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Industrial trucks — Verification of stability —

Part 22: Lateral- and front-stacking trucks with and without elevating operator position

Chariots de manutention — Vérification de la stabilité —

Partie 22: Chariots à prise latérale - et frontale - avec et sans poste de conduite élevable

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Foreword

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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).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 110, *Industrial trucks*, Subcommittee SC 2, *Safety of powered industrial trucks*.

ISO 22915 consists of the following parts, under the general title *Industrial trucks — Verification of stability*:

— *Part 1: General*

— *Part 2: Counterbalanced trucks with mast*

— *Part 3: Reach and straddle trucks*

— *Part 4: Pallet stackers, double stackers and order-picking trucks up to and including 1 200 mm lift height*

— *Part 5: Single-side-loading trucks*

— *Part 7: Bidirectional and multidirectional trucks*

— *Part 8: Additional stability test for trucks operating in the special condition of stacking with mast tilted forward and load elevated*

— *Part 9: Counterbalanced trucks with mast handling freight containers of 6 m (20 ft) length and longer*

— *Part 10: Additional stability test for trucks operating in the special condition of stacking with load laterally displaced by powered devices*

— *Part 11: Industrial variable-reach trucks*

— *Part 12: Industrial variable-reach trucks handling freight containers of 6 m (20 ft) length and longer*

— *Part 13: Rough-terrain trucks with mast*

— *Part 14: Rough-terrain variable-reach trucks*

— *Part 15: Counterbalanced trucks with articulated steering*

— *Part 16: Pedestrian-propelled trucks*

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

— *Part 21: Order-picking trucks with operator position elevating above 1 200 mm*

— *Part 22: Lateral- and front-stacking trucks with and without elevating operator position*

— *Part 24: Slewing variable-reach rough-terrain trucks*

Industrial and RTT lorry-mounted trucks are to form the subject of a future part 23.

Industrial trucks — Verification of stability —

Part 22: Lateral- and front-stacking trucks with and without elevating operator position

1 Scope

This part of ISO 22915 specifies the tests to verify the stability of lateral- and front-stacking trucks, as defined in ISO 5053-1, with and without elevating operator position.

It applies to trucks fitted with fork arms, shuttle forks, and/or integrated attachments under normal operating conditions.

It applies to trucks fitted with a load carrier that can be shifted laterally or pivoted out of the longitudinal centre plane of the truck.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, *Powered 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 purpose of this document, the terms and definitions given in ISO 22915-1 and the following apply

3.1
normal operating condition
operating condition corresponding to the truck travelling indoors on smooth, level floors of sufficient strength such as those of concrete

3.2
guided steering
steering mode, either mechanical (e.g. guidance rails) or non-mechanical (e.g. inductive guidance, laser sensor or infrared) not controlled directly by the operator, used to steer the truck on a predetermined straight path while travelling

3.3
restricted steering
operation under which the truck's steering is controlled by the operator and the steering angle is limited to not more than ±10° from the forward or reverse travel direction

3.4
unrestricted steering
steering mode controlled by the operator with no limitation of the steering angle

4 Test conditions

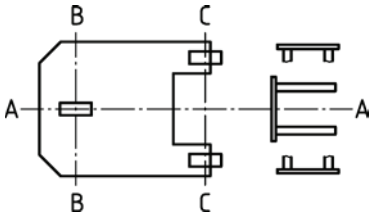
4.1 General

See ISO 22915-1.

4.2 Position of the truck on tilt table

4.2.1 Load and steer axles

The load axle and the drive/steer axle are defined by Figure 1.



Key

A–A longitudinal centre plane of truck

B–B drive/steer axle

C–C load axle

Figure 1 — Load axle and drive/steer axle

4.2.2 Tests 1, 2 and 3

The truck shall be positioned on the tilt table with the drive (steer) axle B-B and the load axle C-C parallel to the tilt axis X-Y, of the tilt table. See Table 1.

4.2.3 Test 4

The truck shall be positioned on the tilt table with the longitudinal centre plane of truck A-A parallel to the tilt axis X-Y, of the tilt table. See Table 1.

