INTERNATIONAL STANDARD

ISO 22915-12

First edition
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Industrial trucks — Verification of stability —

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

Chariots de manutention — Vérification de la stabilité —

Partie 12: Chariots à portée variable manutentionnant des conteneurs de 6 m (20 ft) de long et plus

Reference number
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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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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*.

This first edition cancels and replaces ISO 13562-2, which has been technically revised.

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 with operator position elevating up to and including 1 200 mm lift height*

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

— *Part 7: Bidirectional and multidirectional truck*

— *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 off 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 trucks — Verification of stability —

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

1 Scope

This part of ISO 22915 specifies the tests for verifying the stability of industrial variable-reach trucks when handling empty or laden freight containers of 6 m (20 ft) length and longer.

It is applicable to these types of industrial variable-reach trucks that are equipped with a spreader (top lift and side lift), swap bodies, or semi-trailers or other load-handling means applicable for container handling.

This part of ISO 22915 does not specify requirements for industrial variable-reach trucks (see ISO 22915-11) and rough terrain variable-reach trucks (see ISO 22915-14).

This part of ISO 22915 does not apply to trucks when handling a container which has a mobile centre of gravity (see ISO 3874).

This part of ISO 22915 is not applicable to counterbalanced trucks with masts designed for handling freight containers, dealt with by ISO 22915-9.

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 1496-2, *Series 1 freight containers — Specification and testing — Part 2: Thermal containers*

ISO 3691-2:—[1)], *Industrial trucks — Safety requirements and verification — Part 2: Self-propelled variable-reach trucks*

ISO 3874, *Series 1 freight containers — Handling and securing*

ISO 5353:1995, *Earth-moving machinery, and tractors and machinery for agriculture and forestry — Seat index point*

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

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*

3 Terms and definitions

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

1) To be published.

3.1
industrial variable-reach truck handling freight container
counterbalanced lift truck with an articulating boom, telescopic or not, non-slewing, as defined in ISO 5053:1987, 4.13.2.2.2, used especially for handling freight containers of 6 m (20ft) length and longer

Note 1 to entry: The load-handling means are mounted directly on the lifting means. Lifting means are non-slewing or have slewing movement not more than 5° either side of the longitudinal axis of the truck.

Note 2 to entry: Industrial variable-reach truck handling freight containers are intended to be used on substantially firm, smooth, level and prepared surfaces.

Note 3 to entry: Industrial variable-reach truck handling freight containers may be fitted with stabilizers, axle locking, or lateral frame levelling devices, as defined in ISO 3691-2:—[2)].

4 Operating conditions

4.1 General

In addition to ISO 22915-1, the following conditions apply:

— operating the truck (travelling with the freight container at normal travelling height and stacking) in conditions where the wind rated speed is up to 12,2 m/s.

4.2 Partially elevated container

The container is elevated for travel so that the bottom of the container is no higher than 900 mm above the seat index point (SIP) as defined in ISO 5353 and with the boom fully retracted.

NOTE The elevated container permits an operator in a low position on the truck to see underneath the container.

5 Test conditions

5.1 General

See ISO 22915-1.

The tests shall take into account the normal degree of eccentric loading of containers defined in ISO 3874.

When handling empty containers with integral refrigeration unit (reefer), as specified in ISO 1496-2, the offset loading needs to be taken into account, according to ISO 22915-20.

5.2 Prevailing wind

The tests shall not be carried out in a prevailing wind that would significantly affect the test results.

2) To be published.

5.3 Wind force

5.3.1 Longitudinal tests

For the longitudinal tests the wind force acting on the freight container is calculated by the following formula:

$$F = \frac{\rho}{2} \cdot h \cdot L \cdot v_w{}^2 \cdot C_{f1}$$

where

F is the wind force [N];

ρ is the air density 1,225 kg/m^3 (at 15 °C);

h is the freight container height, 2,90 m (9 ft 6 in);

L is the freight container length [m] (longest container length the truck is designed for);

v_w is the rated wind speed 12,2 m/s (Beaufort scale 6);

C_{f1} is the shape coefficient 1,3.

