2.1 Load and steer axles

The load and steer axles are defined by Figure 1.



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## Key

A-A longitudinal centre plane of the truck

B-B steer axle

C-C load axle

**Figure 1 — Load and steer axles****4.2.2 Test 1 and 2**

The truck shall be positioned on the tilt table so that its load axle, C-C, is parallel to the tilt axis, X-Y, of the tilt table. See Table 1.

**4.2.3 Test 3 and 4**

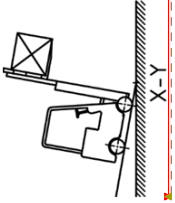
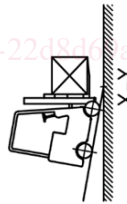
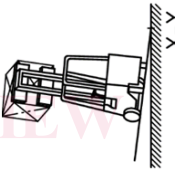
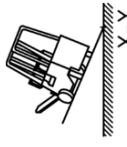
The truck shall be positioned on the tilt table in a turning position with the line, M-N, parallel to the tilt axis, X-Y, of the tilt table.

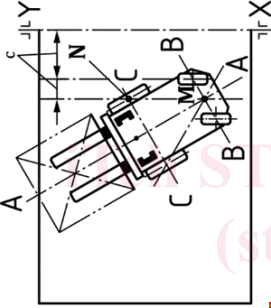
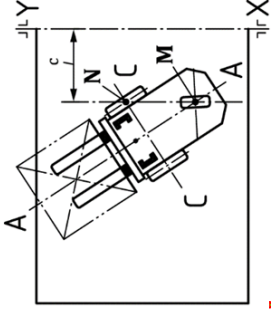
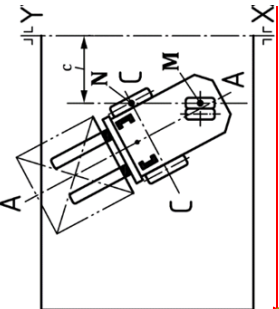
As shown in Table 1, the steered wheel nearest to the tilt axis shall be parallel to X-Y. Point M is defined as follows.

- a) For trucks having an articulating steer axle: point M shall be the projection on the tilt table of the intersection of the longitudinal centre-plane, A-A, of the truck with the axis of this axle.
- b) For trucks steered by a single wheel: point M shall be the centre point of the tread contact area between the steered wheel and the tilt table surface.
- c) For trucks steered by twin wheels: point M shall be the centre point of the tread contact area between the steered wheel closest to the tilt axis, X-Y, of the tilt table and the tilt-table surface.
- d) For trucks having wheels for steering not connected by a common axle, but that are arranged to articulate approximately about the longitudinal centre-plane of the truck: point M shall be the projection on the tilt table of the intersection of the longitudinal centre-plane of the truck, A-A, with the steer axle B-B connecting the vertical turning axis of the steer wheels.

As shown in Table 1, point N is defined as the centre point of the area of contact between the tilt table surface and the load wheel nearest to the tilt axis.

Table 1 — Verification of stability

Test criteria	Test 1	Test 2	Test 3	Test 4
Direction of test	Longitudinal	x		
	Lateral		x	x
Direction of load handling device	Load leading	x		
	Load trailing			
Mode of operation	Travelling	x		x
	Stacking/retrieving		x	
Load at load centre	With	x	x	
	Without			x
Lift height	Maximum	x	x	
	Travel	x		x
Position of mast	Vertical			
	Full rearward	x	x	x
Tilt-table angle for actual capacity	<5 000 kg	18 %	6 %	(15 + 1,4 · v) % <sup>a</sup>
	≥5 000 kg			(15 + 1,4 · v) % <sup>b</sup>
Truck position on the tilt table				
Truck position on the tilt table	Points M and N			

		As per 4.2.2	  
<b>Key</b> v travel speed of the unladen truck in km/h a 50 % maximum. b For North America and Australia: 50 % maximum. For all other regions: 40 % maximum. c Parallel.			

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### 4.3 Datum point positions

Test 1 shall be conducted with the horizontal position of the load datum point, E, unchanged when elevated from its lowered position as shown in Figure 2.

With the prescribed test load, set the mast vertical and then elevate to approximately 300 mm above the tilt table. With the shank of the front face of the fork arm set vertical, establish point E, as shown in Figure 2 a), on the fork arms or fork carrier having a fixed relationship to the centre of gravity of the test load. E shall be used to provide a reference datum point, F, on the tilt table. When the mast is elevated, a new point,  $F_1$ , on the tilt table may occur, as shown in Figure 2 b). This new point may be returned to the original location of F, as shown in Figure 2 c), by varying the tilt of the mast within the limits provided by the design of the truck.

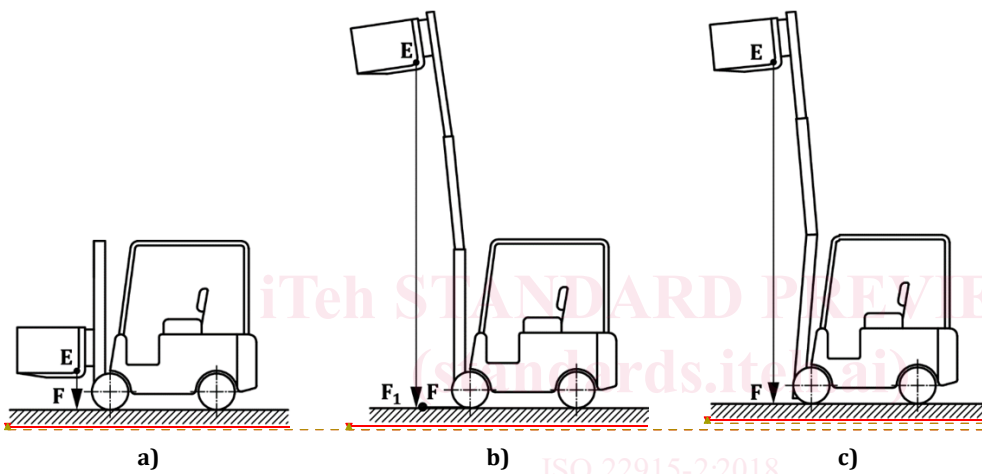


Figure 2 — Datum point positions

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### 4.4 Lift height for tests simulating travel

For tests simulating travel (Tests 2 and 4), the upper face of the fork arms, measured at the heel of the fork arm, shall be positioned 300 mm above the tilt table for trucks with a rated capacity less than or equal to 10 t, and 500 mm for trucks with a rated capacity of greater than 10 t.

## 5 Verification of stability

### 5.1 General

The stability of a truck shall be verified in accordance with Table 1. Those trucks having a rated capacity greater than or equal to 5 000 kg are subject to the following regional requirements when their stability is verified using Test 4.

### 5.2 General Regional requirements for trucks with rated capacity $\geq 5\,000$ kg

#### 5.2.1 North America and Australia

Maximum tilt-table angle required: 50 %.

#### 5.2.2 All other regions

Maximum tilt-table angle required: 40 %.

## Bibliography

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- [2] ISO 22915-2, Industrial trucks — Verification of stability — Part 2: Counterbalanced trucks with mast
- [3] ISO 22915-3, Industrial trucks — Verification of stability — Part 3: Reach and straddle trucks
- [4] ISO 22915-4, 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
- [5] ISO 22915-5, Industrial trucks — Verification of stability — Part 5: Single-side-loading trucks
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