4.2.4 Tests 5, 6 and 7

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

Point M is defined as follows:

a) For trucks with dual drive (steer) wheels, point M is the vertical projection onto the tilt table of the point of intersection between the centre line of the drive axle and the centre plane of A-A of the truck.

b) For trucks with a single drive (steer) wheel, point M is the vertical projection onto the tilt table of the point of intersection between the centre line of the drive (steer) axle and the centre line of the drive wheel width.

c) For trucks with a sprung castor or wheel, point M is the vertical projection onto the tilt table of the point of intersection between the centre line of the drive wheel axle and the centre line of drive wheel width.

d) For trucks with a drive (steer axle in an articulated frame), point M is the vertical projection onto the tilt table of the point of intersection between the lateral axis of the articulating frame and the point of articulation.

e) For trucks with a non-articulated drive wheel, point M is the vertical projection onto the tilt table of the point of intersection between the centre line of the drive wheel axle and centre line of drive wheel width.

f) For trucks with non-articulated, non-sprung castor or wheel point M is the vertical projection onto the tilt table of the point of intersection between the centre line of the castor or wheel axle and the centre line of the castor wheel or drive wheel width. The castor or wheel shall be positioned with the centre line of the castor wheel axle nearer to the centre plane of the truck.

g) For trucks with five-wheel suspension, four solid and one articulated point M are the projection to the tilt table of the intersection of the pivot axis of the three–wheel articulated frame and the centre line between the tires.

h) For trucks with centre-articulating frame steering, point M is the projection to the tilt table from the intersection of the centre line of the drive wheel axle and the centre line of the drive wheel width.

Point N indicates the centre point of the area of contact between the tilt table surface and the front-load wheel closest to the tilt axis X-Y of the tilt table.

4.3 Lift height

Lift heights for tests shall be measured from the tilt table to the upper most point of the load-carrying surface.

5 Verification of stability

The stability shall be verified according to Table 1.

Table 1 — Verification of stability of lateral- and front-stacking trucks with and without elevating operator position

Test criteria		Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7
Direction	Longitudinal, load leading	x	x					
	Longitudinal, load trailing			x				
	Lateral				x	x	x	x
Test load	With	x	x	x	x	x		
	Without	x	x	x			x	x
Load carrier position	Least stable side extended	x			x			
	Least stable transport		x	x		x	x	x
Lift height		b	b	b	c	d	d	e
Tilt table angle	Guided steering	4 %[f] (4 + 0,62 · *v*) %	6 %[g] (0,28 + 1,43 · *v*) %[h]	8 %[g] (1,4 + 1,65 · *v*) %[h]	4 %	6 %	6 %	
	Restricted steering							
	Unrestricted steering					6 %[f] (6 + 1,24 · *v*) %	6 %[f] (6 + 2,48 · *v*) %	(15 + 1,1 · *v*) %

v maximum speed of truck, km/h

[a] Parallel.

[b] Any attainable combination of lift height, load, and corresponding maximum travel speed that produces the least tilt table angle value for a given tilt table angle requirement of Test 1 and Test 2. Travel speed v can be zero.

[c] Any attainable combination of lift height and load that produces the least tilt table angle value for a given tilt table angle requirement.

[d] Any attainable combination of lift height above 1 200 mm and corresponding maximum travel speed that produces the least tilt table angle value for a given tilt table angle requirement.

[e] Lift height up to and including 1 200 mm.

[f] Requirement for speed up to and including 2,5 km/h (see ISO 3691-3[1] for speed limits when lateral reach mechanism is extended, extending, or retracting).

[g] For travel speeds up to and including 4 km/h.

[h] For travel speeds above 4 km/h.