For trucks intended for use in a higher wind speed than the rated wind speed of 12,2 m/s, v_w shall be changed to the actual wind speed.

NOTE Reference sources, e.g. crane and building standards, confirm that a value of 1,3 for C_{f1} is appropriate for wind acting normal to the longitudinal axis of freight containers.

5.3.2 Lateral tests

The effect of wind in lateral stability tests has been shown to be significant only when handling containers. For the lateral tests, the wind force acting on the container shall be calculated by the following formula (see also Figure 1).

$$F = \frac{\rho}{2} \cdot v_w{}^2 \cdot C_{f2} \cdot h\left(L \sin\alpha + w \cos\alpha\right)$$

where

F is the wind force [N];

ρ is the air density 1,225 kg/m^3 (at 15 °C);

v_w is the rated wind speed 12,2 m/s (Beaufort scale 6);

C_{f2} is the shape coefficient 0,8;

h is the freight container height, 2,90 m (9 ft 6 in);

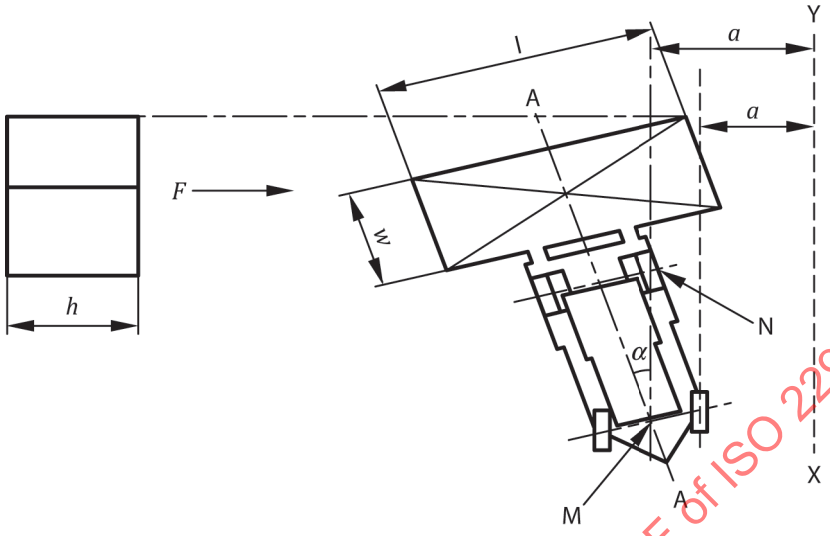
L is the freight container length [m] (longest container length the truck is designed for);

w is the freight container width 2,44 m;

α is the angle of lateral tipping axis relative to the longitudinal axis of the truck [degrees].

For trucks intended for use in a higher wind speed than the rated wind speed of 12,2 m/s, v_w shall be changed to the actual wind speed.

NOTE Reference sources, e.g. crane and building standards, confirm that a value of 0,8 for C_{f2} is appropriate for wind acting normal to the longitudinal axis of freight containers.



Key

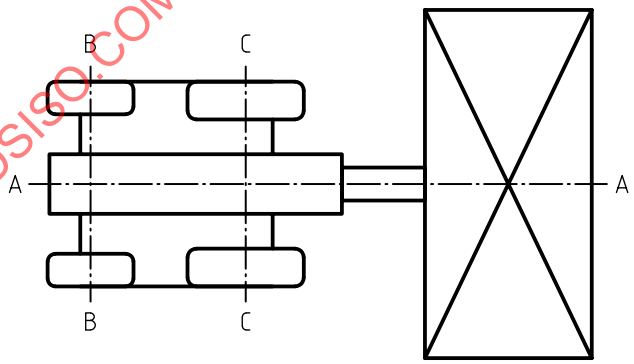
F wind force

a parallel

Figure 1 — Wind force for lateral tests

5.4 Position of the truck on the tilt table

The truck shall be positioned on the tilt table according to Table 1. The indication of load and steer axle is the centreline of the load and steer axle. The allocation of the indication is defined in Figure 2.



