
**Industrial trucks — Verification of
stability —**

Part 9:

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

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Chariots de manutention — Vérification de la stabilité —

*Partie 9: Chariots travaillant en porte-à-faux avec mât
manutentionnant des conteneurs de 6 m (20 ft) de long et plus*

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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
Web www.iso.org

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Contents

	Page
Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Operating conditions	1
4.1 General	1
4.2 Partially elevated container	2
5 Test condition	2
5.1 General	2
5.2 Prevailing wind	2
5.3 Wind force	2
5.4 Position of the truck on the tilt table	4
5.5 Test load	4
5.6 Lift height	5
6 Verification of stability	6
7 Marking	6

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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).

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 edition cancels and replaces ISO 10525, 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 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 trucks*

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

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Industrial trucks — Verification of stability —

Part 9:

Counterbalanced trucks with mast 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 counterbalanced trucks with masts when handling empty or laden freight containers of 6 m (20 ft) length and longer.

It is applicable to these types of industrial trucks that are equipped with forks, a spreader, (top lift and side lift), or other load handling means applicable for container handling.

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

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 668, *Series 1 freight containers — Classification, dimensions and ratings*

ISO 1496-2:2008, *Series 1 freight containers — Specification and testing Part 2: Thermal containers*

ISO 3691-1:2010, *Industrial trucks — Safety requirements and verification — Part 1: Self-propelled industrial trucks, other than driverless variable reach trucks, and burden carrier trucks*

ISO 3874:1997, *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 purpose of this document, the terms and definitions given in ISO 22915-1 apply.

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 speed is up to the rated wind speed of 12,2 m/s.

4.2 Partially elevated container

Container 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.

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

5 Test condition

5.1 General

See ISO 22915-1.

The tests 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, account needs to be taken of the offset loading 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.

5.3 Wind force

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5.3.1 Longitudinal tests

For the longitudinal tests, the wind force acting on the freight container is calculated by Formula (1):

$$F = \frac{\rho}{2} \cdot h \cdot L \cdot v_w^2 \cdot C_{f1} \quad (1)$$

where

F wind force (N);

ρ air density 1,225 kg/m³ (at 15 °C);

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

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

v_w rated wind speed 12,2 m/s;

C_{f1} shape coefficient 1,3.

For trucks intended for use in higher wind speeds 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 Formula (2) (see also [Figure 1](#)):

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

where

F wind force [N];

ρ air density 1,225 kg/m³ (at 15 °C);

v_w rated wind speed 12,2 m/s;

C_{f2} shape coefficient 0,8;

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

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

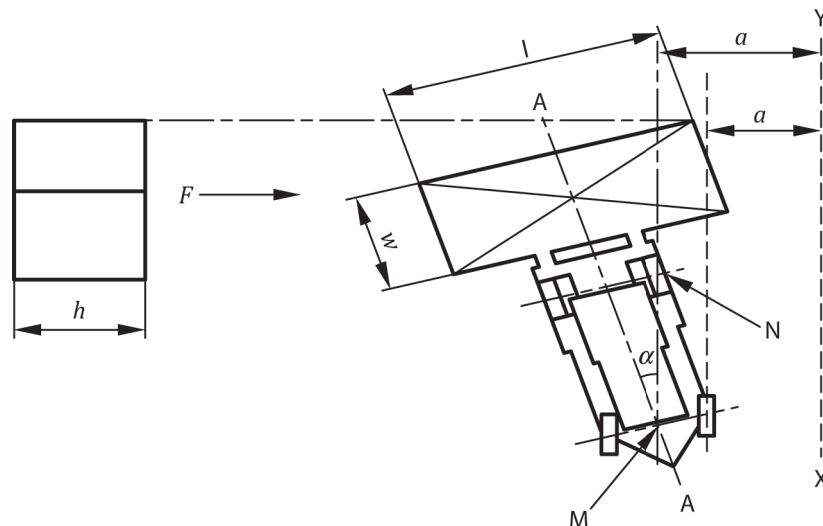
α angle of lateral tipping axis relative to the longitudinal axis of the truck (degrees);

w container width 2,44 m.

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For trucks intended for use in higher wind speeds 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 a wind acting normal to the lateral tipping axis of a freight container handling counterbalanced truck.



Key

F wind force

a parallel

Figure 1 — Wind force for lateral tests