Table 1 — *(continued)*

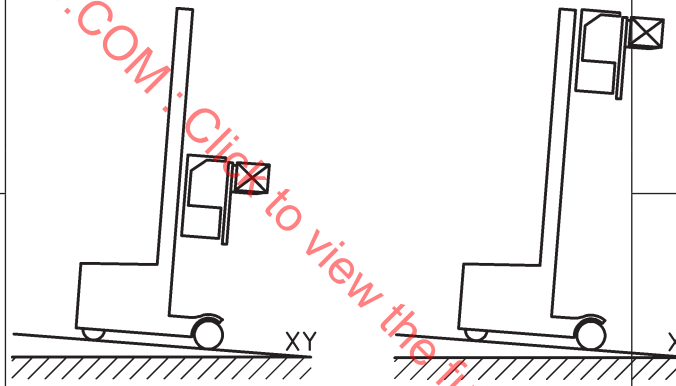
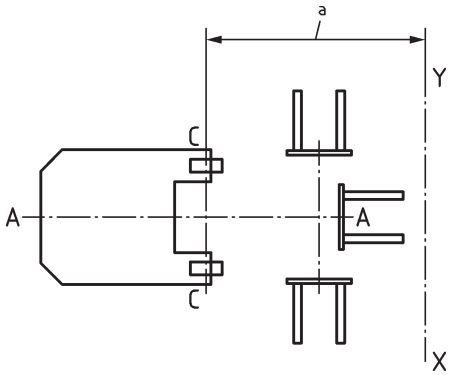
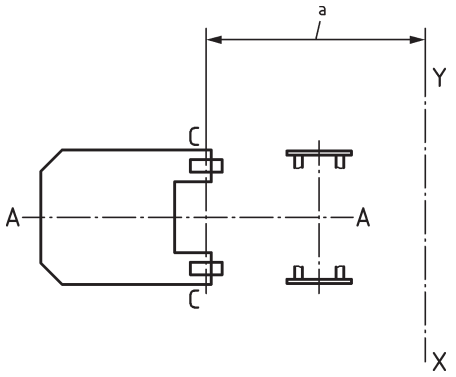
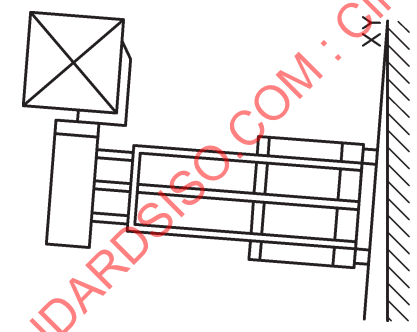
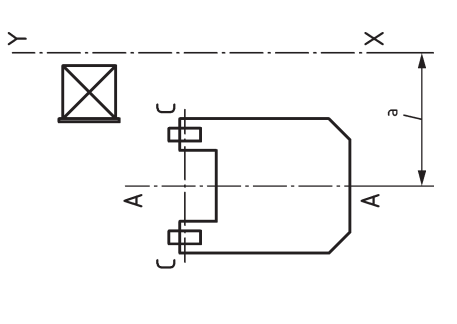
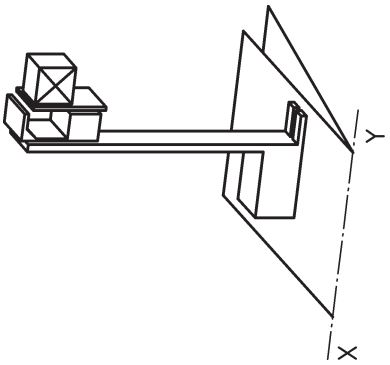
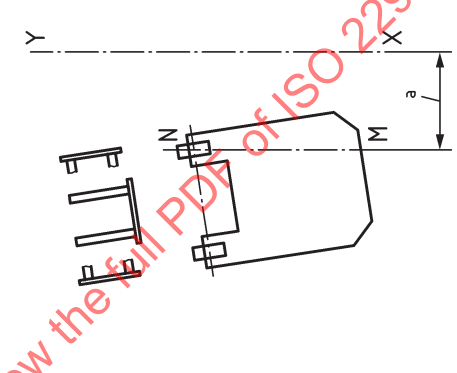
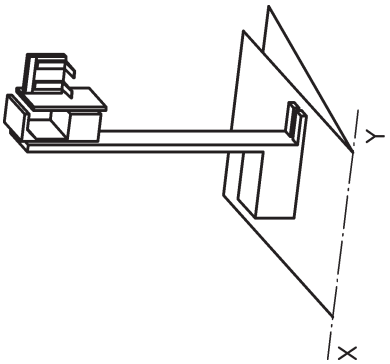
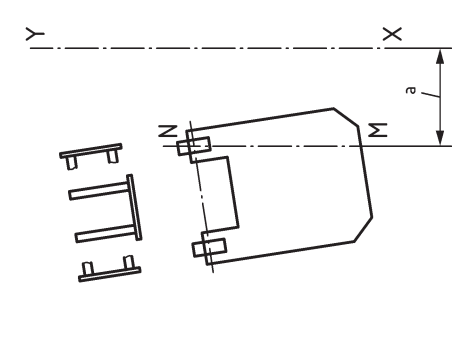
Truck position on tilt table	Tests 1 and 2	
Load handling device is leading — Load carrying device extended		 **Test 1 — As per 4.2.2**
Load handling device is leading — Load carrying device in transport position		 **Test 2 — As per 4.2.2**
[a] Parallel.		