Key

A–A longitudinal centre plane of truck

B–B steer axle (rear axle)

C–C load/drive axle (may also be a steer axle on four-wheel steer trucks)

Figure 2 — Longitudinal centre plane and axles

For tests 1 and 2 (see Table 1), the truck shall be positioned on the tilt table so that the load axle C-C is parallel to the tilt axis X-Y of the tilt table.

For tests 3, 4, 5, and 6 (see Table 1), the truck shall be positioned on the tilt table in a turning position with line M-N parallel to the tilt axis X-Y of the tilt table.

For trucks with articulating steer axle, the wheel on the steer axle nearest to the tilt axis of the tilt table shall be parallel to the tilt axis. In case of trucks with selectable stabilizers and/or axle locking, tests 1 and 3 of Table 1 shall be conducted with stabilizers/axle locking engaged and disengaged.

Point M is defined as follows:

a) for trucks with articulating steer axle: the projection onto the tilt table of the intersection of the longitudinal centre plane, A-A, of the truck with the axis of the steer axle;

b) for trucks with axle locking: the centre point of the area of contact between the tilt table and the rear wheel nearest the tilt table tilting axis.

Point N is defined as the centre point of the area of contact between the tilt table surface and the load wheel or stabilizer pad nearest the tilting axis.

5.5 Test load

5.5.1 General

The test load shall consist of a load corresponding to the weight of the container, and a load or force simulating the effect of the wind on the container.

5.5.2 Basic load

The test load shall be equivalent to an ISO container 2,90 m (9 ft 6 in) high, with a mass equivalent to the rated load as specified by the manufacturer, acting through its centre of gravity.

When using a top lift, side lift, or other load-handling means, the position of the centre of gravity shall be determined by the connection points to the test load, e.g. twist locks into the corner fittings.

Where the load-handling means can be laterally adjusted to the truck longitudinal centreline, ISO 22915-10 may apply.

Where the load-handling means has positional adjustment capability in the direction of the truck longitudinal centreline, other than boom reach, the tests shall be carried out at both extremes of adjustment.

5.5.3 Wind force

The effect of this force can be simulated in the tests by one of the following methods:

— applying this force normal to the tipping axis of the truck through the load centre of gravity, in the same vertical angle as specified for the tilt table in Table 1 (parallel to the tilt table surface),or

— applying a vertical load, in addition to the test load, giving an equivalent moment to the wind force acting when the slope is at the required tilt angle as specified in the table of tests.

5.6 Lift height

5.6.1 Lift height for tests simulating stacking

For tests simulating stacking, the load shall be in the least stable combination of lift and reach, as determined by the manufacturer.

Test 5 (see Table 1) shall be conducted at maximum and minimum boom extension at maximum boom angle.

5.6.2 Lift height for tests simulating travelling with the container

For tests 2 and 4 (see Table 1) simulating travelling with a container, the boom shall be fully retracted and the centre of gravity of the test load shall be positioned 2 350 mm above the seat index point (SIP) as defined in ISO 5353.

This lift height does not apply where it is not necessary to elevate the container to obtain adequate visibility in the direction of travel, e.g. high-level operator position or driving in reverse (freight container trailing). At these circumstances, the load shall be positioned in the actual position defined by the manufacturer.

5.6.3 Lift height for tests simulating travelling without the container

For tests simulating travelling without a container, the bottom surface of the load-handling means shall be positioned 900 mm above the seat index point (SIP) as defined in ISO 5353, with the boom fully retracted.

6 Verification of stability

The stability shall be verified according to Table 1.

When performing tests 4 and 5, no wheels shall lose contact with neither the tilt table nor any part of the structure or other feature make contact with the tilt table.

