
**Industrial trucks — Verification of
stability —**

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

*Chariots de manutention — Vérification de la stabilité — Partie 13:
Chariots tout-terrain à mât*

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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 22915-13 was prepared by Technical Committee ISO/TC 110, *Industrial trucks*, Subcommittee SC 2, *Safety of powered industrial trucks*.

This first edition of ISO 22915-13, together with ISO 22915-14, cancels and replaces ISO 8379:1998, of which it constitutes a technical revision.

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 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 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 13: Rough-terrain trucks with mast
- Part 14: Rough-terrain variable-reach 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

The following parts are under preparation:

- Part 12: Industrial variable-reach trucks handling freight containers of 6m (20ft) length and longer
- Part 15: Counterbalanced trucks with articulated steering
- Part 16: Pedestrian-propelled trucks
- Part 22: Lateral- and front-stacking trucks with elevating operator position

Single side-loading trucks, and counterbalanced trucks with mast handling freight containers of 6 m (20 ft) length and longer are to form the subject of future Parts 5 and 9.

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Industrial trucks — Verification of stability —

Part 13: Rough-terrain trucks with mast

1 Scope

This part of ISO 22915 specifies the tests for verifying the stability of rough-terrain counterbalanced trucks with mast, equipped with fork arms or with load handling attachments with a rated load up to and including 10 000 kg. It is not applicable to those trucks designed for handling freight containers.

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 5053, *Powered industrial trucks — Terminology*

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

3 Terms and definitions

[ISO 22915-13:2012](#)

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

4 Test conditions

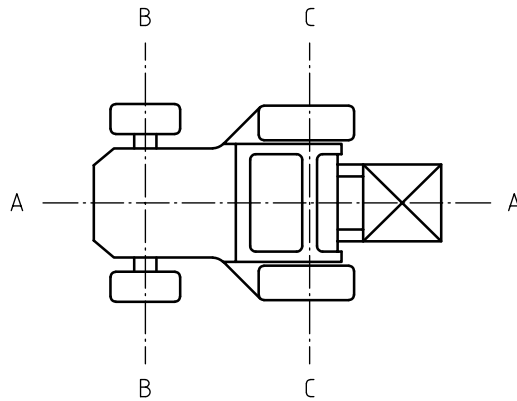
4.1 General

See ISO 22915-1.

4.2 Position of truck on the tilt table

4.2.1 Load and drive/steer axles

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



- Key**
- A-A longitudinal centre plane of the truck
 - B-B steer axle (can also be drive axle on 4-wheel-drive trucks)
 - C-C load axle (can also be steer axle on 4-wheel steer trucks)

Figure 1 — Load axle and drive/steer axle

4.2.2 Stabilizers/axle locking

Stabilizers or axle locking, if fitted, shall only be used for Tests 1 and 3.

4.2.3 Tests 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.

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4.2.4 Tests 3, 4 and 5

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. See Table 1.

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 with 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 (see Table 1).
- b) For trucks with an articulating chassis, point M shall be the projection on the tilt table of the intersection of the longitudinal centre plane, J-J, of the rear chassis module and the axis of the rear axle when fully articulated (see Table 1).
- c) For trucks with axle locking, point M shall be the centre point of the area of contact between the tilt table and the rear wheel nearest to the tilt axis, X-Y, of the tilt table (see Table 1).

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 (or the stabilizer pad, if fitted) nearest to the tilt axis, X-Y, of the tilt table.

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 500 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, F₁, 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.