Table 1 — *(continued)*

Truck position on tilt table	Test 3
Load handling device is trailing — Load carrying device in transport position	 **As per 4.2.2**

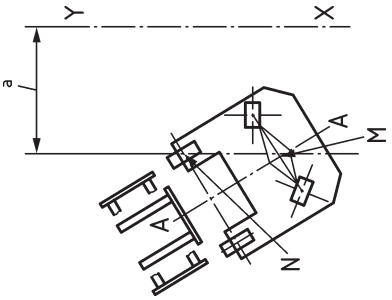
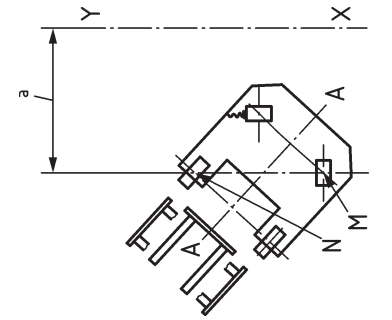
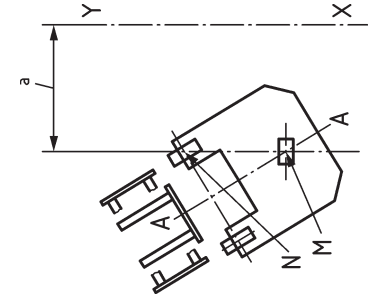
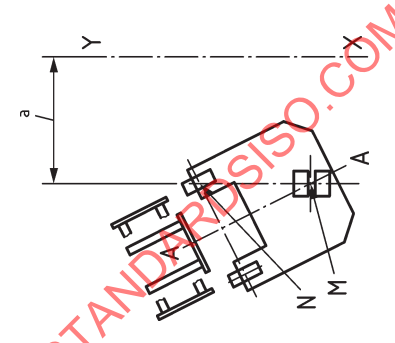
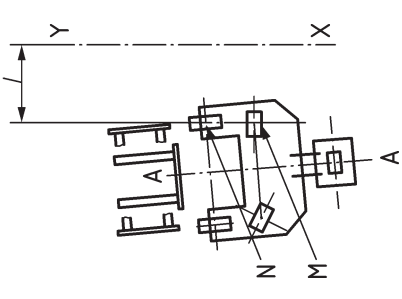
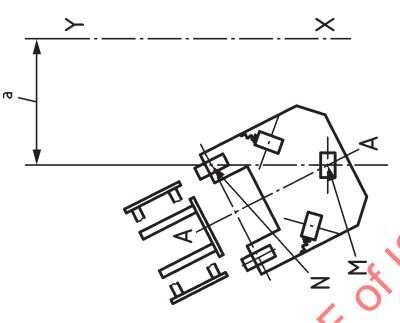
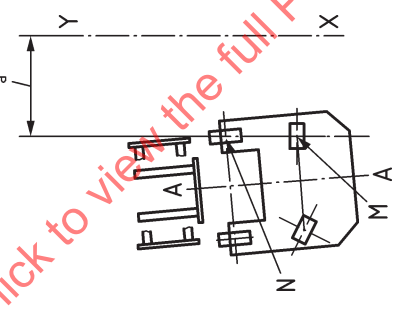
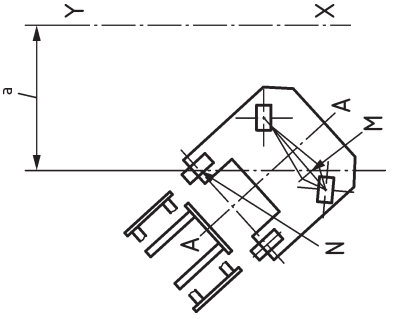
[a] Parallel.

Table 1 — *(continued)*

Truck position on tilt table	Test 4	Test 5	Tests 6 and 7
Lateral tests	 	 	 

a Parallel.

Table 1 — *(continued)*

Truck position on tilt table	Tests 5, 6 and 7			
Points M and N				
	As per 4.2.4 d)	**As per 4.2.4 c)**	**As per 4.2.4 b)**	**As per 4.2.4 a)**
				
	As per 4.2.4 f)	**As per 4.2.4 e)**	**As per 4.2.4 e)**	**As per 4.2.4 d)**

a Parallel.