7 Marking

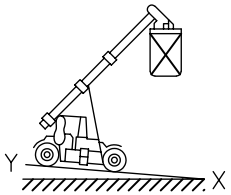
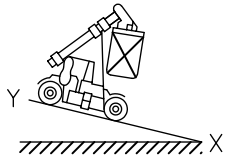
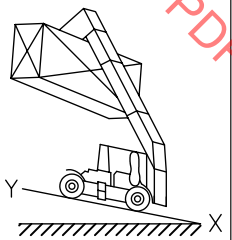
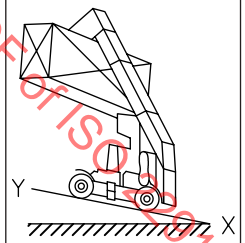
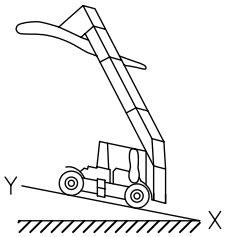
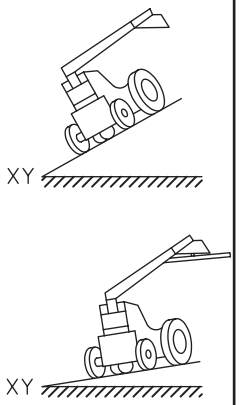
The actual capacity for container handling as determined by these stability tests shall be indicated on a capacity plate as specified in ISO 3691-2:—[3], 6.3.

The additional capacity as determined by stability tests with stabilizers and or axle locking (see 5.4) shall be indicated on the capacity plate.

The wind speed according to the calculation in 5.3 exceeding the rated wind speed of 12,2 m/s shall be indicated.

3) To be published.

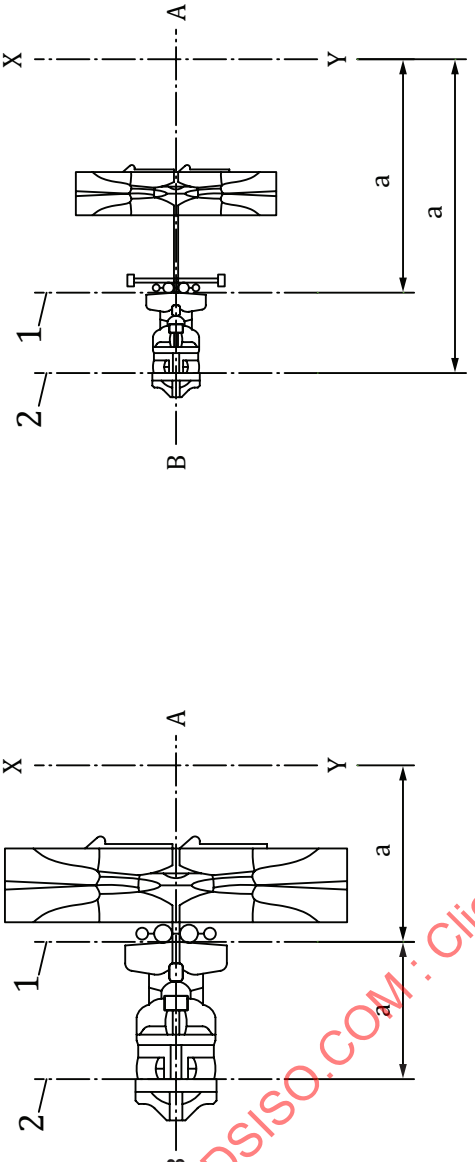
Table 1 — Verification of stability

Test criteria		Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
Direction of test	Longitudinal	x	x				
	Lateral			x	x	x	x
Mode of operation	Travelling		x		x		x
	Stacking	x		x		x	
Test load (container)	With	x	x	x	x		
	Without					x	x
Wind force	With	x	x	x	x		
	Without					x	x
Lift height	Least stable combination[b]	x		x		x[c]	
	Travel		x		x		x
Stabilizer device and/or axle locking	With	x		x			
	Without	x	x	x	x	x	x
Tilt table angle for rated capacity		3,5 %	20 %	6 %	(5 + 1,1 *v*)% (20 % max)	6 %	(15 + 1,4 *v*) % (40 % max)
Truck position on tilt table							

v maximum travel speed of the unladen truck in km/h

XY tilt axis

Table 1 — *(continued)*

Test criteria	Tests 1 and 2
Truck position on tilt table	 **As per 5.4** (stabilizers engaged) only applicable to Test 1 2 steer axle **As per 5.4** (without stabilizer device) 1 load axle