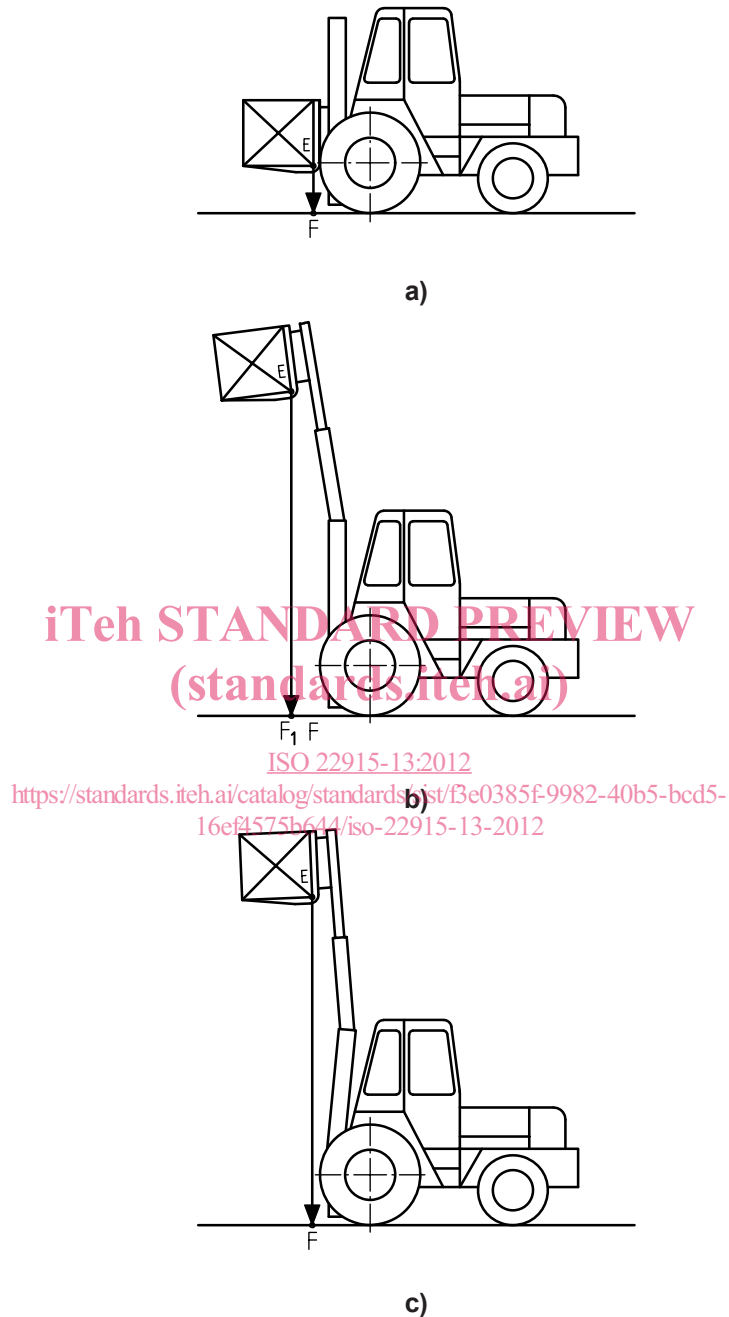


Figure 2 — Datum point positions

4.4 Lift height

For tests simulating travel (Tests 2 and 4), the upper face of the fork arms, measured at the heel of the fork arm when fully tilted rearward, shall be positioned 500 mm above the tilt table.

Test 3 shall be conducted at maximum lift height, and at maximum backward tilt or 10° backwards tilt, or with a 600 mm rearward displacement of the load centre of gravity — whichever leads to the least favourable stability condition.

4.5 Lateral test procedure (Test 3 only)

For trucks fitted with operator-selectable stabilizers, and/or axle locking, Test 3 shall be conducted both with stabilizers/axle locking engaged and disengaged.

For trucks fitted with operator-selectable stabilizers, or chassis levelling, Test 3 shall be performed with a maximum lateral slope correction of 7 % (4°). Lateral slope correction shall only be achieved by operator-selectable stabilizers or chassis levelling.

Lateral slope correction shall not be used for tests other than Test 3.

5 Verification of stability

5.1 General

Stability shall be verified in accordance with Table 1.

5.2 Regional requirements

The tilt table slope to be used in Tests 1, 3 and 4 is subject to regional requirements.

5.2.1 North America

— **Test 1**

Tilt-table slope required: 6 %.

— **Test 3**

Tilt-table slope required: 10 %.

— **Test 4**

Tilt-table slope required: 40 %.

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5.2.2 All other regions

— **Test 1**

Tilt-table slope required: 7 %.

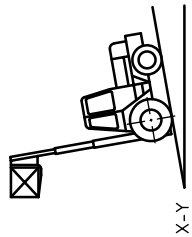
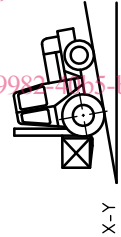
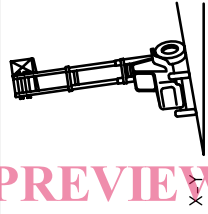
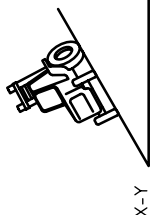
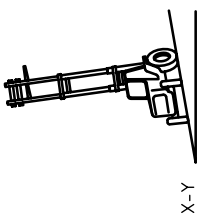
— **Test 3**

Tilt-table slope required: 12 %.

— **Test 4**

Tilt-table slope required: 50 %.

Table 1 — Verification of stability

| Test criteria | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 |
|---------------------------------------|--|--|---|--|--|
| Direction of test | Longitudinal | X | | | |
| | Lateral | | X | X | X |
| Direction of load handling device | Load leading | X | | | |
| | Load trailing | | X | X | X |
| Mode of operation | Travelling | | X | X | |
| | Stacking/retrieving | X | | | X |
| Load at load centre D | With | X | X | | |
| | Without | | | X | X |
| Lift height | Maximum | X | X | | X |
| | Travel | | | X | |
| Stabilizer device and/or axle locking | With | X | X | | |
| | Without | X | X | X | X |
| Lateral slope correction | | | X | | |
| Position of mast | Vertical | X (see 4.3) | X | | X |
| | Full rearward | | | X | |
| Tilt table angle for actual capacity | 6 % or 7 % ^a | 22 % | 10 % or 12 % ^b | 40 % or 50 % ^c | 10 % |
| Truck position on tilt table |  |  |  |  |  |

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